Cover Page for CTF Project/Program Approval Request[a]

1. **Country/Region**	Colombia		2. **CIF Project ID#**	(CIF AU will assign ID.)	
3. **Investment Plan (IP) or Dedicated Private Sector Program (DPSP)**	IP	✓	4. **Public or Private**	Public	✓
	DPSP			Private	
5. **Project/Program Title**	Efficient Energy Demand Management in Non-Interconnected Zones - San Andres, Providencia and Santa Catalina Archipelago Pilot Program				
6. **Is this a private sector program composed of sub-projects?**	Yes				
	No	✓			

7. **Financial Products, Terms and Amounts**

Financial Product		**USD** (million)	**EUR** (million)[b]
Grant			
Fee on grant			
MPIS (for private sector only)			
Public sector loan	Harder terms	10	
	Softer terms		
Senior loan			
Senior loans in local currency hedged			
Subordinated debt / mezzanine instruments with income participation			
Second loss guarantees			
Equity			
Subordinated debt/mezzanine instruments with convertible features			
Convertible grants and contingent recovery grants			
Contingent recovery loans			
First loss guarantees			
Other (please specify)			
Total		10	

8. **Implementing MDB(s)**	Inter-American Development Bank (IDB)
9. **National Implementing Agency**	Ministry of Mines and Energy (MME)
10. **MDB Focal Point**	Claudio Alatorre (calatorre@iadb.org)

11. **Brief Description of Project/Program (including objectives and expected outcomes)**[c]

The Government of Colombia (GoC) is undertaking an important effort to improve the economic, social and environmental conditions of the people living in the non-interconnected zones (ZNI). The IDB is supporting (or plans to support) this effort with programs with a particular focus in two regions: the Colombian Pacific coastline and the San Andres, Providencia and Santa Catalina (SAPSC) Archipelago.

These programs have strong sustainable energy components, which seek to contribute to the GoC's efforts to reduce the dependence on fossil fuels, the use of firewood, and the emissions of GHG in the ZNI:

i. In the Colombian Pacific coastline, the sustainable energy component includes access to reliable, efficient and sustainable electricity services in the area, as well as other sustainable energy solutions to decrease dependence on fossil fuels and firewood. This component will benefit over 20,000 families who live along the Pacific coastline. (USD 91 million out of a USD 231.4 million program, which includes as well water and sanitation interventions).
ii. In the SAPSC Archipelago, the energy component is focused mainly on the promotion of energy efficiency (EE) measures. It targets the commercial, residential, industrial and government sectors, with a goal of reaching at least 3,000 users in the first 5 years and 8,000 by the end of year 10. (This component, with USD 10 million, complements a separate USD 70 million project, which addresses interventions in housing, water and sanitation, coastal infrastructure and risk management, as well as the development of microbusinesses and fiscal sustainability).
iii. Finally, a nation-wide program, the Renewable Energy Financing Program for the ZNI (USD 20 million, including 10 million from CTF) will complement the two above programs with specific interventions.

CTF resources are hereby requested for the energy component in the SAPSC Archipelago, called "Efficient Energy Demand Management in Non-Interconnected Zones - San Andres, Providencia and Santa Catalina Archipelago Pilot Program" (hereafter "the Program").

The general objective of the Program is to reduce greenhouse gas (GHG) emissions, and its specific objective is to improve energy sustainability through enhancements in electricity demand management (DM), such as energy efficiency measures and the use of local energy resources. The Program includes: (i) an efficient DM mechanism; (ii) an environmental, communications and social management sustainability plan; and (iii) an administration component.

CTF resources will be channeled through the Non-Conventional Energy and Efficient Energy Management Fund (FENOGE). The technical design of the Program is based on previous studies conducted by the Ministry of Mines and Energy (MME) through its Mining and Energy Planning Unit (UPME), on user distribution, consumption habits, and sector-disaggregated energy demand.

The Program focuses primarily on residential users, as they are the majority, not only in number but also in aggregate energy consumption. Additionally, commercial, industrial (hotel) and government sectors have also been identified as potential beneficiaries of the Program.

The Program will finance this mechanism during a period of five years, during which program activities will be carried out. Once the Program implementation is complete, FENOGE may continue to operate through its fiduciary fund for an additional period, estimated to be five years, for a total duration of ten years during which funds from credit repayments would be used. The CTF funding of USD10 million, is to be disbursed in the first 5 years, of which US7.5 million will be earmarked for implementation of energy efficiency (EE) subprograms (refrigeration, lighting and air conditioning) and installation of non-conventional sources of energy generation (solar/photovoltaic). These technologies will be incorporated through a process of equipment substitution defined within the Program operational framework. Resources for Program implementation will cover, in addition to equipment, Program transaction costs as well as a portion of the scrapping costs associated with final disposal of obsolete equipment, in order to

prevent the possible emergence of a black market which could negatively affect Program results.

The Program will draw lessons from and seek synergies with the other energy efficiency interventions that the IDB is implementing in Colombia with CTF resources: the Program for Funding Energy Efficiency Projects in the Service Sector (USD 20 million, including 10 million from CTF), and two inter-related private sector projects targeting energy efficiency in SMEs.

A project preparation grant of USD 552,000 was approved by the CTF Trust-Fund Committee on May 2014 for the Program. One part of these resources was used to prepare the Program proposal. The remaining part will be used for the communication strategy, the social management plan, technical training, and some pilot interventions.

12. **Consistency with CTF investment criteria**[c]	
(1) Potential GHG emissions savings	See Annex 1, page 1
(2) Cost-effectiveness	See Annex 1, page 2
(3) Demonstration potential at scale	See Annex 1, page 2
(4) Development impact	See Annex 1, page 2
(5) Implementation potential	See Annex 1, page 3
(6) Additional costs and risk premium	See Annex 1, page 4
Additional CTF investment criteria for private sector projects/ programs	
(7) Financial sustainability	
(8) Effective utilization of concessional finance	
(9) Mitigation of market distortions	
(10) Risks	
13. **For DPSP projects/programs in non-CTF countries, explain consistency with FIP, PPCR, or SREP Investment Criteria and/or national energy policy and strategy**	
Not applicable	
14. **Stakeholder Engagement**[c]	
See Annex 1, page 4	
15. **Gender Considerations**[c]	
See Annex 1, page 4	
16. **Indicators and Targets**[1]	
Project/Program Timeline	
Expected start date of implementation[d]	May 2016
Expected end date of implementation[d]	December 2021
Expected investment lifetime in years (for estimating lifetime targets)	15

[1] The results listed here correspond only to the operation in the SAPSC Archipelago, and not to the operation in the Pacific Coastline (CO-L1156), because of differences in scope.

Core Indicators		**Targets**[e]
GHG emissions reduced or avoided over lifetime (tons of CO_2-eq)		141,000
Annual GHG emissions reduced or avoided (tons of CO_2-eq/year) (specify: upon completion of the project/program / on the maximum year / on a representative year)	on year 10 (maximum)	9,425
Installed capacity of renewable energy (MW)		
Number of additional passengers using low-carbon transport per day		
Energy savings cumulative over lifetime of investment (MWh)		113,000
Annual energy savings (MWh/year) (specify: upon completion of the project/program / on the maximum year / on a representative year)	on year 10 (maximum)	19,000
Identify relevant development impact indicator(s)		**Targets**
Beneficiaries (families, firms or government agencies) on year 10		8,000
Reductions in subsidies (USD million) over the 10 years of program execution		12.4

17. **Co-financing**		
	Please specify as appropriate	Amount (in million USD)
MDB 1	Energy Component, Pacific Coastline[2]	91
MDB 2 (if any)		
Government		
Private Sector		
Bilateral		
Others	Contributions by beneficiaries	2
Total		93

18. **Expected Date of MDB Approval**
CTF operation will be approved in February 24th 2016. IDB Loan CO-L1156 (Pacific coastline) will be approved in December 6th 2015.

NOTES:

[a] This cover page is to be completed and submitted together with the MDB project/program proposal when requesting CTF funding approval by the Trust Fund Committee.

[b] For products denominated in EUR, please also provide USD equivalent in the column to the left

[c] Please provide the information in the cover page or indicate page/section numbers in the accompanying project/program proposal where such information can be found.

[d] Insert "not applicable" (N/A) if dates cannot be determined at the time of submission (e.g. private sector programs)

[e] Insert value N/A if indicator is not applicable to the project/program.

Version December 9, 2014

[2] Given that the two programs (SAPSC and Pacific coastline) were planned together, we are including here the co-financing figures of the Pacific coastline project. (The indicators and targets correspond only to the SAPSC Program.)

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

COLOMBIA

EFFICIENT ENERGY DEMAND MANAGEMENT IN NON-INTERCONNECTED ZONES - SAN ANDRES, PROVIDENCIA AND SANTA CATALINA ARCHIPELAGO PILOT PROGRAM

(CO-L1119)

PROPOSAL FOR OPERATIONAL DEVELOPMENT

This document was prepared by the Project Team made up of the following members: José Ramón Gómez (ENE/CCO), Team Leader; Roberto Esmeral Berrio (CCS/CCO), Alternate Team Leader; Nancy Jesurun-Clements (INE/ENE); Juan Roberto Paredes (INE/ENE); Jorge Mercado (ENE/CDR); Haydemar Cova León (INE/ENE); Wilkferg Vanegas (INE/ENE); Sofía Greco (LEG/SGO) Andrea Giraldo (CAN/CCO); Miguel Orellana (FMP/CCO); Gabriele del Monte (FMP/CCO); and Álvaro Concha Perdomo (CMF/CCO); and Óscar Camé (ESG/CPR).

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MAIN DOCUMENT

ANNEXES

ABBREVIATIONS	
AOP	Annual Operating Plans
CND	National Dispatch Center (*Centro Nacional de Despacho*)
COP	Colombian Pesos
CTF	Clean Technology Fund
DEM	Development Effectiveness Matrix
DM	Demand Management
EA	Executive Agency
EE	Energy Efficiency
ESMF	Environmental and Social Management Framework
ESMR	Environmental and Social Management Report
FENOGE	Non-Conventional Energy and Efficient Energy Management Fund (*Fondo de Energías No Convencionales y Gestión Eficiente de la Energía*)
GHG	Greenhouse Gases
Government	Government of Colombia
IDB	Inter-American Development Bank
IRR	Internal Rate of Return
IPSE	Institute of Planning and Promotion of Energy Solutions in NZI (*Instituto de Planificación y Promoción de Soluciones Energéticas para las ZNI*)
MEP	Multiannual Execution Plan
MGAS	Environmental and Social Management Framework (MGAS)
MME	Ministry of Mines and Energy
NCRE	Non-Conventional Renewable Energy
NIS	National Interconnected System
ZNI	Non-Interconnected Zones (*Zonas no interconectadas*)
NPV	Net Present Value
POR	Program Operational Regulation
PCU	Program Coordination Unit
PRONE	Electric Power Standardization Program (*Programa de Normalización de Redes Eléctricas*)
PROURE	Program for Rational and Efficient Conventional and Non-Conventional Energy Use (*Programa de Uso Racional y Eficiente de la Energía y demás formas de Energía No Convencional*)
PP	Procurement Plan
RE	Renewable Energy
SAPSC	San Andres, Providencia and Santa Catalina
SE4All	Sustainable Energy For All
SOPESA	*Sociedad Productora de Energía de San Andrés y Providencia S.A*
SSPD	Residential Public Utility Superintendency (*Superintendencia de Servicios Públicos Domiciliarios*)
TC	Technical Cooperation
UPME	Mining and Energy Planning Unit (*Unidad de Planeación Minero Energética*)
UBN	Unsatisfied Basic Needs
WEM	Wholesale Energy Market

PROGRAM SUMMARY
COLOMBIA
EFFICIENT ENERGY DEMAND MANAGEMENT IN NON-INTERCONNECTED ZONES - SAN ANDRES, PROVIDENCIA AND SANTA CATALINA ARCHIPELAGO PILOT PROGRAM
(CO-L1119)

<table>
<tr><th colspan="5">Financial Terms and Conditions</th></tr>
<tr><td colspan="3">Borrower:
Republic of Colombia</td><td>Amortization Period:</td><td>20 years</td></tr>
<tr><td colspan="3" rowspan="2">Executive Agency (EA):
Ministry of Mines and Energy (MME)</td><td>Disbursement Period:</td><td>5 years</td></tr>
<tr><td>Grace Period:</td><td>10.5 years</td></tr>
<tr><td>Source [a]</td><td>Amount (US$)</td><td>%</td><td>Administration Commission (single payment)</td><td>0.45%</td></tr>
<tr><td>Clean Technology Fund (CTF) [b]</td><td>10,000,000</td><td>100</td><td>Interest Rate:</td><td>0.75% Fixed</td></tr>
<tr><td>Total:</td><td>10,000,000</td><td>100</td><td>Currency of Approval:</td><td>US$ chargeable to CTF</td></tr>
<tr><th colspan="5">Project Scheme</th></tr>
<tr><td colspan="5">Project Objective/Description. The program's general objective is to reduce greenhouse gas (GHG) emissions in the non-interconnected zones (ZNI). Its specific objective is to improve energy sustainability through improvements in electricity demand management (DM), such as, energy efficiency (EE) measures and the use of local energy resources. This will be achieved through the development and implementation of a pilot program in San Andres, Providencia and Santa Catalina Archipelago (SAPSC), and the resulting experience could be replicated in other ZNI of Colombia. The program includes: (i) an efficient DM mechanism; (ii) an environmental, communications and social management sustainability plan; and (iii) administration.</td></tr>
<tr><td colspan="5">Special contractual conditions prior to first disbursement: The Executive Agency (EA) shall submit, to the Bank's satisfaction, evidence of: (i) the official approval of the regulation of FENOGE, and the selection of the trust that will administer it. (¶3.1); (ii) creation of the Program Coordination Unit (PCU) and hiring of the required minimum staff, in accordance with terms previously agreed upon with the Bank (¶3.2); and (iii) entry into effect of the Program Operational Regulations (POR) previously agreed upon with Bank (¶3.5).</td></tr>
<tr><td colspan="5">Special contractual conditions for execution: Prior to execution of activities under Component 1 of the program, the EA must present to the Bank's satisfaction: (i) evidence of a valid subsidiary agreement between the EA and the program's technical operator, in accordance with terms previously agreed upon with the Bank (¶3.4); and (ii) a training plan, specific to financial and procurement management, directed to EA staff assigned to program execution (¶3.3).</td></tr>
<tr><td colspan="5">Exceptions to the Bank's Policies: None.</td></tr>
<tr><td colspan="5">The project qualifies[c]: SV ☐ PE ☐ CC ☑ CI ☐</td></tr>
</table>

(a) Resource availability is subject to prior approval by the Clean Technology Fund (CTF) Trust Fund Committee. Program sources will be complemented by investment project funding under the "Water, Basic Sanitation and Electrification Program for the Colombian Pacific" (CO-L1156) (¶ 1.15).

(b) Proposal for the establishment of the Clean Technology Fund (CTF) in the Inter-American Development Bank (GN-2571).

(c) SV (Small and Vulnerable Countries), PE (Poverty Reduction and Equity Enhancement), CC (Climate Change, Sustainable Energy and Environmental Sustainability), CI (Regional Cooperation and Integration).

I. PROJECT DESCRIPTION AND MONITORING OF RESULTS

A. Background, Issue and Justification

1.1 **The Electricity Sector in Colombia.** Law 142 (Public Utility Services Act) and Law 143 (Electricity Act) of 1994 regulate operation of the industry organization and electricity market's operation. In accordance with the above legal framework, the Ministry of Mines and Energy (MME), the National Planning Department (NPD) and the Mining and Energy Planning Unit (UPME) are in charge of defining sector policies and its indicative planning. The Energy Regulatory Commission (CREG) and the Residential Public Utility Superintendency (SSPD) perform the functions of regulation, supervision and control of sector operation. Law 697 of 2001 establishes that the MME is the responsible entity for promoting, organizing and ensuring the development and monitoring of efficient and rational energy use programs. These laws and the current institutional framework have a sufficiently sound political and regulatory foundation to promote public and private investments in the country.

1.2 According to its operating structure, Colombia's electricity generating system is divided into two service zones, as follows:

a) **National Interconnected System.** The National Interconnected System (NIS) is a liberalized market for electricity retailing, implemented through the mechanism of power exchange and long-term transactions using financial contracts. In the NIS, the power generated has been retailed since 1995 in the Wholesale Energy Market (WEM) operated by the National Dispatch Center (CND), and

b) **The Non-Interconnected Zones (ZNI).** Colombia's ZNI are those areas without access to NIS electricity services. The ZNI are located far from cities and consumption centers, with high rates of unsatisfied basic needs (UBNs) and populations with reduced payment capacity, costly electricity services, based mainly in the use of liquid fossil fuels transported to the ZNI at high cost, and high rates of electricity losses. Sixty-six percent (66%) of the national territory falls under the category of ZNI in 16 departments; however, their inhabitants represent just 2% of the country's electric energy users. The current installed capacity in the ZNI is 118MW, of which only 8% is generated by non-conventional renewable energy (NCRE) sources and 92% by diesel generation plants. The Government intervenes in these zones through the Institute for Planning and Promotion of Energy Solutions (IPSE), the supervisory agency overseeing 92 service providers, including 46 municipalities, 34 utility companies, 1 governorship and 11 community organizations and cooperatives.

1.3 **San Andres, Providencia and Santa Catalina Islands.** The surface area of the San Andres, Providencia and Santa Catalina Archipelago (SAPSC) is 52.2 km^2. Its capital is San Andres Island, located 720 km northeast of the Caribbean coast, and it is one of the ZNI's municipal capitals. The Archipelago has 75,167 inhabitants with a population density of 1.44 inhabitants/m^2. The main economic activities are tourism and commerce, and to a lesser degree agriculture and subsistence fishing.

1.4 Coverage of electricity services in the SAPSC Archipelago is close to 100%, and its energy matrix is almost entirely dependent on fossil fuels. Demand was

approximately 200 GWh in 2013. The system had a maximum potential of 31.4 MW, distributed mainly between the residential, industrial and business sectors, each of which account for 30% of total consumption.

1.5 It is estimated that the annual short-term growth of demand, considering the historical trend, will be around 2.2%, with a tendency toward reducing the pace of growth in the mid- and long-term timeframe. The Archipelago's energy matrix is based 100% on power generation based on diesel technology, exerting significant impact not only on the tariffs applied to the users. Electric power services are delivered under a concession contract within the legal framework of the Exclusive Service Area, whose signees are the MME and *Sociedad Productora de Energía de San Andrés y Providencia S.A.* (SOPESA), the private operator in charge of electric power generation, distribution and retailing in the Archipelago.

1.6 The UPME of the MME completed a study to characterize power consumption and energy audits in different economic sectors of the SAPSC Archipelago between 2010 and 2012. Its findings indicate that the largest consumption of electricity occurs in the residential sector, with up to 80% associated to refrigeration, air conditioning and heating, especially among the higher socioeconomic levels of consumers (tiers 4 to 6)[1]. In other sectors such as the hospitality industry, businesses and the public sector, the highest demand for electricity comes from air conditioning, followed by refrigeration and lighting systems. Specifically in the hotel sector, air conditioning generates between 60% and 75% of the electricity demand. The main causal factors identified for these high consumption levels were the large inefficiencies due to inadequate practices of selection, installation, operation and maintenance of equipment, and technological obsolescence[2].

1.7 In view of the environmental impacts associated to greenhouse gas (GHG) emissions and the high costs of fossil-fuel generated electricity services on the Archipelago[3], the Government decided to prioritize the implementation of Energy Efficiency (EE) and electricity DM measures in this area to reduce electricity consumption[4]. This reduction would result in lower GHG emissions—currently around 109,000 tons of CO_2/year—and savings for consumers by reducing their total electricity bills, and in reductions in electricity subsidies the Government provides to the ZNI based on consumption volumes, that amount to around

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1 Households are classified by Colombia's National Administrative Department of Statistics (DANE) based on socioeconomic indicators. The purpose is to apply differentiated charges for utility services grouped in tiers, allowing the assignment of subsidies (tiers 1-3) and the collection of contributions (tiers 5-6), according to affordability.

2 In the case of homes that consume less than 400 kWh/month (80% of all residential users), UPME audits found that consumption associated to refrigerators without automatic cycle, was significant (less efficient) : between 100 and 200 kWh/month, compared to normal consumption of around 50 KWh/month.

3 The average spot price of electricity in Colombia during the first quarter of 2015 ranged between Col$160 and Col$200 per kWh, while the corresponding figure for the Archipelago can be as high as Col$850/kWh.

4 The European Union (June 2015), "Energy Efficiency Trends and Policies in the Household and Tertiary Sectors: An Analysis based on the ODYSEE and MURE Databases", concludes that the benefits of EE and renewable energy go beyond energy savings and reduced GHG emissions. According to the report of the Nordic Council of Ministers, "The Impact of Renewables and Energy Efficiency on Greenhouse Gas Emissions", GHG emissions of the Nordic countries are currently between 30% and 40% lower than forecasted as a result of the implementation of EE and RE measures.

US$30.2 million per year for the SAPSC Archipelago[5]. There are 19,300 users receiving subsidies, with consumption levels of up to 800 kWh/month in San Andres[6]. Through audits, UPME determined that, depending on the sector, it would be possible to save between 25% and 55% in consumption, in potential minimal savings arising 5% from good practices, 10% from technological retrofitting and 10% from building modifications, and the use of Renewable Energy (RE).

1.8 Table I-1 presents the distribution of energy consumption by user.

Table I -1 Distribution of Energy Consumption By User Type

Use	**User Type**					
Residential	**Tier 1**	**Tier 2**	**Tier 3**	**Tier 4**	**Tier 5**	**Tier 6**
Refrigeration	35%	34%	29%	18%	14%	10%
Ventilation	23%	23%	11%	8%	8%	8%
Air Conditioning	0%	0%	22%	52%	56%	61%
Lighting	12%	13%	13%	9%	8%	10%
Television	19%	18%	10%	8%	7%	3%
Commercial	**Sales**			**Food Products**		
Refrigeration	-			58%		
Air Conditioning	53%			24%		
Lighting	29%			10%		
Industrial	**Hotels/Category**					
	High > 300 rooms		**Medium 100-200 rooms**		**Low > 100 rooms**	
Refrigeration	24%		13%		6%	
Air Conditioning	60%		64%		75%	
Lighting	5%		11%		7%	

1.9 **Program Strategy.** Through improved management of electricity demand and the use of local energy resources, the program is expected to contribute to the Government of Colombia's efforts to move forward in the promotion of sustainable energy solutions to reduce dependence on fossil fuels, the use of firewood, and GHG emissions in the ZNI. The program will initiate this support through development and implementation of a pilot program in SAPSC Archipelago, through the promotion of NCRE sources and EE measures, specifically in the commercial, residential, industrial and government sectors, with a goal of reaching, at least, 3,000 users. (¶1.22). The program is consistent with the principles of the Government strategy for electricity coverage to the 39 municipal capitals in the ZNI[7], namely: (i) sustainable structure of electricity services from the utility companies; (ii) rational and efficient energy use; (iii) control and monitoring of electricity services; y (iv) adequate structure of

[5] In 2014, the Government electricity subsidies in the ZNI totaled over US$70 million. http://www.minminas.gov.co/en/subsidios-zonas-no-interconectadas.

[6] In the rest of the country this figure is 173 kWh/month.

[7] Indicative Plan of Electric Energy Coverage Expansion 2013 - 2017. Ministry of Mines and Energy (MME)

projects for conventional and non-conventional RE supply, with the goal of 30% of supply from these sources by 2020.

1.10 **Government Strategy.** The Government declared rational and efficient energy use a matter of social, governmental and national interest through Law 697 of 2001. To conform to this Law, the MME created the Electric Power Standardization Program (PROURE)[8]. PROURE aims to reduce energy intensity, improve EE in the consumption sectors and promote NCREs, in order to identify potential areas and energy savings targets and increase the share non-conventional technologies and sources in the country's energy matrix.

1.11 The government has prioritized the development of new tools for reaching its goals, including: formulation of a public policy on EE and introduction of fiscal incentives for the integration of NCREs to the national energy system (Law 1715 of 2014), and MME Resolution 90325 of March 25, 2014, through which policy guidelines were adopted toward reduction of emissions in the electricity, mining and hydrocarbon sectors. The Government adopted the Indicative Action Plan 2010–2015, Vision 2020, to develop the PROURE, and to set a goal for 2015 of 14.75% savings in national electricity consumption, of which 8.7% would come from the residential sector, and 2.7% from the commercial, government and service sectors.

1.12 Under Law 1715 of 2014, the Government created the Non-Conventional Energy and Efficient Energy Management Fund (FENOGE)[9], FENOGE will provide financing for programs and projects for all sectors in the ZNI and to lower consumption residential sector tiers (1, 2 and 3) in SIN, for implementing small-scale self-generating energy solutions as well as for improved EE through the promotion of good practices, end-use energy equipment, internal connections upgrading and building modifications. FENOGE will be regulated by the MME and administered by a trust. Through Law 1715, multilateral or international organizations can make contributions to FENOGE.

1.13 **Recent Participation by the IDB.** The IDB has wide experience in Colombia's energy sector, in areas such as intelligent networks, EE measures, hydroelectric projects, geothermal energy, and supporting regional electric interconnection initiatives[10]. The Bank has experience in the SAPSC Archipelago through the Program for Support to the Sustainable Development of the Archipelago of San Andres, Providencia and Santa Catalina (3104/OC-CO) for US$70 million. This program's objective is to improve the population's social and economic conditions with interventions in housing, water and sanitation, coastal infrastructure and risk management, development of microbusinesses and fiscal sustainability[11] .

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8 Action Plan-PROURE Consultants' Final Report .

9 *Fondo de Energías No Convencionales y Gestión Eficiente de la Energía.*

10 The technical cooperation projects in implementation in Colombia are: ATN/KK-14254-CO, ATN/OC-13351-CO, ATN/CM-12805-CO, ATN/CM-12825-CO, ATN/TC-14531-CO y ATN/OC-14807-RG.

11 As a result of the reduction in expected electricity consumption, the proposed program will supplement actions carried out by 3104/OC-CO, in improvements to the provision of public services and local economic development.

1.14 The IDB has been working with the Clean Technology Fund (CTF)[12] in implementing EE and RE measures in Colombia, such as: (i) the Program for Funding Energy Efficiency Projects in the Service Sector (CO-L1124) (US$20 million), aimed at improving the competitiveness of hotels, clinics and hospitals throughout the country and reducing GHG emissions through a mechanism of private sector funding of EE projects;[13] and (ii) the RE Funding Program for ZNI (CO-L1161) (US$10 million), aimed at reducing GHG emissions, as a result of an increase in private sector investments in RE in the ZNI and isolated localities by providing long-term financing for private investors interested in carrying out RE investments in these zones[14].

1.15 The IDB is in process of preparing the Program for Water, Basic Sanitation and Electrification for the Colombian Pacific (CO-L1156). This program will support the implementation of the "*Todos Somos Pazcífico*" plan, which aims to generate and strengthen the economic, social and environmental conditions of the population by prioritizing interventions in water, basic sanitation and energization. This sustainable rural energy subprogram aims to promote: (i) access to reliable, efficient and sustainable electricity services to the population of the Colombian Pacific coastal area; (ii) sustainable energy solutions to decrease dependence on fossil fuels and firewood, thus reducing GHG emissions. The subprogram will benefit over 20,000 families who live along the Pacific coastline.

1.16 Through its broad experience, the Bank has learned valuable lessons that have been used to design the program, such as: (i) to ensure adequate technical capacity of the Executive Agency (EA) as an integral part of the project and within the context of the country's reality. The institutional capacity of the MME was analyzed and proposals were made to strengthen the institution as part of the program's activities; (ii) the need for support and leadership from the highest levels of the institutional framework, so that the intervention may be prioritized from the central level, and be framed within a previously defined public policy. During program preparation, high-level meetings with the MME, DNP and the Finance Ministry were held, to agree jointly on the scope of the intervention and to analyze the different options for the implementation mechanism; and (iii) ensure compliance with the socio-environmental criteria in line with the safeguards of the Bank and the country. Environmental prerequisites for the program were included accordingly, and will form part of the POR.

1.17 **Strategic Alignment.** The program is aligned with the 2015–2018 Country Strategy, which identifies three policy areas: (i) productivity of the economy,

[12] The CTF was created to provide concession financing to middle-income countries for the demonstration, implementation and transfer of low-carbon technologies with high potential for GHG emission reduction. In 2010 the CTF approved an Investment Plan for Colombia, ratified in 2013, which delineates the strategy, sectors and objectives of the programs and projects to be implemented by the World Bank (WB) and by the IDB in Colombia, for the purpose of leveraging additional resources and supporting GHG and climate change mitigation measures. This Plan includes US$39 million of concessionary resources for EE programs, of which US$10 million will be implemented under this program.

[13] The program strengthens the vision of promoting rational and efficient energy use in strategic sectors, in conjunction with the Program for Innovative Instruments for Small- and Medium-Sized Enterprises, in Colombia (CO-M1095). These two programs propose financing schemes that make it possible to overcome barriers to resource availability and promotion in both private and public sectors.

[14] The program is currently under preparation and will be implemented by the *Banco de Comercio Exterior de Colombia S.A.* (Bancóldex). This operation is supported by a Technical Cooperation (CT) with funds from the Clean Technology Fund (CTF) for US$ 552,000 (ATN/TC-14531-CO), approved in 2014.

(ii) effectiveness of public sector management, and (iii) social mobility and consolidation of the middle class. The program contributes to these three areas through the reduction of energy costs, the fiscal cost of subsidies, and increased service provision to the ZNI. The program will contribute to the IDB Ninth General Capital Increase (GCI-9) to support climate change initiatives, RE and environmental sustainability, by funding EE measures that will reduce fossil-fuel-based energy consumption and installation of stand-alone photovoltaic systems. The project is aligned with the regional objective of environmental protection, mitigating climate change, promoting RE and improving food security, by reducing GHG emissions from electricity generation.

1.18 The program will contribute with the following products: (i) percentage of energy generation from low-carbon emission sources over total energy generation, financed by the IDB; and (ii) climate change pilot projects in agriculture, energy, health, water and sanitation, transport and housing. The program is aligned with the priority areas of the Sustainable Infrastructure Strategy for Competitiveness and Inclusive Growth (GN-2710-5), that supports the construction and maintenance of environmentally and socially sustainable infrastructure that will contribute to enhanced quality of life.

1.19 **Consistency in IDB Policies.** The program is consistent with the objectives stated in the Public Utility Policy (GN-2716-6). The operation meets the conditions of financial sustainability and economic evaluation consistent with the regulation of FENOGE, which requires the projects to be financed with its resources to comply with cost-benefit analysis that compares the project cost with economic savings or generated earnings. The fulfillment of these conditions is reflected in the program economic analysis (¶2.6). This analysis shows that more efficient refrigeration, air conditioning and lighting equipment can lead to a decrease in energy consumption, which in turn reduces GHG emissions as well as the subsidies granted by the Government for fossil fuel-based power generation.

1.20 The program is aligned with the global objectives of the Sustainable Energy for All (SE4All) initiative, promoted by the United Nations (UN). The program contributes to the Sustainable Development Goals approved by the United Nations under its 2030 Agenda for Sustainable Development. Specifically, the program contributes to SDG *Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all*. The program contributes to the target of doubling the global rate of improvement in energy efficiency; and SDG *Goal 13: Take urgent action to combat climate change and its impacts.* The program contributes to the target of improving education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

B. Objectives, Components and Costs

1.21 **Objectives.** The general objective of the program is to reduce GHG emissions in ZNI. The specific objective is to improve energy sustainability through enhancing electricity DM, using EE measures and local energy resources. This objective will be achieved through a pilot project in the San Andres Archipelago (SAPSC). The experience could then be replicated in other ZNI. The project includes the following components:

1.22 **Component 1. Efficient Energy Demand Management Mechanism (US$7.5 million).** A financial mechanism will be created, offering differentiated loan conditions for each type of client, to support SAPSC users to implement EE and RE measures, such as: (i) technological reconversion through replacement of refrigeration, ventilation and lighting equipment with appliances that are more efficient in terms of energy consumption for residential, commercial, industrial (small and medium-sized hotels), and government users; and (ii) installation of individual solar photovoltaic generation solutions that reduce consumption of energy generated from fossil fuels by industrial and government users. All technologies financed by the program must have energy certification through the scheme developed by MME or an equivalent scheme officially recognized by the MME and the IDB.

1.23 The technologies proposed to be included in the program for the residential sector are: refrigeration equipment for all tiers; roof turbine vents to improve ventilation conditions for tiers 1, 2 and 3; air conditioners for tiers 3 to 6, and lighting equipment for all tiers. The technologies proposed for the commercial and industrial (hotel) sectors include: high efficiency refrigeration, air conditioning and lighting equipment. Additionally, the program proposes on-grid solar photovoltaic energy generation solutions for self-consumption in the hotel sector and for government buildings whose consumption curves and roof availability allow for the installation of 5kWp systems without generating surplus for the grid, while having available space for solar panels.

1.24 The basic criteria established for the use of the financial mechanism are: (i) grant investments for public entities; and (ii) credit for all other users, with payments set as a percentage of the savings generated by the reduction in consumption resulting from the program, to be reflected in users' electricity bills. The percentage to be applied as payment for the credit is as follows: 50% during 24 months for residential users in tiers 1 to 3; 85% during 48 months for commercial, industrial (low-range) and residential users in tiers 4 to 6; 85% during 24 months for mid-range industrial users. The goal is to benefit the largest possible number of users with the resources available. Each beneficiary will have access to funding only once. The POR will establish in detail, the equipment delivery mechanism, formulas for calculating savings in electricity bills, and the technical specifications of equipment eligible for replacement.

1.25 Funds collected as repayments will be directly deposited into FENOGE's (¶3.1) fiduciary fund, through which they can be relent to new beneficiaries. The program will finance this mechanism during a period of five years, during which program activities will be carried out. Once the program implementation is complete, FENOGE may continue to operate through its fiduciary fund for an additional period, estimated to be five years, for a total duration of ten years during which funds from credit repayments would be used. It is expected that 8,000 users could benefit from the program, of which 3,000 would benefit in the first five years of implementation.

1.26 **Component 2. Environmental sustainability, communication and social management plan (US$1.8 million).** This component will finance: (i) design and implementation of an environmental management plan that establishes the measures and mechanisms to ensure proper disposal of equipment replaced in the program; (ii) design and implementation of a communication and promotion strategy targeted at potential users and beneficiaries; and (iii) design and

implementation of a social management plan that includes training activities to promote energy saving and efficient energy use to end users, training in educational establishments and community centers, disseminating of informational material to users and beneficiaries, design and implementation of a training course for EE technicians, and analysis of alternative potential DM methods at the end user level. It is expected that at least 50% of people trained will be women.

1.27 **Administration (US$0.6 million).**This component will finance activities that support MME in program implementation. Activities include hiring a program coordinator and specialist technical coordinator, such as activities for the technical operator procurement process; coordination between different actors involved in the program implementation including the Government of San Andres, and SOPESA the energy concessionary of San Andres and Providencia; program administration costs associated with program auditing, monitoring and evaluation. Final evaluation will focus on lessons learned from the SAPSC Archipelago pilot project, which will serve as input for the design of interventions by FENOGE in other parts of the country.

1.28 Table I-2 provides the costs associated with these activities.

Table I-2. Total Program Costs (in US$)

Investment Category	Cost (US$)
Component 1. Efficient Energy Demand Management Mechanism	**$7,500,000**
Financial Cost of FENOGE's Trust Fund	$150,000
Investments in EE measures	$7,110,000
Administrative costs	$240,000
Component 2. Environmental sustainability, communication and social management plan	**$1,822,000**
Design of comprehensive environmental and social awareness plan	$30,000
Implementation of comprehensive environmental and social awareness plan	$1,412,000
Design of program communication and promotion strategy	$30,000
Implementation of program communication and promotion strategy	$350,000
Administration	**$633,000**
Program coordinator	$198,000
Program assistant	$65,000
Environmental specialist	$75,000
Fiduciary specialist	$35,000
Procurement specialist	$35,000
Lawyer	$25,000
Operation, logistic, auditing and assessment costs	$200,000
IDB Administrative Commission (0.45%)	**$45,000**
Total	**$10,000,000**

B. Key Result Indicators

1.29 The Results Matrix (Annex 2) presents indicators of the impact and results associated with the program objectives. As an impact and result of the EE measures to be implemented, there is a decrease of 9,500 tons of CO_2 emissions annually, a contribution to climate risk mitigation. The main results identified are: reduction in energy consumption in commercial, residential, industrial and government sectors; and improvement in financial sustainability of the electricity

sector on SAPSC Archipelago. The indicators proposed for these results are: (i) annual energy savings as a result of EE measures implemented; and (ii) reduction in subsidies for electricity generation. The program aims to reach a minimum of 3,000 users with EE measures under program.

II. FINANCING STRUCTURE AND MAJOR RISKS

A. Financing Instruments

2.1 **Financing Structure.** The program is structured as an investment loan for up to US$10 million. The program execution duration is five years, in accordance with the Disbursement Timeline in Table II-1, detailed in the Pluriannual Execution Plan[15].

Table II-1 Disbursement Timeline

Source	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
CTF	$1,145,262	$1,105,817	$2,632,974	$2,582,974	$2,532,974	$10,000,000
TOTAL	$1,145,262	$1,105,817	$2,632,974	$2,582,974	$2,532,974	$10,000,000
Disbursement (%)	11.5%	11.1%	26.3%	25.8%	25.3%	100%

B. Viability and Sustainability

2.2 **Technical Viability.** In preparation for the program, a technical viability analysis was performed to determine market potential for developing a program in EE and NCRE sources for different types of users in the SAPSC Archipelago. The analysis included the following aspects: (i) potential energy savings through investment in equipment substitution by end users who switch to more efficient appliances, as well as through the introduction of solar photovoltaic systems in industrial (small to medium-scale hotels) and government sectors; (ii) identification of technologies to be included in the program, using as a reference, consumption distribution among users, as identified by UPME's energy audits; (iii) definition of investment potential of the program under different scenarios using different adoption rates among selected users, based on technologies included and considered eligible by type of user; (iv) identification of different technology adoption scenarios; (v) reduction of GHG emissions that will be achieved as a result of program implementation; and (vi) preparation of a program operational proposal, taking into account characteristic of potential beneficiaries as well as operational risks.

2.3 The technical viability analysis determined that the EE program for SAPSC Archipelago is technically and economically viable. The analysis was able to identify the most technically and economically viable EE and RE measures, among which are: technological substitution in refrigeration (fridges), air conditioning (roof turbine vents and air conditioners) and lighting equipment, as well as solar energy solutions targeted at the public sector (small-scale solutions)

[15] In accordance with the proposal for the establishment of Clean Technology Fund (CTF) in IDB (GN-2571) for financing of individual investment projects in EE, the program's CTF resources will be complemented with project investment funded by "Water, Basic Sanitation and Electrification Program for Colombian Pacific" (CO-L1156) currently being prepared(¶1.15)

and the industrial sector (hotels). The equipment to be installed under the program must have energy certification acceptable to the MME, and agreed upon with the IDB (¶1.22)

2.4 **Sustainability**. The program will contribute to the environmental sustainability of the sector through GHG emission reduction as a result of replacing refrigeration, air conditioning and lighting equipment with more energy efficient models. The program envisions environmental awareness activities and training on EE measures, which will contribute to reducing energy consumption and ensure technical sustainability of the measures implemented. EE measures to be implemented will lead to a reduction in fiscal expenditure on subsidies on electricity generation from fossil fuels, and will thus contribute to the financial sustainability of the sector.

2.5 **Institutional Viability.** An analysis of the institutional capacity of MME was performed during preparation of the Program for Institutional Strengthening of the Mines and Energy Sector in Colombia (CO-L1140) in 2014. The analysis shows that MME has a satisfactory level of institutional development with low associated risks. Nevertheless, the analysis emphasizes that MME has limited experience in program implementation with multilateral development banks. It recommends strengthening the areas that will provide support to program implementation; to define communication guidelines and mechanisms; and preparing specific guidelines for the program to support institutional strengthening, and to ensure smooth implementation for the Bank, MME and other actors involved. These recommendations are considered part of the program activities (¶1.27).

2.6 **Economic Viability.** A cost–benefit analysis was performed to assess the investments to be made under the Efficient Demand Management Mechanism (see Annex 4). Two main variables—savings in subsidies and reduction in GHG emissions—are identified and quantified. Based on the characteristics of the program (EE) and of electricity service delivery (subsidies to all users), estimated benefits are discounted from the current and project values of the variables. The region receives approximately US$10.2 million per year in electricity subsidies. Applying a social discount rate of 12%, the analysis demonstrated that the activities proposed are in line with economic viability requirements. A sensitivity analysis was performed in order to validate the distribution of program beneficiaries by sector and by technology implemented, as well as to verify the conditions of the economic model on which the program is based. The program's overall internal rate of return is 12.6%, and its net present value is US$158,644 at the end of the ten-year period of program duration. The analysis shows a reduction of 9,500 tons of CO_2 per year (56,017 fewer tons of CO_2 accumulated over the course of the program, or approximately 7.2% in annual reduction), and that the resulting savings in subsidy expenditure would translate into a payback period for the Government of 5.7 years over the investment of US$10 million, leading to US$9.7 million in savings in total subsidy expenditure over the course of ten years of program implementation, and approximately 5.9% in annual subsidy savings from year 10 onward.

2.7 Considering the potential savings and emission reductions that can be achieved during the life of technologies, estimated in 10 years on average between all sectors, reduction of one ton of CO_2 costs between US$127 and US$147. Given the cost of electricity generation per kWh of 900 Colombian Pesos (COP$) and assuming energy prices to stay constant throughout the assessment period,

savings generated would be US$450/ton. Henceforth, benefits from emission reduction would be between US$324/ton to US$ 324/ton.

2.8 To test robustness of the results of the economic analysis, sensitivity to changes of the main input variables identified was analyzed. These variables were grouped in the four following categories: (i) program adoption rate by user segment and by technology; (ii) financial variables such as discount rates, exchange rate, % risky receivables, and post-consumption costs; (iii) potential savings by technology; and (iv) cost of each type of technology. The most sensitive variables are adoption rates by government, commercial and residential sectors, which is consistent with consumption levels and the subsidies associated with them.

2.9 Given the limited investment funds available, adoption rates were assumed at 9.5%, 15% and 10%, by these segments respectively. The discount rate and dollar/Colombian peso exchange rate are shown to be the financial variables with the highest impact, with a boundary of 12.4% and col$3,100 respectively, for the net present value to stay positive. Based on the sensitivities identified, the scope of the program was adjusted in terms of targets of users, segments and rates that will be applied to ensure economic viability.

C. Environmental and Social Risks

2.10 Based on the IDB's Environmental and Safeguards Compliance Policy (GN-2208-20 y OP-703), the program is classified as Category "B". The program has potential environmental risks that are temporary, localized, unscalable, and can be mitigated. EE measures funded by the program are expected to translate into savings in consumption of electricity generated from fossil fuels, leading to a reduction in GHG emissions and improvement in the quality of life of residents of the SAPSC Archipelago. The Environmental and Social Management Report (ESMR) (Annex 3) has identified that the biggest environmental risk of the program lies in the process of dismantling and disposal of discarded refrigerators and air conditioning equipment, which could cause pollution due to lubricant spillage and gas leakage. To mitigate this risk, an Environmental and Social Management Framework (ESMF) was developed for the MME and for the program technical operator, through FENOGE, as a key instrument to ensure compliance with IDB's environmental and social safeguards policies.

2.11 The ESMF establishes guidelines for: (i) preliminary assessment of each program activity based on its potential environmental and social risks; (ii) rating of each activity according to its environmental and social risks; (iii) determining the requirements for the prevention and mitigation of the above-mentioned risks; (iv) determining the eligibility of projects to receive funding; and (v) conducting monitoring and supervision of the program's environmental and social management. Financed by the program, the ESMF incorporates measures and guidelines for the Environmental and Social Management Plan (ESMP) regarding the processes of collection, transportation, storage, dismantling and disposal of obsolete refrigeration, air conditioning and lighting equipment that will be replaced. The program's technical operator will be responsible for preparing the ESMP and for obtaining approval from MME and non-objection from the Bank before starting with equipment substitution activities.

D. Fiduciary Risks

2.12 The analysis of MME's fiduciary management capacity was conducted in February 2014 in preparation for the Program for Institutional Strengthening of the Mines and Energy Sector in Colombia (CO-L1140), in which the Bank's Institutional Capacity Assessment System (ICAS) tools were applied and major institutional processes studied. The assessment concluded that MME has sufficient capacity to carry out activities in financial management, fund administration and program-related procurement. Nevertheless, MME has limited experience in multilateral agencies program implementation, which translates into medium fiduciary risk. To mitigate this risk, the following measures were determined:

2.13 Financial management measures: (i) preparation and implementation of a POR (¶3.5); (ii) creation of a Program Coordination Unit (PCU) (¶3.2) within MME.

2.14 Procurement Measures: (i) provide support to PCU by a government official/consultant with experience in procurement financed by the Bank; and MME project team training on financial management, IDB procurement procedures and Procurement Plan Management System (PPMS) tool application; and (ii) design a detailed and exhaustive flowchart on interventions and approvals involved in the process of procurement and contract administration, agreed upon with the Bank.

E. Other Project Risks

2.15 Low demand for program funding by potential beneficiaries due to unfamiliarity with the program has been identified as a high developmental risk. To mitigate this risk, a communication and social management plan under Component 2 to disseminate and promote the program will be implemented. The following medium developmental risks have been identified: (i) delay in recruitment and hiring of the program technical operator, which could lead to delays in program implementation; and (ii) the possibility that users could benefit from equipment substitution on more than one occasion, which could lead to development of a parallel market of delivered appliances. The following measures are taken to mitigate each of the risks mentioned: (i) preparation of a legal analysis with legal recommendations on existing options for program operation, as well as a market analysis on the potential program operators to be financed with CT CO-T1353 funds, and (ii) creation of a card that will be provided to each user/beneficiary, which shall control the number of equipment he or she can receive.

III. Implementation and Management Plan

A. Summary of Implementation Arrangements

3.1 **Implementation Scheme.** MME shall be the EA of the program. Given the synergies between the objectives and implementation structure of the program and the objective of FENOGE, MME shall channel CTF funds through FENOGE toward program implementation. This shall be done through FENOGE's fiduciary in charge of managing CTF funds. The fiduciary will keep separate accounts for the two sources of program funds: program disbursements and credit repayments by beneficiaries. **As a special contractual condition prior to first**

disbursement, the EA must provide evidence of the official approval of the regulation of FENOGE, and the selection of the trust that will administer it.

3.2 MME will create a PCU, responsible for the program's technical and administrative management and to ensure strict compliance with the terms established in the POR (¶3.5) Specifically, it will oversee formulation, procurement, implementation and monitoring of all projects and activities to be funded; coordination of program activities with FENOGE, other institutions involved in the program, and other levels of government. The PCU will consist of at least the following professionals: (i) a Manager/Coordinator responsible for comprehensive setting of all aspects of program implementation, both technical and operational; and (ii) a technical coordinator specialized in monitoring and evaluation of program activities and for coordination between PCU and MME. Both professionals should have exclusive dedication to implementation of the program. The PCU can hire consulting services for procurement, financial management, accounting, environmental and legal areas. These specialists must have the profile, skills and experiences agreed upon with the Bank. **As a special contractual condition prior to first disbursement, the EA must provide evidence of the creation of the PCU and hiring of the required minimum staff, in accordance with terms previously agreed upon with the Bank.**

3.3 **Special contractual condition for execution**. Prior to execution of activities under Component 1 of the program, the EA must present to the Bank's satisfaction, a training plan, specific to financial and procurement management, directed to EA staff assigned to program execution.

3.4 The MME through the PCU, will hire a technical operator to be responsible for the program's operational management. The technical operator will manage relations with users and will ensure that they comply with program procedures and criteria established in the POR (¶3.5). The technical operator will: perform equipment procurement in accordance with established technical standards; replace equipment for end users, and track program progress to reflect equipment delivery and loan disbursement; bill and collect corresponding credit fees from end users; follow FENOGE fund transfer procedures; allocate adequate staff and budget for preparing and supervising implementation of the ESMP in relation to the final disposal of equipment replaced in the program, and the ESMPs that can potentially arise regarding the installation of electricity generation equipment financed by the program; implement the communication and social management plan; prepare a report on the results of consumption reduction in accordance with the status of progress throughout the program. As a special contractual condition for execution, the EA must provide evidence of a valid subsidiary agreement between the EA and the program's technical operator, in accordance with terms previously agreed upon with the Bank.

3.5 **Program Operating Regulations (POR)**. Program implementation will be regulated by the terms defined in the POR consistent with FENOGE's current regulation. During execution, the POR could be modified with the Bank's written "non-objection". The POR will include all procedures to be used during program implementation, a financial chapter on the terms and conditions and the technical coordination scheme between FENOGE and MME. Specifically, the POR will include: (i) a detailed implementation scheme complete with technical standards for the equipment to be replaced and installed, beneficiary selection criteria, equipment delivery protocol and property rights, as well as criteria and

obligations related to the use of the financial mechanism; (ii) institutional and operational roles and responsibilities of the entities involved; (iii) intervention strategy; (iv) rules and procedures for the selection and procurement of works, goods and services including those related to hiring the technical operator; (v) rules and procedures for administrative and financial management; (vi) procedures for monitoring and evaluation; and (vii) measures, actions and procedures established in the ESMF, in an annex of the POR. **As a special contractual condition for first disbursement, the EA must provide evidence of the entry into effect of the Program Operational Regulations (POR) previously agreed upon with Bank.**

3.6 **Procurement of Consulting Work, Goods and Services.** The Policies for the procurement of works and goods financed by the Inter-American Development Bank (GN-2349-9) and the Policies for the selection and contracting of consultants financed by the Inter-American Development Bank (document GN-2350-9) will apply. There shall be no exceptions to these policies, national procurement systems will not be used, and local regulations will not apply.

3.7 **Auditing.** During the period of loan disbursement MME shall submit audited annual financial reports of the program to the Bank within the 120 days following the end of the fiscal year. The scope and other related aspects of the program should be determined in accordance with the Financial Management Policy for IDB-financed Projects (OP-273-6) and the Financial Statement and External Auditing Guide. Auditing costs shall be covered by program funds, and MME will be responsible for hiring the audit firm.

B. Summary of Arrangements on Results Follow-up

3.8 **Monitoring and Evaluation.** The program has a Monitoring and Evaluation Plan, which includes: (i) Procurement Plan (PP); (ii) Pluriannual Execution Plan (PEP); (iii) Annual Operating Plans (AOP); (iv) annual verification of achievement of goals established in the Results Matrix (Annex 2); and (v) biannual reports containing: (a) activities conducted during the period, progress in implementation, problems encountered and their solutions, (b) assessment of: RM, PP, AOP and risk analysis, and (c) analysis of the Bank's Project Monitoring Report, assessing the achievement indicator targets for products and results defined in the RM. Program implementation during this period will be evaluated and program plan for the following semester included.

3.9 MME shall prepare reports on the progress and achievement of results in activities under its responsibility. With program resources, MME will hire consulting services to conduct the following evaluations: (i) mid-term evaluation once 50% of funds has been disbursed and proper justification submitted to the Bank, or after 30 months of implementation, whichever occurs first. The evaluation's objective is to analyze the progress made, relevant aspects of coordination and implementation, degree of compliance with contractual obligations, and recommendations to achieve the proposed objectives and the sustainability of investments, so as to guide MME in defining the necessary strategic and operational adjustments for successful completion of the program; and (ii) final evaluation of the program, to be started six months before the last disbursement. This evaluation will focus on analyzing the experience of the pilot project in SAPSC Archipelago, as a source of information on lessons learned that

could be considered in subsequent uses of FENOGE funds and/or resources from similar to EE and RE mechanisms in the country.

3.10 The Bank plans to conduct an ex post economic evaluation similar to the ex-ante Cost-Benefit Analysis performed (¶2.6). The assessment shall seek to determine if the socioeconomic benefits of the program are sufficient for recovering the investment based on the costs incurred.

Annex 1. Fit with CTF Investment Criteria

**EFFICIENT ENERGY DEMAND MANAGEMENT IN NON-INTERCONNECTED ZONES –
SAN ANDRES, PROVIDENCIA AND SANTA CATALINA ARCHIPELAGO PILOT PROGRAM
CO-L1119**

Program Fit with Colombia's Investment Plan (IP)

In 2010, the CTF Trust-Fund Committee (TFC) endorsed an Investment Plan (IP) for Colombia, with an envelope of up to US$150 million in CTF funding. The IP outlines the strategy, sectors, and objectives to be implemented by the IDB, the World Bank and the IFC in leveraging additional resources to support climate change mitigation measures in the country. The Energy Efficiency (EE) Program was presented in the original CTF IP as a priority sector, with an initial allocation of US$50 million, along with Sustainable Urban Transport (US$100 million). The proposed CTF EE Program sought to strategically deploy CTF financing through a series of private and public sector interventions, using technical assistance, investment financing, and performance-based incentives to systematically reduce identified barriers (financial, regulatory and knowledge).

In 2013, the CTF and the Government of Colombia revised the original plan. The overall rationale for CTF intervention remained unchanged, but the revisions to the IP reflected adjustments, circumstances and the evolution of relevant national policies and priorities, especially through the National Development Plan (PND) 2010 – 2014, adopted by Law 1450 of 2011. Among these circumstances, a new environment for investments in generation capacity through non-conventional renewable energy (NCRE), including incentives and the promotion of alternative energy sources to feed the national interconnected system (SIN), was identified as a strong window of opportunity for the development of this sector. As a result, the government proposed to bring in the NCRE Program as a third priority sector of the IP, originally proposed as a possible Phase II priority. From the USD 50 million, originally allocated to energy efficiency USD 11 million were reallocated to the other two priorities: USD 1 million to urban transport and USD 10 million to NCRE.

The general objective of the proposed Efficient Energy Demand Management in Non-Interconnected Zones – San Andres, Providencia and Santa Catalina Archipelago Pilot Program (SAPSC Archipelago) is to reduce greenhouse gas (GHG) emissions in the non-interconnected zones (ZNI). Its specific objective is to improve energy sustainability through improvements in electricity demand management (DM), such as energy efficiency (EE) measures and the use of local energy resources. This objective will be achieved through a pilot project in the SAPSC. The resulting experience could be replicated in other ZNI of Colombia.

1. Potential for GHG Emissions Savings

The Program will contribute to the environmental sustainability of the sector through GHG emission reductions as a result of replacing refrigeration, air conditioning and lighting equipment with more energy efficient technology in a selected sample from all sectors of the SAPSC (90% of Program resources); and installation of solar photovoltaic systems (PV) in some public offices and medium and small hotels (10% of Program resources). Electricity generation in the Archipelago is produced almost entirely from diesel. More efficient electricity consumption will reduce diesel usage, the main source of GHG emissions in SAPSC.

As an impact and result of the EE and RE measures to be implemented[1] in the SAPSC Archipelago, 9,425 tons of CO2e emissions will be abated at the peak of the Program in year 10. Considering an average lifetime of the technologies of 15 years, total cumulative emission reductions will amount to 141,000 tons of CO_2e over the lifetime of the technologies.

[1] The main measures to be implemented include: replacement of nearly 7,000 household refrigerators (energy savings of 15%), replacement of air conditioning systems in households (energy savings of 15%) and replacement of 115,000 incandescent light bulbs with LED (energy savings ranging between 70% and 90%). EE measures are expected to serve a minimum of 3,000 users.

(The program in the Pacific Coastline that will be developed in parallel with IDB resources expects to achieve 1.02 million tons CO_2e of emission reductions over a period of 6 years).

2. Cost Effectiveness

Considering 141,000 tons of CO_2e reduced during the lifetime of the technologies to be implemented, and the CTF resources (USD 10 million), the cost effectiveness of the Program is 71 USD/t CO_2e.

And considering the aggregate emission reductions and financial resources of the two programs (SAPSC Archipelago and Pacific coastline), the figures are as follows: The combined emission reductions are 1.161 million t CO_2e; the combined financial resources are USD 103 million, and the cost effectiveness is 89 USD/t CO_2e.

3. Demonstration Potential at Scale

The Program envisions environmental awareness activities and training on EE measures, which will contribute to reducing energy consumption and to ensure the technical sustainability of the measures implemented. The model proposed by the Program, as well as the selected technologies, constitute an opportunity to remove some important barriers to investment in EE and RE projects in the ZNI[2] in Colombia by displaying and creating awareness of their feasibility and benefits.

Given the amount of resources available *vis-à-vis* the potential areas where EE and RE solutions could generate the envisioned benefits, the Program will promote a pilot model of limited size. If the model is successful, it could be scaled up to support more EE and RE projects for the ZNI in Colombia. The Program has high potential for replication in other countries and regions, especially in the Caribbean island countries. The characteristics of the communities not connected to the grid in Colombia are very similar to others in the rest of Latin America and the Caribbean, where around 32 million people have no access to commercial electricity grids[3], often living in remote areas with very low population density and where access to services is difficult and very costly.

As an additional feature of the Program, it is expected that the EE measures to be implemented will lead to a reduction in fiscal expenditure on subsidies on electricity generation from fossil fuels, thus contributing to the financial sustainability of the sector. This outcome would provide incentives for the Government to expand the experience in the rest of the SAPSC and other ZNI.

Transformation Potential. The Program is consistent with the strategy of the Government of Colombia to ensure electricity coverage for the 39 municipal capitals in the ZNI, namely: (i) sustainable structure of electricity services from the utility companies; (ii) rational and efficient energy use; (iii) control and monitoring of electricity services; and (iv) adequate structure of projects for conventional and non-conventional RE supply, with the goal of 30% of supply from these sources by 2020.

4. Development Impact

The Program contributes to the Sustainable Development Goals approved by the United Nations under its 2030 Agenda for Sustainable Development. Specifically, the Program contributes to SDG *Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all*. The Program contributes to the target of doubling the global rate of improvement in energy efficiency; and SDG *Goal 13: Take urgent action to combat climate change and its impacts.* The Program contributes to the target of improving education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

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[2] Barriers to investment in EE and RE in Colombia were identified and analyzed under the IDB's Renewable Energy Financing Program for the Non Interconnected Zones (CO-L1161) sponsored by CTF funding. Among the most relevant to this pilot program are the inadequate financing conditions available in the Colombian markets and the lack of familiarity with EE and RE solutions by the financial intermediaries and the operators.

[3] Improving access to water and energy in poor communities in Latin America with mobile technology. http://bit.ly/accLAmob.

It is estimated that the SAPSC Archipelago Program will allow for total energy savings that range between 10.8 GWh/year to 32.4 GWh/year, equivalent to a reduction of 7% and 20% of current electricity consumptions (2013 baseline). Therefore, in addition to the benefits to the economy of reduced energy consumption in terms of fiscal cost, a direct impact to users of reducing energy consumption is the cost savings for the households that will translate into increased disposable income for alternative use. Moreover, the Program will create employment during execution (in particular for energy efficiency services and post-consumption related activities), which will improve income opportunities to the local communities and could generate small business ideas for participation in a new market in the various links of the EE commercial chain.

Environmental co-benefits. In addition to GHG emissions reductions by replacing the use of diesel, the project is expected to result in several other environmental benefits, such as (i) reduction in the risk of oil leakages and spills during transport of diesel to remote areas and operation of generators[4]; (ii) reduction in emissions of local pollutants such as carbon monoxide (CO), volatile organic compounds, nitrous oxides (NOx) and Sulphur oxides (SOx)[5]; and (iv) reduction in noise[6]. Considering that Solar PV systems will be isolated and in a small scale, no cumulative negative impacts will occur

In general, efficient refrigeration devices allow not only for lower GHG emissions due to a lower energy consumption, but also reduce ozone-depleting substances (ODS) as the new devices are ODS free and have lower potential for leakage of harmful substances. Efficient refrigeration systems not only lead to higher comfort for users and improvement in their lifestyle, but also lower food contamination risks that can lead to gastrointestinal diseases.

The Program will also finance the dismantling and material sorting activities for recycling and proper final disposal of metals and residual substances. It is expected that plastic, foam, and metal will be recovered and recycled as appropriate. Refrigerants (ODS) and oils from the refrigerator motors will be properly separated, stored and safely disposed.

5. Implementation Potential

Country and sector strategies. The Government of Colombia declared rational and efficient energy use a matter of social, governmental and national interest through Law 697 of 2001. To conform to this Law, the Ministry of Mines and Energy (MME) created the Electric Power Standardization Program (PROURE). PROURE aims to reduce energy intensity, improve EE in the consumption sectors and promote NCREs, in order to identify potential areas and energy savings targets and increase the share non-conventional technologies and sources in the country's energy matrix.

The Government of Colombia has prioritized the development of new tools for reaching its goals, including: formulation of a public policy on EE and introduction of fiscal incentives for the integration of NCREs to the national energy system (Law 1715 of 2014), and MME Resolution 90325 of March 25, 2014, through which policy guidelines were adopted toward reduction of emissions in the electricity, mining and hydrocarbon sectors. The Government adopted the Indicative Action Plan 2010–2015, Vision 2020, to develop the PROURE, and to set a goal for 2015 of 14.75% savings in national electricity consumption, of which 8.7% would come from the residential sector, and 2.7% from the commercial, government and service sectors.

Under Law 1715 of 2014, the Government created the Non-Conventional Energy and Efficient Energy Management Fund (FENOGE). FENOGE will provide financing for programs and projects for all sectors in the ZNI and to lower consumption residential sector tiers (1, 2 and 3) in SIN, for implementing small-scale

[4] World Bank. 2007. Environmental, Health and Safety Guidelines. Industry Sector Guidelines: Thermal Power Plants - Hazardous Materials and Oil.

[5] World Bank. 2007. Environmental, Health and Safety Guidelines. General Guidelines: Environmental – Air Emissions and Air Quality and Environmental, Health and Safety Guidelines. Industry Sector Guidelines: Thermal Power Plants – Air Emissions.

[6] World Bank. 2007. Environmental, Health and Safety Guidelines. Industry Sector Guidelines: Thermal Power Plants – Noise and World Bank. 1994. Solar Energy: Lessons from the Pacific Island Experience.

self-generating energy solutions as well as for improved EE through the promotion of good practices, end-use energy equipment, internal connections upgrading and building modifications. FENOGE will be regulated by the MME and administered by a trust. Through Law 1715, multilateral or international organizations can make contributions to FENOGE.

The proposed Program is aligned with a series of initiatives and policies from the Government of Colombia. In particular, it will support commitments under the National Development Plan 2014-2018 (PND) to (i) expand national coverage, by providing 24-hour service in larger municipalities and localities of the ZNI; (ii) boost schemes for power generation from NCRE and hybrid systems; and (iii) implement economically efficient electricity generation systems in the ZNI and in areas of difficult access, according to the ZNI Electrification Plan.

MME will be the Executing Agency of the Program. Given the synergies between the objectives and implementation structure of the Program and the objective of FENOGE, MME will channel the CTF funds through FENOGE toward Program implementation. This will be done through FENOGE's fiduciary in charge of managing CTF funds. The fiduciary will keep separate accounts for the two sources of Program funds: Program disbursements and credit repayments by beneficiaries. An analysis of the institutional capacity of MME was performed showing that MME has a satisfactory level of institutional development with low associated risks. Nevertheless, the analysis emphasizes that MME has limited experience in Program implementation with multilateral development banks. In this regard, the IDB will provide financing to support to MME with a government official/consultant with experience in IDB's procurement policies. It will also provide the MME project team with training on financial management and IDB procurement procedures, as well as on the Procurement Plan Management System (PPMS) tool application.

6. Additional costs and risk premium

The current highly subsidized energy distribution model of the SAPSC Archipelago not only represents a major cost for the Colombian Government, but also a disincentive for energy users to invest in energy efficiency. The concessional funding from CTF makes viable the deployment of low-carbon technologies.

In order to increase demand mobilization and awareness for energy efficiency among energy consumers in the beneficiary sectors, the Program has designed a component to share the information required to engage users in energy efficiency investments and behaviors. Grant resources from CTF will be used in a communication strategy and in a social management plan for education and technical training on efficient energy use and dissemination.

On the other hand, creating and managing a financial mechanism that supports the loan structuring and the operational tasks for the replacement of equipment and for the installation of renewable energy technologies requires additional costs that could affect the willingness of potential users to engage into the Program, mainly because most of them are from the lower economic tiers 1 to 3. Grant resources from CTF will therefore be used to buy down the cost of these Program implementation costs.

7. Stakeholder engagement

The Program has been designed in close coordination with different governmental stakeholders such as MME, DNP and UPME. The Program will finance activities that support MME in Program implementation. Activities include hiring a Program coordinator and specialist technical coordinator in order to coordinate between different actors involved in Program implementation, including the Government of San Andres and the Technical Operator of the Program. Potential Beneficiaries have been reached during the project preparation phase, and they constitute an important stakeholder from this Program, since training and awareness workshops among final users will contribute to the replication of the Program.

8. Gender issues

Since there is no previous data for determining a baseline for the adoption of energy efficiency measures among female and male users in the SAPSC Archipelago, the Program will contribute to consolidate this

information by disaggregating data collected from the participants of training activities as well as the final beneficiaries from the Program by gender.

In the context of the design of the social management plan, communications strategies and contents of the training course, the Program will promote gender criteria, encouraging women to assume a leadership on energy efficiency within their households. To ensure that at least 50% of the people trained are women, some training contents and activities will be designed specifically to meet women perspectives and time availability.

In the process of project monitoring and evaluation, data collected from final users will consider whether the beneficiary in charge of the unit (household, commerce, hotel, public building) is either male or female.

EFFICIENT ENERGY DEMAND MANAGEMENT IN NON-INTERCONNECTED ZONES SAN ANDRES, PROVIDENCIA AND SANTA CATALINA ARCHIPELAGO PILOT PROGRAM (CO-L1119) ANNEX 2. RESULTS MATRIX				
Objective	The program's general objective is to reduce greenhouse gas (GHG) emissions in the non-interconnected zones (ZNI). Its specific objective is to improve energy sustainability through improvements in electricity demand management (DM), such as, energy efficiency (EE) measures and the use of local energy resources. This will be achieved through the development and implementation of a pilot program in San Andres, Providencia and Santa Catalina Archipelago (SAPSC). The resulting experience could be replicated in other ZNI of Colombia			
Indicators	**Units**	**Baseline 2015**	**Target End of Program Year 10**	**Verification Means**
Impact				
Greenhouse gas emissions reduction[1] in the San Andres, Providencia and Santa Catalina Archipelago SAPSC				
Equivalent CO_2 emissions in tons per year in the SAPSC Archipelago.	tCO_2/Yr	147,727	138,302	Annual reports prepared by the program operator and approved by the Ministry of Mines and Energy (MME). Reports include energy consumption figures of program's user beneficiaries and the estimate of emissions avoided based on the energy savings obtained.
Results[2]				
Result: An 8.5% reduction in the average electricity consumption (GWh/year) of residential customers who implemented EE measures in the SAPSC Archipelago.				
Average electricity consumption (GWh/year) of residential customers who implemented EE measures in the SAPSC Archipelago.	GWh/year	220	201	Annual reports prepared by the program operator and approved by the MME. Reports include the user beneficiaries' energy consumption figures.
Result: Improvement of electric power sector's financial sustainability in the SAPSC Archipelago.				
Subsidies associated to power generation granted by the Colombian Government.	US$/year (millions)	40.4	37.6	MME resolutions authorizing the annual disbursements associated to electric power generation in the ZNI.

[1] Greenhouse gas emissions calculation based on CO_2 emission equivalent.
[2] Projections of the indicators' behavior in year 10 without project will be used as the baseline, according to the Cost-Benefit Analysis (CBA) prepared for the operation.

EFFICIENT ENERGY DEMAND MANAGEMENT IN NON-INTERCONNECTED ZONES
SAN ANDRES, PROVIDENCIA AND SANTA CATALINA ARCHIPELAGO PILOT PROGRAM
(CO-L1119)
RESULTS MATRIX

Products	Unit	Targets						Verification Means
		Year 1	Year 2	Year 3	Year 4	Year 5	Final	
Component 1. Efficient Demand Management Program								
1.1 Users benefited by Energy Efficiency (EE) measures[3]								
1.1.1 Residential	User	165	175	690	740	804	2,573	Semi-annual progress reports on the program, prepared by the technical operator and approved by the MME.
1.1.2 Commercial	User	27	27	110	110	110	383	
1.1.3 Industrial	User	0	0	2	2	2	6	
1.1.4 Government	User	1	1	4	4	4	16	
1.2 Users benefited by photovoltaic solar solutions[4]								
1.2.1 Industrial	User	4	4	15	15	15	53	
1.2.2 Government	User	1	2	6	12	19	40	
Component 2. Communications Strategy and Environmental and Social Management Plan[5]								
2.1 Integrated Environmental and Social Awareness-Building Plan implemented in SAPSC Archipelago	Plan					1	1	Annual reports on the program prepared by the operator and approved by the MME, which include: Copy of the Environmental License for storage and
Milestones:								
Comprehensive environmental and social awareness plan designed	Plan	1						

[3] For the purposes of the program, EE measures mean reduction of electricity consumption in the SAPSC Archipelago through technological reconversion, by replacing refrigeration, ventilation and lighting equipment with more efficient technology in terms of energy consumption. Measures are aimed at residential, commercial, industrial (small- and medium-sized hotels) and government users. "User" refers to the electrical connection to the distribution network, whether of a residential building, or a commercial, industrial or government establishment.
[4] Installation of individual solar -based power generation solutions.
[5] The communications strategy and environmental and social plan will consist of an integrated environmental and social awareness building plan, a communications and promotion strategy for the program, and a training plan for technicians in EE. These products will have defined implementation calendars. A product will be considered as delivered once all of the milestones established in the implementation calendar have been achieved.

Annualized implementation of a comprehensive environmental and social awareness plan implemented in the SAPSC Archipelago	Annualized implementation plan	1	1	1	1	1	5	final disposal of the replaced equipment; and record of quantity of equipment sent for final disposal.
2.2 Communications and program promotion Strategy implemented in SAPSC Archipelago	Strategy				1		1	Copy of minutes of EE training events held in schools with data on # persons trained in EE in community centers, etc.
Milestones:								
Communications and promotion strategy of program designed	Strategy	1					1	
Annualized implementation of the Communications and promotion strategy implemented in the SAPSC Archipelago	Annualized implementation plan	1	1	1	1	1	5	Copy of attendance records of technicians trained.
2.3 Plan for training of technicians in energy efficiency implemented in SAPSC Archipelago[6]	Plan		1				1	Record of promotional activities held: brochures, radio, press, etc.

[6] It is expected that at least 50% of people trained will be women.

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COLOMBIA

EFFICIENT ENERGY DEMAND MANAGEMENT IN NON-INTERCONNECTED ZONES - SAN ANDRES, PROVIDENCIA AND SANTA CATALINA ARCHIPELAGO PILOT PROGRAM

(CO-L1119)

ANNEX 3. ENVIRONMENTAL AND SOCIAL MANAGEMENT REPORT (ESMR)

This document was prepared by the project team consisting of José Ramón Gómez (ENE/CCO), Project Team Leader; Roberto Esmeral Berrio (CCS/CCO), Alternate Team Leader; Nancy Jesurun-Clements (INE/ENE); Juan Roberto Paredes (INE/ENE); Jorge Mercado (ENE/CDR); Haydemar Cova León (INE/ENE); Wilkferg Vanegas (INE/ENE); Sofía Greco (LEG/SGO) Andrea Giraldo (CAN/CCO); Miguel Orellana (FMP/CCO); y Gabriele del Monte (FMP/CCO); Edgar Botero, Jorge Rodriguez, Juan Andrés López Silva and Juan Eduardo Afanador (Consultants)

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ACRONYMS

ESA	Environmental and Social Analysis
AOM	Administration, Operation and Maintenance
IDB	Inter-American Development Bank
CARs	Autonomous Regional Corporations (*Corporaciones Autónomas Regionales)*
CIF	Clean Investment Funds
CO	Carbon Monoxide
CO2	Carbon Dioxide
CORALINA	Corporation for the Sustainable Development of San Andres, Providencia and Santa Catalina Archipelago *(*Corporación *para el Desarrollo Sostenible del Departamento Archipiélago de San Andrés, Providencia y Santa Catalina)*
COTELCO	Columbian Hotels and Tourism Association (*Asociación Hotelera y Turística de Colombia*)
VOC	Volatile Organic Compounds
CTF	Clean Technology Fund
DANE	National Administrative Department of Statistics (*Departamento Administrativo Nacional de Estadística*)
DIMAR	National Maritime Authority (*Dirección General Marítima*)
DNP	National Planning Department (*Departamento Nacional de Planeación*)
EA	Environmental Assessment
EE	Energy Efficiency
EIS	Environmental Impact Study
ENE	Energy
TE	Territorial Entity
FENOGE	Non-Conventional Energy and Efficient Energy Management Fund (*Fondo de Energías Renovables y Gestión Eficiente de la Energía*)
NCSRE	Non-Conventional Sources of Renewable Energy
GC	Government of Colombia
DM	Demand Management
GHG	Greenhouse Gases
HC	Hydrocarbons
IDEAM	Institute of Hydrology, Meteorology and Environmental Studies of Colombia (*Instituto de Hidrología, Meteorología y Estudios Ambientales de Colombia*)

INVEMAR	José Benito Vives de Andréis Marine and Coastal Research Institute (*Instituto de Investigaciones Marinas y Costeras "José Benito Vives de Andreis*)
MADS	Ministry of Environment and Sustainable Development (*Ministerio de Medio Ambiente y Desarrollo Sostenible*)
ESMF	Environmental and Social Management Framework
MME	Ministry of Mines and Energy (*Ministerio de Minas y Energía*)
NOx	Nitrogen Oxides
ILO	International Labor Organization
OP	Operational Policy
NO	Network Operators
ESMP	Environmental and Social Management Plan
PM	Particulate Matter
RP	Resettlement Plan
PRC	Office of the President of the Republic of Colombia (*Presidencia de la República de Colombia*)
PV	Photovoltaic
POR	Program Operating Regulation
RETIE	Electrical Installations Technical Regulations (*Reglamento Técnico de Instalaciones Eléctricas*)
RETILAP	Technical Regulation for Lighting and Public Lighting (*Reglamento Técnico de Iluminación y Alumbrado Público*)
S.A. E.S.P.	Utilities Stock Company (*Sociedad Anónima Empresa de Servicios Públicos*)
ODS	Ozone Depleting Substance
ISOH	Industrial Safety and Occupational Health
SNPAD	National System for Disaster Prevention and Response (*Sistema Nacional para la Prevención y Atención de Desastres*)
SOPESA	Energy Production Company of San Andres and Providencia (*Sociedad Productora de Energía de San Andrés y Providencia*)
SOx	Sulfur Oxides
SAPSC	San Andres, Providencia and Santa Catalina
TOR	Terms of Reference
UNGRD	National Disaster Risk Management Unit (*Unidad Nacional para la Gestión de Riesgo de Desastres*)
UPME	Mining and Energy Planning Unit (*Unidad de Planeación Minero Energética*)
USD	United States Dollar
ZNI	Non-Interconnected Zones (*Zonas no interconectadas*)

I. INTRODUCTION

Country	Colombia
Sector	ENE (Energy)
Project Name	Efficient Energy Demand Management Program for Non-Interconnected Zones – San Andres Pilot Project (CO-L1119)
Executive Agency	Ministry of Mines and Energy (FENOGE)
Transaction Type	Non-Reimbursable Loan
Total Project Cost	US $12 million
IDB (CTF)	US $10 million
Environmental Category	Category B

II. PROGRAM DESCRIPTION

A. Components

2.1. The program's general objective is to reduce greenhouse gas (GHG) emissions in the non-interconnected zones (ZNI). Its specific objective is to improve energy sustainability through improvements in electricity demand management (DM), such as, energy efficiency (EE) measures and the use of local energy resources. This will be achieved through the development and implementation of a pilot program in San Andres, Providencia and Santa Catalina Archipelago (SAPSC), and the resulting experience could be replicated in other ZNI of Colombia. The program includes: (i) an efficient DM mechanism; (ii) an environmental, communications and social management sustainability plan; y (iii) administration:

a) **Component 1. Efficient Energy Demand Management Mechanism (US$7.5 million).** A financial mechanism will be created, offering differentiated loan conditions for each type of client, to support SAPSC users to implement EE and RE measures, such as: (i) technological reconversion through replacement of refrigeration, ventilation and lighting equipment with appliances that are more efficient in terms of energy consumption for residential, commercial, industrial (small and medium-sized hotels), and government users; and (ii) installation of individual solar photovoltaic generation solutions that reduce consumption of energy generated from fossil fuels by industrial and government users. All technologies financed by the program must have energy certification through the scheme developed by MME or an equivalent scheme officially recognized by the MME and the IDB.

b) The technologies proposed to be included in the program for the residential sector are: refrigeration equipment for all tiers; roof turbine vents to improve ventilation conditions for tiers 1, 2 and 3; air conditioners for tiers 3 to 6, and lighting equipment for all tiers. The technologies proposed for the commercial and industrial (hotel) sectors include: high efficiency refrigeration, air conditioning and lighting equipment. Additionally, the program proposes on-grid solar photovoltaic energy generation solutions for self-consumption in the hotel sector and for government buildings whose consumption curves and

roof availability allow for the installation of 5kWp systems without generating surplus for the grid, while having available space for solar panels.

c) The basic criteria established for the use of the financial mechanism are: (i) grant investments for public entities; and (ii) credit for all other users, with payments set as a percentage of the savings generated by the reduction in consumption resulting from the program, to be reflected in users' electricity bills. The percentage to be applied as payment for the credit is as follows: 50% during 24 months for residential users in tiers 1 to 3; 85% during 48 months for commercial, industrial (low-range) and residential users in tiers 4 to 6; 85% during 24 months for mid-range industrial users. The goal is to benefit the largest possible number of users with the resources available. Each beneficiary will have access to funding only once. The POR will establish in detail, the equipment delivery mechanism, formulas for calculating savings in electricity bills, and the technical specifications of equipment eligible for replacement.

d) Funds collected as repayments will be directly deposited into FENOGE's fiduciary fund, through which they can be relent to new beneficiaries. The program will finance this mechanism during a period of five years, during which program activities will be carried out. Once the program implementation is complete, FENOGE may continue to operate through its fiduciary fund for an additional period, estimated to be five years, for a total duration of ten years during which funds from credit repayments would be used. It is expected that 8,000 users could benefit from the program, of which 3,000 would benefit in the first five years of implementation.

e) **Component 2. Environmental sustainability, communication and social management plan (US$1.8 million).** This component will finance: (i) design and implementation of an environmental management plan that establishes the measures and mechanisms to ensure proper disposal of equipment replaced in the program; (ii) design and implementation of a communication and promotion strategy targeted at potential users and beneficiaries; and (iii) design and implementation of a social management plan that includes training activities to promote energy saving and efficient energy use to end users, training in educational establishments and community centers, disseminating of informational material to users and beneficiaries, design and implementation of a training course for EE technicians, and analysis of alternative potential DM methods at the end user level. It is expected that at least 50% of people trained will be women.

f) **Administration (US$0.6 million).**This component will finance activities that support MME in program implementation. Activities include hiring a program coordinator and specialist technical coordinator, such as activities for the technical operator procurement process; coordination between different actors involved in the program implementation including the Government of San Andres, and SOPESA the energy concessionary of San Andres and Providencia; program administration costs associated with program auditing, monitoring and evaluation. Final evaluation will focus on lessons learned from the SAPSC Archipelago pilot project, which will serve as input for the design of interventions by FENOGE in other parts of the country.

B. Environmental and Social Surroundings

2.1. As the capital of San Andres, Providencia and Santa Catalina (SAPSC) Archipelago, San Andres Island is located 720 kilometers northwest of the Caribbean coast. It is one of the municipal centers of Non-Interconnected Zones (ZNI) of Colombia. San Andres Archipelago has a surface area of 52.2 km^2, 75,167 inhabitants (2014), and a population density of 1.44 people/m^2. Thirty-five per cent of the population is known as Raizal, an indigenous ethnic group with its own history, origins, culture, language and custom[1]. The main economic activities of the Archipelago are tourism and trade, followed by agriculture and subsistence fishing, at a scale that is insufficient to provide for the entire population. Consequently large amounts of food, supplies and household products, including electrical appliances are shipped from the mainland.

2.2. The environmental surrounding of the project is that of an island-city, densely populated and with the typical environment modified/anthropized by urban growth. The Archipelago has been suffering intense coastal erosion mainly due to growing tidal surges, rising sea level and strong winds. Due to its location and geology, SAPSC archipelago faces moderate risks of hurricanes, tropical storms and storm surges, as well as high risks of coastal erosion and beach instability. Additionally, the low regions, including densely populated coastal areas are prone to frequent floods, which are aggravated by the lack of permanent natural water currents and inadequate drainage infrastructure. The majority of public and tourist infrastructure is concentrated in coastal areas, and is therefore associated with a high level of coastal risk.

2.3. Generally speaking, the archipelago lacks fresh surface water, with the exception of Providencia Island, which has three tiny basins – Bottom House, Borden and Fresh Water, all of which suffer from their own erosion process. Studies conducted by Institute of Hydrology, Meteorology and Environmental Studies of Colombia (*Instituto de Hidrología, Meteorología y Estudios Ambientales de Colombia*, hereinafter referred to as IDEAM) in 2001 indicate that the archipelago has a dryness index lower than 0.60, which reflects a large deficit in fresh water. Consequently, the Land Use Management Plan sets strict requirements on the designation of final disposal areas or waste stockpiling areas for discarded objects during the electrical appliances substitution process.

[1] Law 70 of 1993 does not apply to Afro communities of ethnic and territorial nature, but they are included in the definition of indigenous peoples as established by Convention No. 169 of International Labor Organization (ILO).

Figure-01 – General Map of the Archipelago. San Andres Island is the one on the left.

III. COMPLIANCE WITH REQUIREMENTS AND STANDARDS

A. Environmental and National Social Assessment Process

3.1. Colombia has extensive legislation on environmental regulation. Many parameters are involved in the supervision and control over the development of infrastructure and public utilities projects. The current environmental laws cover all aspects related to the protection, conservation and sustainable use of natural resources. In addition to general environmental protection laws and regulations,

there are sector-specific technical standards to ensure that development projects are carried out in an appropriate manner. The main laws and regulations will be discussed below.

3.2. Created by Law 99 of 1993, the National Environmental System (*Sistema Nacional Ambiental*, or SNA) establishes the general framework for environmental management aimed at promoting sustainable development. Law 99 designates the Ministry of Environment and Sustainable Development (*Ministerio del Medio Ambiente y Desarrollo Sostenible*, or MADS) as the governing body on matters related to the sustainable management of the environment and natural resources, and environmental land use. This law also mandates the creation of Autonomous Regional Corporations (*Corporaciones Autónomas Regionales,* or CARs), which are in charge of managing the environment and natural resources in the territory under its jurisprudence.

3.3. The regional authority on environmental matters is CORALINA, the Autonomous Regional Corporation for the Sustainable Development of the Archipelago of San Andres, Providencia and Santa Catalina.

3.4. National regulation (Decree 2041 of 2014) under law 99 of 1993 sets requirements on the obtainment of environmental licenses for projects that require measures to mitigate and prevent relatively significant environmental risks. The decree provides a classification of specific cases for which environmental licenses are required, and defines whether such licenses are to be obtained from the National Environmental License Agency (*Agencia Nacional de Licenciamiento Ambiental*, or ANLA) or from the local environmental authority (i.e. CORALINA), depending on the type of project. Particularly, in the case of the final disposal of refrigerators, air conditioners and light bulbs contemplated in the program, Decree 2041 requires environmental license for the final disposal site. Other interventions contemplated in the program do not require permits or licenses.

3.5. Public consultation is required and regulated by Decree 2041, in which Article 15 on the Participation of Communities states that Environmental Impact Studies (EIS) should allow for community participation. The above applies to projects that require EIS and Environmental License.

B. Consistency with IDB Policies and Guidelines

3.6. The Appendix contains a summary on the project's consistency with the Bank's Environment and Safeguards Compliance Policy (OP-703). The program is largely compliant with IDB safeguard policies.

C. Project Requirements and Standards

3.7. The biggest environmental risk of the project is associated with the dismantling and final disposal of parts of refrigerators, air conditioners and light bulbs that will be replaced, as some of the materials and inputs used in the appliances are either polluting or pose environmental risks to recycling operators or waste final disposal system operators. To prevent these risks, the project will comply with current Colombian environmental policies, legislation and regulations, including labor and occupational safety standards. In this particular case, the project will obtain an Environmental License for the disposal and recycling of refrigerators,

air conditioners and light bulbs to be replaced. Likewise, the project will adhere to the IDB's Environment and Safeguards Compliance Policy by implementing an Environmental and Social Management Framework (ESMF), which incorporates measures to prevent and mitigate environmental and social risks, as well as an Environmental and Social Management Plan (ESMP) for the handling of replaced equipment by companies duly licensed for this purpose.

IV. Environmental and Social Risks, Impacts and Mitigation

A. Summary of Main Impacts and Risks

4.1. The main environmental and social risks of the project are related to the handling of refrigeration and air conditioning equipment as well as incandescent and fluorescent bulbs, which will be replaced by more efficient appliances purchased with project funds. The replaced equipment must be dismantled and parts disposed of in an appropriate manner that is consistent with national legislation and the IDB's Environment and Safeguards Compliance Policy.

4.2. In accordance with the Environment and Safeguards Compliance Policy (OP-703), Directive B.03, the Project has potential environmental risks that are temporary and unscalable, which can be mitigated and localized. Consequently, it is recommended that the project be assigned Category B.

B. Environmental Impacts and Risks

4.3. The Project will co-finance the installation of small electricity generation equipment that uses renewable sources (i.e. solar), as well as the collection and storage of incandescent and compact fluorescent (CF) light bulbs and other old equipment that will be replaced. Henceforth, the project will arrange for necessary transportation and renting of storage areas with appropriate conditions. The storage area can be a stockpile site to hold waste before it is dispatched to the scraps and final disposal area, or it can be delineated within the same final disposal area. Additionally, the project will co-finance activities involved in the dismantling of equipment, separating materials for recycling and final disposal, and scrapping of the remaining metal. This second subcomponent consists of recycling plastic and metal parts of appliances, as well as to recover and dispose of refrigerant gases and foaming agents (which are Ozone Depleting Substances, or ODS), and the leftover oil in engines.

4.4. Although there are environmental benefits associated with the substitution of more efficient refrigeration, air conditioning and lighting equipment, the project themselves can potentially have temporary and localized impacts associated with the collection and final disposal processes of old equipment and luminaries, and the future disposal of efficient equipment. Given the environmental risks, the dismantling and disposal of refrigeration and lighting equipment must be done by a company duly licensed for such activities. The environmental risks associated with the dismantling of refrigerators and air conditioners are related to the handling of refrigerant gases (especially CFC-12) which deplete the ozone layer and act as powerful global pollutants, as well as gases present in foams (i.e., CFC-11, HCFC-141b). On the other hand, the necessary process to recover plastic and metals can cause spillage and contamination by lubricants. The incandescent bulbs pose the risk of injury in handling glass shards, while

compact fluorescent light bulbs (CFL) and efficient LED lamps – which are financed by the project, pose additional risks for disposal due to mercury content in the former and the aluminum filling in the latter.

4.5. The removal, dismantling and final disposal process for refrigeration, air conditioning and lighting equipment must be done within the framework or adequate safety as well environmental and social management protocols. The final disposal can only be done in establishments or installations with environmental license. An Environmental Impact Assessment and an Environmental License are required for the storage, treatment, use and/or final disposal of dangerous waste or residue. An adequate plan must be designed for the removal, transportation and final disposal of appliances to be removed from households that participate in the program, in order to mitigate the environmental and social risks of the project. As a prerequisite for the first loan disbursement, an Environmental and Social Management Plan (ESMP) will be established to mitigate the impacts associated with the collection, transportation and disposal of the replaced appliances.

4.6. The installation of new, renewable generation systems must follow management plans that ensure safe management and protect the environment. Installation works and processes can cause temporary and specific disturbance and environmental risks, which can be effectively mitigated through environmental and social management plans. The project does not contemplate large-scale investments in infrastructure, conversion or degradation of critical habitat, or resettlement housing, and henceforth does not represent potentially significant negative environmental and social impacts.

C. POSITIVE IMPACTS

4.7. The environmental and social impacts resulting from the project are generally positive, to the extent that the activities of the project allow for the reduction of electricity consumption, which is generated by diesel combustion in the Archipelago. Reduction of hydrocarbon consumption not only has impacts on climate change as less CO2e is released into the atmosphere, it also affects air quality and public health since the internal combustion processes of diesel are inefficient and always release air-polluting gases such as carbon monoxide (CO), volatile organic compounds, hydrocarbons and fine particulate matter.

D. IDB Additionality

4.8. In addition to the intrinsic benefits of the project such as contributing to the reduction of greenhouse gas (GHG [2]) emission through improving energy efficiency of refrigeration, air conditioning and lighting equipment, the Bank's intervention will provide added value to several key social-environmental aspects such as: validate the existence of proper public consultation or socialization processes for the project, and ensure that collection and recycling processes of the replaced equipment, which do not need environmental license under the local regulation, have in place some type of instrument or document that is compatible with or similar to an Environmental and Social Management Plan (ESMP).

[2] The specific impact will depend on the old equipment replaced and new one to be installed and their particular electricity consumptions (i.e. diesel-generated electricity).

V. MANAGEMENT AND MONITORING OF ENVIRONMENTAL, SOCIAL, HEALTH AND OCCUPATIONAL SAFETY IMPACTS AND RISKS

A. Management Plans and Systems

5.1. An Environmental and Social Management Framework (ESMF) has been developed for the project, and it will be used as a tool by the Ministry of Mines and Energy and the project operator through FENOGE to comply with the Bank's Environmental and Social safeguards Policies. The project ESMF specifically establishes guidelines for (i) conducting preliminary assessment of each of the activities of the project in accordance with its potential risks as well as potential environmental and social impacts; (ii) classifying activities according to their environmental and social risks; (iii) establishing requirements for the prevention and mitigation of above-mentioned risks; (iv) determining the eligibility of projects based on environmental risks; and (v) monitoring and supervising project operation through environmental and social management.

5.2. Additionally, ESMF incorporates measures and guidelines for the Environmental and Social Management Plan (ESMP) with regards to process of collection, transportation, storage, dismantling and disposal of obsolete refrigeration, air conditioning and lighting equipment replaced by new appliances purchased with project funds. Due to factors such as economies of scale and cost reduction, this plan is particularly important since waste and old equipment must undergo an initial disposal phase on the Island before the scraps and recyclable parts are transported to mainland. For this process, the National Industries Association (*Agencia Nacional de Licenciamiento Ambiental*, or ANDI) Green Network will provide assistance to the project by contributing its experience with post consumption management of refrigeration equipment in Bogota.

5.3. Since the final equipment disposal process requires environmental license and the project is designated Category B, the corresponding public consultation/socialization process will be conducted to engage with communities affected by the project in order to comply with the Bank's Environmental Safeguards Policy. Public consultation must be convened in an effective manner, through media with sufficient coverage such as local newspapers, and supplemented with personal or institutional invitations as well as local media. The process must ensure that the points of view voiced in the consultation process are published and considered in the project's preparation process. It will be verified that appropriate mechanism are in place to handle claims and complaints in order to minimize and avoid conflict with community, which may arise due to project implementation.

B. Monitoring and Supervision

5.4. Through the Safeguards Unit (VPS/ESG), the Bank will initiate a supervision process once the project is approved by the Bank's Board of Directors, in order to monitor the implementation of and compliance with environmental and social safeguards policies. It is particularly important to supervise the process of final disposal of appliances.

VI. REQUIREMENTS TO INCLUDE IN LEGAL DOCUMENTS

A. Preconditions for Project Startup

6.1. Through the Loan Agreement, the project enters into commitment with the MME regarding the following aspects:

a. Allocate adequate budget and personnel for the supervision of Environmental and Social Management Plan applicable to the final disposal process of the equipment replaced in the project, as well as for the supervision of ESMPs established for the installation of electricity generation equipment financed by the project;

b. Immediately notify the Bank in case of noncompliance with any environmental, social, health, safety and labor regulation or requirement, or any accident, impact, lawsuit, claim, complaint or other material risk related to the socio-environmental aspects of the project operation.

c. Fully cooperate with the Bank to carry out supervision activities that the Bank deems necessary during the term of the loan, including providing access to all project documentation, installation and personnel and cooperating fully with any inspection or auditing activities conducted by the Bank, its representatives or designated consultants.

d. In the event of detecting noncompliance in the implementation of ESMP or the execution of financial operations, a Corrective Action Plan must be agreed upon with the IDB and implemented to rectify noncompliance and compensate for the liabilities incurred.

VII. APPENDIX 1. COMPLIANCE WITH IDB POLICIES AND GUIDELINES

Applicable Safeguards Policy	Program Impact	Aspects of Safeguards Policy Identified
B.1. Compliance with IDB Energy Policies (OP 733)	The Project involves the installation of equipment to reduce electricity consumption.	Applicable.
B.2 Compliance with national laws	The Borrower shall comply with Colombian legal framework and regulations, as well as with additional IDB requirements.	Applicable to the project. In the event that the national legal requirement is less restrictive than the IDB's Safeguards Standards, the latter will prevail.
B.3 Screening and classification of environmental impact risk	An environmental screening has been conducted to determine the type of interventions needed. The project has been assigned Category B in terms of environmental and social risk.	Applicable to the project.
B.4 Other types of risk such as institutional capacity	The Borrower/Executive Agency has institutional weaknesses in environmental and social management, as it is a new institution which will need specialized personnel in environmental and social matters as well as IDB training.	Applicable to the project.
B.5 Establishing requirements for Environmental Assessment for operations according to risk rating	Environmental and Social Management Plan required.	Applicable. Project activities have low to medium impacts. Impacts associated with the disposal process of used equipment will be managed according to Environmental and Social Management Plans.
B.6 Public consultations	The Project will organize socialization processes with ethnic communities as well as affected communities.	Applicable.
B.7 Monitoring and supervision requirements for project execution	The Bank will monitor the compliance of the Executive Agency/Borrower with all safeguards requirements established in the loan agreement and throughout the project implementation.	Applicable to the project.
B.9 Impacts on natural habitat and cultural sites	The project will not affect national nature parks or other protected areas.	Not applicable.
B.10 Dangerous substances	The project may generate dangerous residue of inflammable or toxic nature, in which case an Environmental Management Plan will be required.	Applicable to oils, residues of power transformers, and gases that require replacement in project operation.
B.11 Pollution prevention and mitigation	Project implementation can potentially contaminate the environment, particularly in the handling of oils and fuels.	Applicable to the project.

Applicable Safeguards Policy	Program Impact	Aspects of Safeguards Policy Identified
B.17 Procurement	Safeguards provisions can be incorporated into specific loan agreement, operational regulations and legal documents that enable the attainment and delivery of environmentally friendly goods and services.	Applicable to the project.
B.1 Compliance with IDB Resettlement Policies – OP 710	The project does not involve activities that produce physical or economic displacement of communities.	Not applicable.
B.1 Compliance with IDB Policy on Indigenous Peoples - OP 765	The project can have potentially negative impact on indigenous populations (please refer to Policy on Indigenous Peoples)	Applicable to the project, since a significant part of the population of the Archipelago belongs to ethnic, ancestral communities.
B.1 Compliance with IDB Policy on Natural Disaster Risk Management – OP 704	The activities to be funded will be conducted within a geographic area or sector exposed to natural disaster threats.	Applicable to the project. Consistent with the requirements of this Policy, the project activities will not raise the level of exposure to natural disaster risks faced by the communities involved.
B.1 Compliance with IDB Policy on Access to Information – OP 102	The Bank and the Executive Agency will provide the public with access to information and documents relevant to the project.	Applicable to the project.
B.1 Compliance with IDB Policy on Women in Development – OP 761	In line with OP-761, the project will conduct education and training workshops for women and vulnerable populations. Additionally, the implementation of projects in this program will not restrict in any way the equitable participation of men and women in activities that can arise during project implementation. Likewise, all members of the population will benefit from the project.	Applicable to the project. In all phases of the project, the Executive Agency as well as its subcontracted parties will incorporate gender standards to promote the equitable participation of men and women in the project's design and assessment, citizen participation, training and decision making, in accordance with the Operational Policy on Women in Development (OP–761).
B.1. Compliance with IDB Policy on Public Utilities (OP 708)	The project is consistent with this Policy.	Applicable to the project.

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

COLOMBIA

EFFICIENT ENERGY DEMAND MANAGEMENT IN NON-INTERCONNECTED ZONES - SAN ANDRES, PROVIDENCIA AND SANTA CATALINA ARCHIPELAGO PILOT PROGRAM

CO-L1119

ECONOMIC ANALYSIS

November 2015

This document has been prepared by: Mauricio Acevedo, BSc Eng, MSc, MBA (Consultant)

Cost Benefit Analysis

Table of Content

I. Introduction

Designed by the Inter-American Development Bank, the program for efficient energy demand management in non-interconnected zones will launch its pilot program in San Andres, Providencia and Santa Catalina (SAPSC) Archipelago. Given electricity service delivery conditions, socioeconomic profile and government support in the form of subsidies for the different tiers and sectors of the Archipelago, a cost-benefit economic analysis would be the most appropriate for the program.

The program will be implemented with resources from the Clean Technology Fund (CTF), from which Colombia obtained approval to receive funding (2010) and ratification (2013) for its Investment Plan. The program's implementation and operational model is defined on the basis of its technical design, and the funds needed for implementation will be channeled through the Non-Conventional Energy and Efficient Energy Management Fund (*Fondo de Energías Renovables y Gestión Eficiente de la Energía*, or FENOGE). The technical design of the program is based on previous studies conducted by the Ministry of Mines and Energy (*Ministerio de Minas y Energía,* or MME) through its Mining and Energy Planning Unit (*Unidad de Planeación Minero Energética,* or UPME), which takes into account user distribution, consumption habits and energy demands of every sector of the Island.

This document presents a detailed description and assessment of the two components of the program: first, the operational model proposal based on FENOGE, with the description of the structure and actors required to ensure that the program reaches the intended users; and second, the economic analysis of the result of incorporating technical variables and requirements defined by the Ministry of Mines and Energy of the Government of Colombia for program implementation. Among the program objectives are: reduction of subsidies for electricity rates in the Island; reduction of greenhouse gas emissions; and generation of positive socioeconomic impact for the region.

The program focuses primarily on residential users, as they are the majority, not only in number but also in aggregate energy consumption. Additionally, commercial, industrial (hotel) and government sectors have also been identified as potential beneficiaries of the program. Technical segmentation and consumption characteristics are used as input variables in the economic analysis, to define the proportion of funds to allocate to each sector.

The program will finance this mechanism during a period of five years, during which program activities will be carried out. Once the program implementation is complete, FENOGE may continue to operate through its fiduciary fund for an additional period, estimated to be five years, for a total duration of ten years during which funds from credit repayments would be used. The CTF funding of US$10 million, is to be disbursed in the first 5 years, of which US7.5 million will be earmarked for implementation of energy efficiency (EE) programs (refrigeration, lighting and air conditioning) and installation of non-conventional sources of energy generation (solar/photovoltaic). These technologies will be incorporated through a process of equipment substitution defined within the program operational framework. Resources for program implementation will cover, in addition to

equipment, program transaction costs as well as a portion of the scrapping costs associated with final disposal of obsolete equipment, in order to prevent the possible emergence of a black market which could negatively affect program results.

A sensitivity analysis of the program's economic viability is conducted, which will serve to validate the distribution of program beneficiaries by sector and technology, as well as assumptions of the economic model on which the program is based. The program is expected to achieve an internal rate of return above 12% and a positive net present value by the end of the ten-year period.

II. Assumptions and methodology

To structure the program, various meetings were held with the IDB project team and representatives of the Government of Colombia from various entities related to the Pilot program in SAPSC.

A. General Assumptions

The main assumptions identified throughout the program structuring process are presented as follows:

a. Segmentation is done on the basis of the technical analysis of the solutions in terms of their potential savings and complexity of implementation. The initial focus of the program is on tiers 1, 2 and 3 residential sector users[1], and small-scale hotels. Depending on the segmentation, cost of solutions and financial-economic conditions of the program, additional sectors are included.
b. Given limited resources and the absence of regulation on the delivery of surplus electricity from small-scale self-generation, the latter will not be considered part of the potential benefits for the program. Self-generation systems considered in the program are considered to satisfy base demand without generating surplus.
c. The program will be funded exclusively with CTF resources, and the total amount will be US$10 million. Out of the total amount, US$7.5 million will be used toward program implementation and disbursed in the first five years in accordance with conditions that will be defined later on. Based on the analysis performed, an estimated US$500,000 will be disbursed during the first and second years, and the remaining amount will be split in equal installments and disbursed in the three following years. The remaining US$2.5 million will be used toward environmental management, communications, and social management, among others. The corresponding resources are budgeted in the model to be disbursed in equal amounts over five years, or US$500,000 per year.
d. The US$7.5 million earmarked for program implementation do not include sensitivity programs nor disposal and scrapping activities. The economic model of the program considers a fixed amount per end user/beneficiary, as logistics of the scrapping process.
e. The resources will be channeled through FENOGE for program implementation. The conditions and model for implementation will and agreed upon between the Ministry, the

[1] Households are classified by Colombia's National Administrative Department of Statistics (DANE) based on socioeconomic indicators. The purpose is to apply differentiated charges for utility services grouped in tiers, allowing the assignment of subsidies (tiers 1-3) and the collection of contributions (tiers 5-6), according to affordability.

IDB and the fiduciary administrator of FENOGE, creating an account for the program, separated from the resources generated through electricity bill payments, as defined in the PND 2014-2018. As established by the regulatory decree of FENOGE, the operational cost of the fund is 2%.

f. The economic model does not consider in its analysis tax incentives, current or under discussion, for technologies and programs to be carried out by the program. Based on the FENOGE decree draft consulted, tax incentives can be utilized when the proposed solutions in the program are implemented by end users, following the procedure defined for their application.

g. The economic analysis was based on the operational model, discussed later in the document. Although the operational model still considers one scenario with the participation of the concessionaire, and another one in which a third party is in charge of the operation, there would be no difference in terms of transaction and operation costs, insofar as the operational procedures are essentially the same, with the sole difference being who receives the commissions. These operational models have been legally reviewed and their validity endorsed, with the implications and risks involved identified for each case. Depending on whether the concessionaire is included or not, the legal-contractual implications should be clarified. To this end the group of consultants discussed it extensively with the legal consultant, as well as with the Ministry of Mines and Energy, as the grantor of the Exclusive Service Area.

h. Also included is an option in which the financial operation is conducted by a third party, which takes on part of the operational credit risk of end users and can leverage program resources such as non-reimbursable funds, compensation rates, among others.

B. Baseline Scenario

The program uses as the baseline, consumption recorded in 2013 in preliminary analyses conducted by UPME when structuring the scenarios. Two main variables are identified and quantified: subsidy savings and GHG emission reduction. Based on the characteristics of the program (EE) and of electricity service delivery (subsidies to all users), estimated benefits are discounted from the current and project values of the variables.

				1	2	3	4	5	6	7	8	9	10
Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Economic Growth (GDP)	Base	4%	4%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%
Projection, without program													
Energy Consumption (GWh/year)	164	171	177	183	188	192	196	200	204	208	212	216	220
Emissions (Ton/year)	109,880	114,275	118,846	122,412	126,084	128,606	131,178	133,801	136,477	139,207	141,991	144,831	147,727
Subsidies (Millions of COP$)	$ 90,200	$ 93,808	$97,560	$100,487	$103,502	$105,572	$107,683	$109,837	$112,034	$114,274	$116,560	$118,891	$121,269
Subsidies (Millions of USD$)	$ 30.1	$ 31.3	$ 32.5	$ 33.5	$ 4.5	$ 35.2	$ 35.9	$ 36.6	$ 37.3	$ 38.1	$ 38.9	$ 39.6	$ 40.4
Reduction, with program													
GHG %				0.23%	0.71%	2.28%	4.09%	6.43%	6.86%	7.01%	7.27%	7.77%	8.63%
Subsidies %				0.18%	0.56%	1.80%	3.23%	5.08%	5.44%	5.57%	5.82%	6.27%	7.05%
Projection, with program													

Energy Consumption (GWh/year)		182	187	188	188	187	190	193	197	199	201
Emissions (Ton/year)		122,127	125,192	125,670	125,816	125,202	127,115	129,454	131,661	133,577	134,982
Subsidies (Millions of COP$)		$100,303	$102,923	$103,669	$104,203	$104,252	$105,941	$107,908	$109,781	$111,441	$112,725
Subsidies (Millions of USD$)		$ 33.4	$ 34.3	$ 34.6	$ 34.7	$ 34.8	$ 35.3	$ 36.0	$ 36.6	$ 37.1	$ 37.6

The region receives approximately US$ 30.2 million per year in electricity subsidies, and emits about 109,000 tons of greenhouse gases (GHG) per year due to electricity consumption. To measure the impact of program implementation, these values are projected based on the economic growth rate of the region of San Andres Islands while taking into account the benefits of GHG reduction and savings in subsidies.

C. Program Operational Model

1. Structuring of the EE program through technology substitution and installation of renewable energy solutions.

As part of the planning, structuring and supervision of the program, it is necessary to define a series of components of the above to facilitate program operation and drastically reduce the risks involved. The following are identified as critical components:

- Selection of technology to be replaced: models/references of appliances that will be installed for end users, reference prices for end users, prices to be paid by suppliers.
- Network of suppliers and authorized installers: seeking to maximize coverage and ensure high level of service to users with appropriate risk management.
- Collection channels/mechanisms for credit fees incurred: ensuring geographic coverage, transaction cost efficiency and risk mitigation measures.
- Program operating regulation: the procedure details will be discussed below to define necessary elements (tools, technology, documentation, communication plan, etc.) in each step and ensure the appropriate program implementation.

The program will be implemented through the Non-Conventional Energy and Efficient Energy Management Fund (FENOGE), which was established by Law 1715 of 2014. This Fund operates through a fiduciary/trust fund, which must comply with the program operating regulations and will be assigned an administrator. FENOGE can receive funds defined in the electricity tariff structure, as well as resources from multilateral entities and other agencies that promote programs with similar objectives.

The program will receive funding from CTF, which will be allocated to the fiduciary fund for its disbursement. In accordance with conditions established in FENOGE's operational manual, a stand-alone trust fund will be created with a proper operation manual to implement the technical and economic proposal prepared as part of the program.

To ensure its success, the program requires a technical and financial operator to act as the fund administrator, who will be determined in accordance with the legal framework of the exclusive service area and the scope of the program. The equipment defined in the technical scope of the program for each segment considered should be tendered to assign the ideal

supplier, who will be in charge of ensuring delivery of new equipment and collection and disposal of obsolete ones.

2. Energy efficiency program operating procedures – technology substitution

The program can start operation once a program operator has been established and initial funds deposited. The program operational model is as follows:

a) First, end users interested in becoming program beneficiaries must complete preregistration directly with the operator, who will analyze repayment behavior and consumption level on a case-by-case basis. Based on this information, every user will be assigned a credit allowance, which can be used for the substitution of electrical appliances that use the types of technologies contemplated in the program.

Based on these conditions, if the user decides to participate in the program, he or she will receive an electronic card with the preapproved allowance, which can be used exclusively with suppliers for technologies and references authorized by the program. In other words, end users will never receive money, nor can they use the credit allowance for purposes other than the ones contemplated in the program.

Once the user receives their preapproved allowance, they can take their old equipment to the supplier (or to the area designated by the program for reception and proper disposal of old appliances). Then, the program beneficiary registry will be updated to certify that the user has fulfilled the requirement to turn in old appliances.

b) End users can choose appliances they will purchase from the supplier with the preapproved allowance. When new appliance purchases are finalized, the supplier will update the available allowance in the cards and request end users to complete necessary documentation so the supplier can generate credit and/or make subsidy payment to them. The supplier will be in charge of delivering and installing the new appliances.

c) Once the appliances are installed, the supplier can present to the operator the certificate of equipment delivery and installation, which is required for receiving the corresponding payment from the latter, based on payment timeline and conditions previously established in the program regulation.

d) If the end user belongs to any segment that is required to pay back the total or partial amount of allowance used, the operator will be responsible for creating the credit and billing directly to the end user of each credit allowance in accordance with conditions agreed upon in the program. To facilitate the program implementation, it is recommended that credit billing be kept separate from electricity consumption billing.

e) Once the credit bill is received, the user should make the respective payments through the channels defined in the program for such purpose (among others: financial institutions, non-banking correspondents, or other channels). The program operator will receive the corresponding payment funds and update the information on available credit based on payments made by users. It should be noted that the program operator is responsible for portfolio management when users breach their financial commitments assumed upon receiving their new appliance.

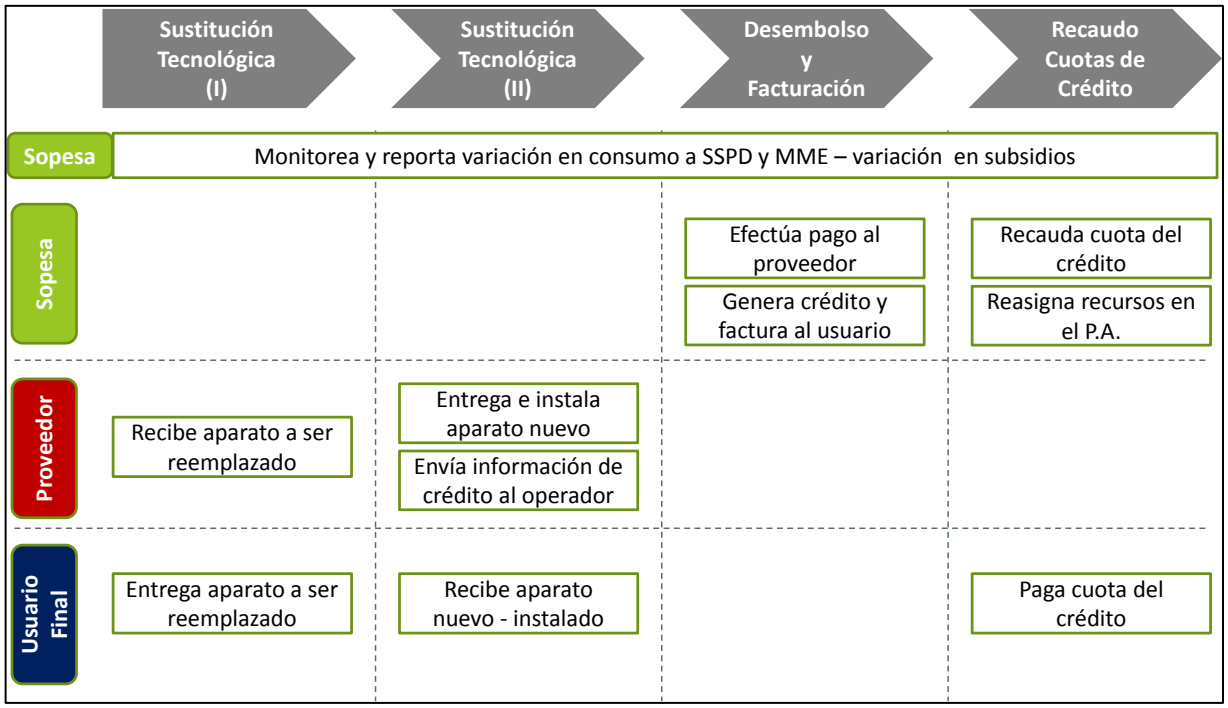
f) Funds that the operator receives as payment for the credits will be directly deposited in the FENOGE's fiduciary fund, in which they will be reallocated to new beneficiaries of the program.

g) During the program implementation, participation of the concessionaire will be necessary for consumption monitoring and reporting to the Ministry of Mines and Energy or to the Residential Public Utility Superintendency so that these institutions can assess compliance with established consumption reduction objectives, calculate savings in subsidies expenditure by the Government of Colombia, and estimate other environmental and economic benefits arising from the program.

3. Alternative program operational schemes

In alternative scenarios, the program operation is essentially the same as described above. However, small changes can be made in terms of identity of the operator (the concessionaire or a third party – a financial institution or another organization), and the choices of channels of end user payment collection. The following discusses three scenarios by describing their differences from the general scheme presented above.

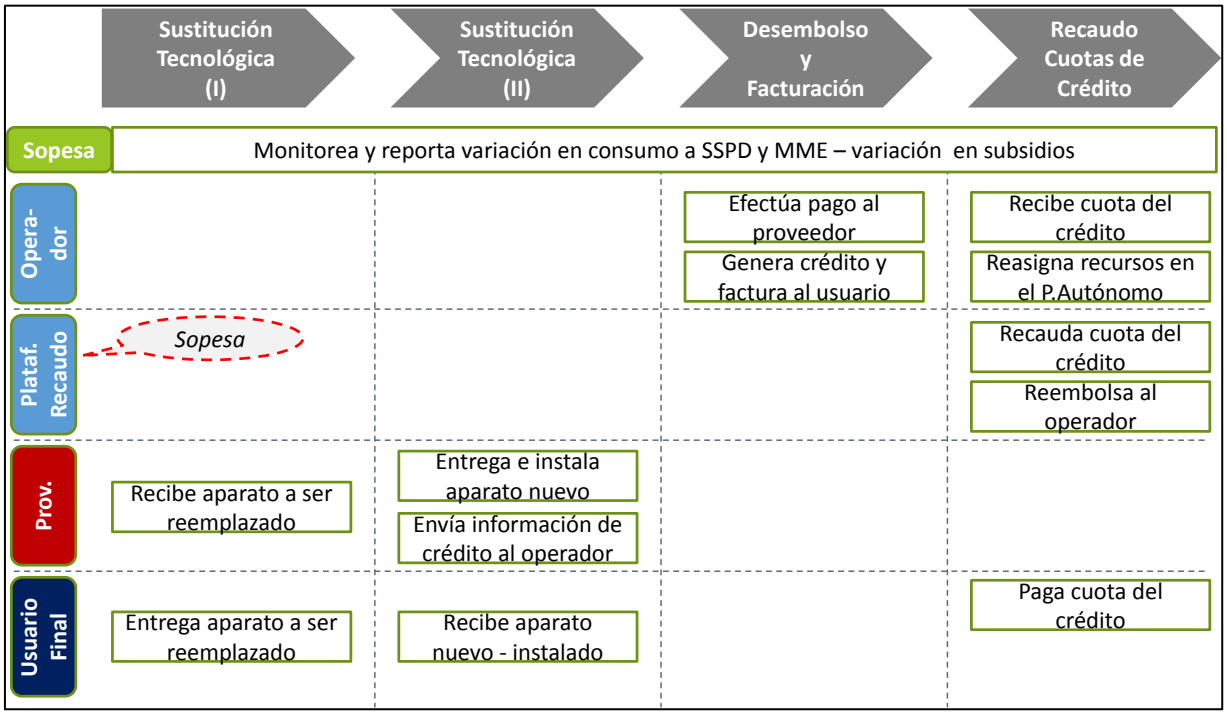
4. Scenario 1 – The concessionaire acts as program operator



Under this scenario, the main difference from the general scheme lies in the fact that operation is conducted through the service infrastructure and collection channels currently used by the concessionaire. From an operational point of view, this scenario presents a simplification of the model, with fewer actors, and less information and resource flow between institutions.

However, it is worth mentioning that the concessionaire may not have many of the operational and technological capacities required to act as the program operator, capacities that include credit creation and management. On the other hand, to ensure transparency of the program, it would be indispensable to keep electricity delivery and program operation separate. Should this option be chosen for program implementation, it will be necessary to clearly define in the program regulation risk mitigation mechanisms and measures to be applied to ensure appropriate use of program resources and attainment of short, medium and long-term expected results.

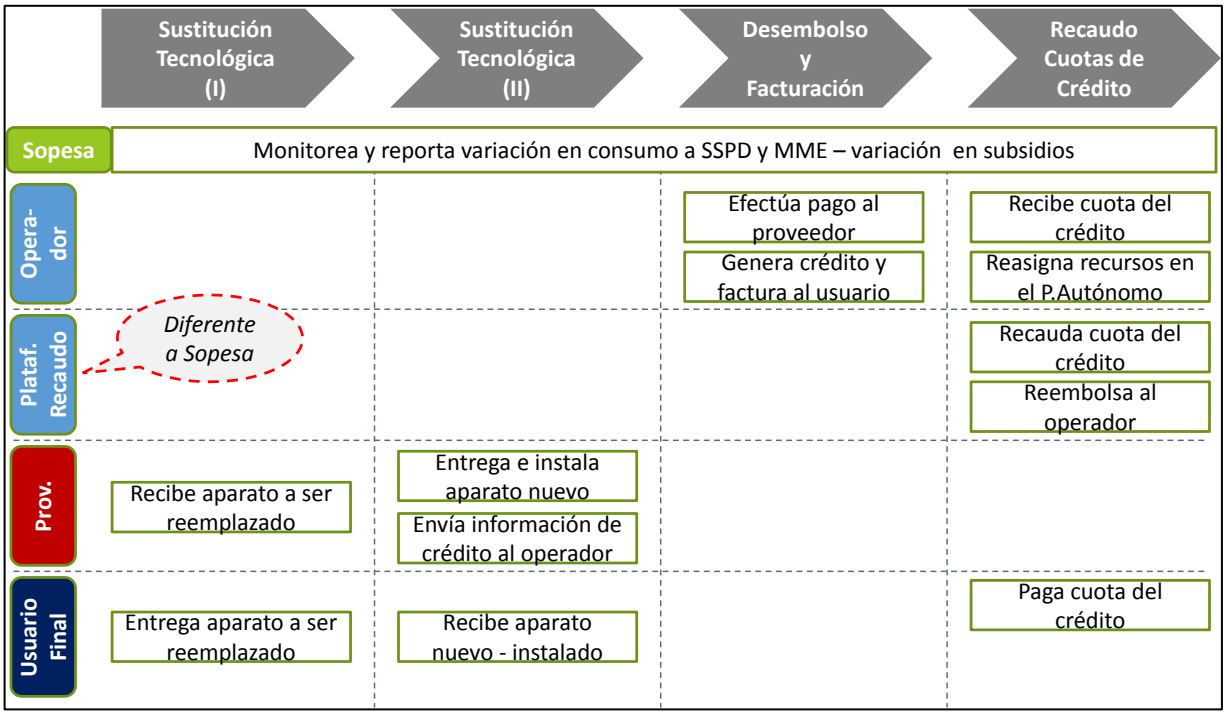
5. Scenario 2 – A third party acts as program operator while the concessionaire remains in charge of credit fees collection through electricity bills



This option ensures total separation between the energy efficiency program and electricity supply delivery. The alternative of having a third party acting as program operator creates the possibility of having an organization with experience in this type of operations. Additionally, using the concessionaire's current collection infrastructure and the consolidation of electricity bills will facilitate the credit payment process for users and can perhaps improve portfolio indicators.

However, depending on the concessionaire's current technology, the bill consolidation process can end up being complex and/or require additional development.

6. Scenario 3 – A third party acts as program operator while billing and credit fees collection are done through channels independent from those currently used by the concessionaire



This scenario is very similar to scenario 2, except that in this case the credit fees collection process is defined as and implemented through different channels. Another important difference lies in the fact that under this scenario, end users will receive a separate bill for the credit fees they need to pay as program beneficiaries, which is similar to any other financial obligations they may have. The billing will be done directly by the program operator; henceforth, an organization with efficient and effective collection capacity must be selected. The program operational model contemplates three scenarios depending on the identity of the program operator and of the credit fees collection channels.

7. Economic analysis model of the program

The model used for performing economic and financial analysis for the program was built in accordance with the structure defined in operation flows. The structure also includes results of the technical analysis and segmentation of beneficiaries.

The technologies proposed were analyzed in terms of return per dollar invested, while taking into account the segmentation of end users. Energy efficient lighting solutions present the best results in terms of investment-induced consumption reduction.

Savings in kWh for every USD invested	
Refrigeration	0.89
Ventilation	1.16
Air Conditioning	0.61
Lighting	2.08
Solar Photovoltaic (SPV)	0.58
Wind Energy	0.14
* Savings calculated for the final year of the program.	

Investment in in wind generation results in lower returns in comparison with investment in energy efficiency and solar photovoltaic generation (SPV).

Savings in USD for every USD invested			
	EE	**SPV**	**Wind**
Residential 1-3	0.25	0.16	0.04
Residential 4-6	0.19	0.16	0.04
Commercial	0.32	0.16	0.04
Industrial	0.71	0.16	0.04
Government	1.01	0.16	0.00
* Savings calculated for the final year of the program.			

Based on average consumption per end user and the number of users in each sector considered in the program, preliminary estimates of investment required by sector, and adoption rate in terms of number of beneficiaries of the program were made. Residential users of tiers 1 to 3, as well as small and medium-scale hotels were defined as program priority by the Government of Colombia.

The final electricity tariffs for each sector and consumption subsidies were incorporated into the model to determine savings generated by reduction in electricity consumption.

The program is defined as technology procurement credit, except for the institutional/public sector. For residential users of tiers 1 to 3, credit will be paid back in 24 months, while for other sectors in 48 months. The credit fees are calculated as a proportion of savings in the electricity bills, due to reduced energy consumption.

The financial operation is structured in two rounds. The first round concerns direct disbursements toward investment based on CTF resources (US$7.5 million) and the second contemplates investment of funds collected through the above-referenced credit modality throughout the program's operation. Resources in the second round will be allocated to residential users of tiers 1 to 3 and to the governmental sector. This structure allows for optimal resource allocation, maximum impact for the users served, especially those

receiving the largest subsidies and that represent the heaviest economic burden for the Government.

BENEFICIAIRES BY SECTOR	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)	Year 6 (2021)	Year 7 (2022)	Year 8 (2023)	Year 9 (2024)	Year 10 (2025)	TOTAL
Residential 1-3	149	161	634	690	763	264	424	718	1,260	2,198	7,262
Residential 4-6	14	14	59	59	59	-	-	-	-	-	207
Commercial	27	27	110	110	110	-	-	-	-	-	384
Industrial	4	4	17	17	17	-	-	-	-	-	60
Government	3	4	14	20	28	29	46	78	137	239	598
TOTAL	198	211	835	897	977	293	470	796	1,397	2,437	8,510

Cash flows over 10 years of program operation are estimated based on variables detailed above. The amounts take into account transaction costs, as well as resources to be used toward scrapping as part of logistical costs associated with the process.

Investment by type	
% Inv in EE	88%
% Inv in SPV	12%
% Inv in Wind	0%

% Beneficiary by Sector	EE	SPV	WIND
EE Residential 1-3	15%	0%	0%
EE Residential 4-6	10%	0%	0%
EE Commercial	15%	0%	0%
EE Industrial	10%	50%	0%
EE Government	9.5%	5%	0%

	Tiers 1-3	Government	% Savings in payment, other users
Distribution of investment of collected fees	40%	60%	
% Savings in credit payment, tiers 1-3 users	50%		85%

The analytical model incorporates additional variables, such as exchange rate, percentage of risky credits in the portfolio and transaction costs, among others. The Net Present Value of the program is calculated on a horizon of 10 years based on final flow figures. This model incorporates the calculations of all the components discussed above, based on technical and financial input variables as well as other variables related to the distribution of beneficiaries.

III. **Economic Benefits**

Based on the program definition, there are two sources of economic benefits:

- EE promotes reduction in electricity consumption of end users in the residential, commercial, industrial and governmental sector. Reduction in electricity consumption will produce a direct economic impact on each user, who will have more resources left for other things, as they pay less for energy consumption. Part of this direct benefit will be used toward paying for the new appliances. These payback resources will thus flow back to the program and will benefit more users who participate in the proposed financing scheme. However, the main economic benefit generated by reduced electricity consumption will be a reduction in emissions of CO_2 produced on the island. In the analysis, these reductions are calculated based on lower estimated consumption due to technological substitution, using international standards to convert KWh to equivalent CO_2 tonnage.

- The program will also generate direct benefits for the Government of Colombia and henceforth the population as a whole, as fewer resources will be spent on energy subsidies for the island as a result of less electricity consumption. This is particularly relevant for the case of SAPSC, where all users of the exclusive service area receive subsidy in the form of a percentage discount on their electricity prices. In the analysis, the lower amount of subsidy expenditure by the Government of Colombia is directly calculated based on the reduction in consumption by different users. The distribution of subsidy savings throughout the program duration is presented as follows:

(US$ millions)	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Income (Subsidy savings)	0.05	0.16	0.54	0.97	1.53	1.64	1.68	1.75	1.89	2.11

As the program is structured in such a way that all non-government users must reimburse part of the savings generated by lower electricity consumption, these resources are reinvested in the program, and by the end of 10-year program duration the FENOGE's fiduciary fund will have a resources available to the Government of Colombia, which could reach US$**8.6 million** as in the last scenario proposed. This could be invested in EE and RE solutions with the best cost-benefit profile and the most efficient for the Island at the end of the program.

IV. Economic Costs

Resources to be invested in the program will come from funds provided by CTF to the Government of Colombia, to be channeled to the program through FENOGE. The total investment will be US$10 million out of which US$7.5 million will be allocated toward program implementation and 2.5 million toward environment interventions, and social management, among others.

Investment flows during the first five years of the program are presented in the following table:

(US$ millions)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6-10	Program total
Program implementation	0.50	0.50	2.17	2.17	2.17	0.00	7.50
Interventions and others	0.50	0.50	0.50	0.50	0.50	0.00	2.50
Total investment	1.00	1.00	2.67	2.67	2.67	0.00	10.00

Once resources are allocated to the program, a series of transaction and operational costs will arise, including financial costs associated with the administration of the program's stand-alone trust fund, as well financial costs that the operator will bear. Instead of being considered additional costs, these are included part of the initial investment. Specifically, these costs are added to initial investment, reducing the remaining amount to be invested.

Additionally, the program contemplates other transaction and operational commissions and costs, especially commissions related to the administration of credit fees collection, financial costs arising from fund transfers between the institution responsible for repayment management and the operator, among others. In total, these charges represent US$1.30 per transaction and are included as many times as necessary for each user depending on payment flows.

The analysis considers scrapping and post-consumption costs, which are calculated based on the number of users who participate in the program. These costs are estimated to be US$60 per user.

V. Economic Return

After analyzing each scenario and considering requirements presented by IDB and the Government of Colombia, the resulting cash flows are presented in the following table. The figures are calculated based on the operational model discussed in previous sections.

(US$ millions)	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Income (subsidy savings)	0.056	0.13	0.54	0.97	1.53	1.64	1.68	1.75	1.89	2.11
Final repayment										8.60
Investment	1.00	1.00	2.53	2.53	2.53	0.00	0.00	0.00	0.00	0.00
Financial and post-consumption cost	0.02	0.02	0.07	0.08	0.09	0.06	0.09	0.15	0.26	0.46
Net benefit	(0.96)	(0.85)	(2.07)	(1.64)	(1.11)	1.58	1.59	1.60	1.62	10.24
NPV (@12%)	1.36									
IRR (10 years)	17.0%									

Considering potential savings and emission reductions that can be achieved with the energy efficiency program over the period of ten years, which is estimated to be the length of useful life of the technologies proposed to receive funding, reducing one ton of CO_2 costs US$ 135 in the high scenario, US$ 127 in the medium scenario and US$ 147 in the low scenario. Savings generated shall be (considering generation cost of per KWh to be 900 COP$ 900) US$ 450/ton over the ten-year lifespan of the technologies on average across all sectors, assuming energy prices to stay constant in the assessment period. Henceforth, the scenarios assessed can generate US$ 316/ton, US$ 324/ton and US$ 304/ton in savings, respectively.

The following table presents a summary of the main variables of the program as well as savings by the end of the program. It is worth mentioning that based on the calculations performed, the program payback period is 4.7 years, making it an attractive model for promoting intervention schemes in energy efficiency and renewable energy sources.

Given the impact of providing full subsidies to the institutional/public sector and partial subsidy to tiers 1 to 3 residential users, the financial net present value and internal rate of return of the program are marginally positive.

Economic Parameters		Per Year	Program Total (10 Years)
Total CTF resources	USD		$ 10,000,000
CTF resources invested in EE and RE	USD		$ 7,500,000
Net Investment at the beginning of the program	USD		$ 7,125,000
Investment made with operational credit	USD		$ 18,730,238
Energy costs at the beginning of the program	USD	$ 50,585,779	
Energy costs at the end of the program	USD	$ 46,708,332	
Reduction in energy consumption, without credit	kWh	10,854,444	76,396,879
Savings in subsidies, with credit	USD	$ 2,118,388	$ 12,327,015
Total program savings, with credit	USD	$ 6,780,929	$43, 496,239
Reduction in energy consumption, with credit	kWh	14,149,547	84,092,037
Emission reduction	TON CO_2	9,426	56,017
Estimated Scrapping Cost	USD/User	$ 67	$ 570,181
Reduction in payment to Concessionaire		7.7%	
Estimated NPV of Savings (10 years)	USD	$1,358,042	
IRR (% 10 years)		17.0%	
Discount rate		12.0%	
Cash balance at the end of the program	USD	$ 8,605,347	
Payback period	Years	4.7	

VI. Sensitivity Analysis

The financial model used is built on parameters obtained from the technical analysis and from the operational model as previously described. For purposes of the sensitivity analysis, input variables were defined, separated from the model and grouped in three categories.

The first category consists of variables related to the distribution of program users or beneficiaries in each of the segments defined in the program objective. The segmentation corresponds to not only the type or tier of user but also to technology or solution defined. For each of the variables, a “high” and a “low” scenario are defined, as well as a “baseline scenario” based on the initial median value. These values, especially the high value, are constrained by the upper limit of investment set as US$7.5 million minus administrative expenses.

Input values related to the distribution of beneficiaries are defined based on the percentage of users that participate in the program, with which the calculation of flows over 10 years of program operation is performed.

Variables			Sensitivity Analysis Scenarios		
% distribution of beneficiaries		Input Value	Low	Baseline	High
EE	EE Residential 1-3	15.0%	0.0%	15.0%	55.0%
	EE Residential 4-6	10.0%	0.0%	10.0%	100.0%
	EE Commercial	15.0%	0.0%	15.0%	38.0%
	EE Industrial	10.0%	0.0%	10.0%	100.0%
	EE Government	9.5%	0.0%	5.0%	47.0%
SPV	SPV Residential 1-3	0.0%	0.0%	0.0%	4.0%
	SPV Residential 4-6	0.0%	0.0%	0.0%	27.4%
	SPV Commercial	0.0%	0.0%	0.0%	22.1%
	SPV Industrial	50.0%	20.0%	50.0%	100.0%
	SPV Gov	5.0%	0.0%	5.0%	100.0%
WIND	WIND Residential 1-3	0.0%	0.0%	0.0%	1.0%
	WIND Residential 4-6	0.0%	0.0%	0.0%	1.0%
	WIND Commercial	0.0%	0.0%	0.0%	1.0%
	WIND Industrial	0.0%	0.0%	0.0%	1.0%
GOV	Distr. Investment Repayment Tiers 1-3	40.0%	20.0%	40.0%	60.0%

The second category groups together financial variables, including the percentage of saving used as credit fees contribution, the percentage of risky portfolio and transaction costs, among others.

Variables			Sensitivity Analysis Scenarios		
Financial Variables		Input Value	Low	Baseline	High
Tiers 1-3	% Savings used toward credit fees, tiers 1-3	50.0%	20.0%	50.0%	70.0%
	% Savings used toward credit fees, other users	85.0%	60.0%	75.0%	100.0%
	Exchange Rate	$ 3,000	$ 2,500	$ 3,000	$ 3,500
	Scrapping Cost Assumed	$ 67	$ 20	$ 60	$ 100
	Discount Rate	12.0%	6%	12%	16%
	% Risky Portfolio	30.0%	20%	30%	50%
	Financial cost by entity/operator	3.0%	2.0%	3.5%	5.0%
	Financial cost of collection	0.50	0.30	0.50	1.00
	Financial cost of return on fund	0.50	0.30	0.50	1.00
	Transaction cost to supplier	0.30	0.30	0.50	1.00

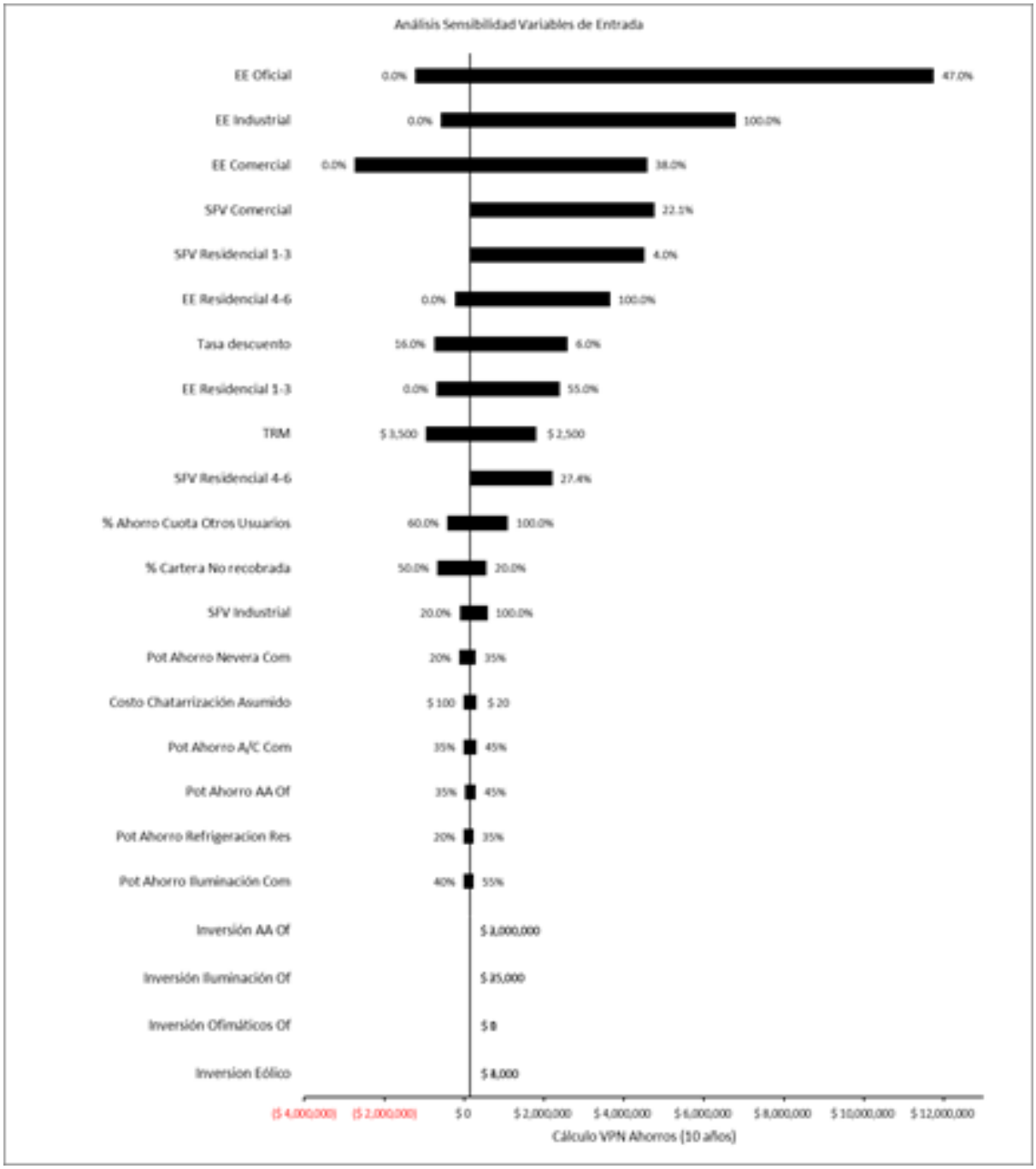
The last category consists of all variables defined in the technical analysis, such as percentages of saving by technology and the corresponding investment amounts, which were defined for each technology and for each sector at which the investments were targeted.

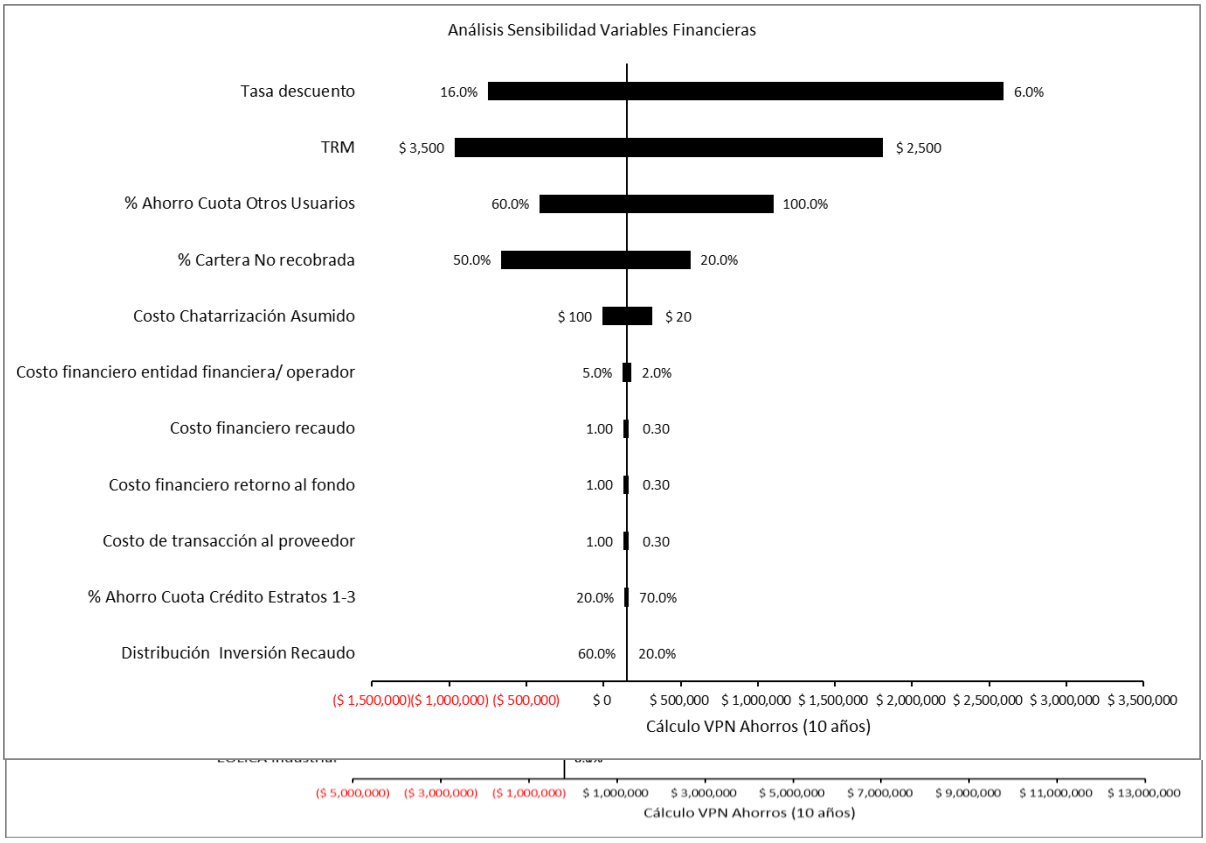
Saving and Investment Variables	Input		Sensitivity Analysis Scenarios		
% Distribution of Beneficiaries		**Value**	**Low**	**Baseline**	**High**
Residential	Pot Saving Refrigeration	30%	20.0%	30.0%	35.0%
	Pot Saving Ventilation Res	50%	45.0%	50.0%	55.0%
	Pot Saving A/C Res	40%	35.0%	40.0%	45.0%
	Pot Saving Lighting Res	50%	45.0%	50.0%	55.0%
	Pot Saving TV Res	0%	0.0%	0.0%	1.0%
	Inv Refrigeration Res	$ 830,000	$ 600,000	$ 830,000	$1,200,000
	Inv Ventilation Res	$ 600,000	$ 400,000	$ 600,000	$ 800,000
	Inv A/C Res	$ 2,470,000	$ 2,000,000	$2,470,000	$3,000,000
	Inv Lighting Res	$ 31,070	$ 25,000	$ 31,070	$ 35,000
	Inv TV Res	$ 0	$ 0	$ 0	$ 1
Commercial	Pot Saving Fridge Com	30%	20%	30%	35%
	Pot Saving Freezer Com	0%	0%	0%	1%
	Pot Saving A/C Com	40%	35%	40%	45%
	Pot Saving Lighting Com	50%	40%	50%	55%
	Pot Saving Bottle Rack Com	0%	0%	0%	1%
	Inv Fridge Com	$ 830,000	$ 600,000	$ 830,000	$1,200,000
	Inv Freezer Com	$ 3,250,000	$ 2,500,000	$3,250,000	$3,500,000
	Inv A/C Com	$ 2,470,000	$ 2,000,000	$2,470,000	$3,000,000
	Inv Lighting Com	$ 31,070	$ 25,000	$ 31,070	$ 35,000
	Inv Bottle Rack Com	$ 3,250,000	$ 2,500,000	$3,250,000	$3,700,000
Industrial	Pot Saving Fridge Ind	30%	20%	30%	35%
	Pot Saving Freezer Ind	0%	0%	0%	1%
	Pot Saving A/C Ind	40%	35%	40%	45%
	Pot Saving Lighting Ind	50%	45%	50%	55%
	Pot Saving Bottle Rack Ind	0%	0%	0%	1%
	Inv Fridge Ind	$ 830,000	$ 600,000	$ 830,000	$1,200,000
	Inv Freezer Ind	$ 3,250,000	$ 2,800,000	$3,250,000	$3,500,000
	Inv A/C Ind	$ 2,470,000	$ 2,000,000	$2,470,000	$3,000,000
	Inv Lighting Ind	$ 31,070	$ 25,000	$ 31,070	$ 35,000
	Inv Bottle Rack Ind	$ 3,250,000	$ 2,800,000	$3,250,000	$3,500,000
Gov	Pot Saving by Gov	0%	0%	0%	1%
	Pot Saving Solar Gov	0%	0%	0%	1%
	Pot Saving A/CGov	40%	35%	40%	45%
	Pot Saving Lighting Gov	50%	45%	50%	55%
	Pot Saving Off Equip Gov	0%	0%	0%	1%
	Inv by Gov	$ 0	$ 0	$ 0	$ 1
	Inv Solar Gov	$ 0	$ 0	$ 0	$ 1
	Inv A/C Gov	$ 2,470,000	$ 2,000,000	$2,470,000	$3,000,000
	Inv Lighting Gov	$ 31,070	$ 25,000	$ 31,070	$ 35,000
	Inv Off Equip Gov	$ 0	$ 0	$ 0	$ 1
SPV	Inv SPV	$ 12,500	$ 11,000	$ 12,500	$ 14,000
WIND	Inv WIND	$ 3,500	$ 3,000	$ 3,500	$ 4,000

Based on the high, medium (baseline) and low scenarios, a sensitivity analysis is performed for each variable, within the constraint of the net initial investment available at the beginning of the program, which is US$7.5 million minus administrative costs. The analysis is performed with reference to the

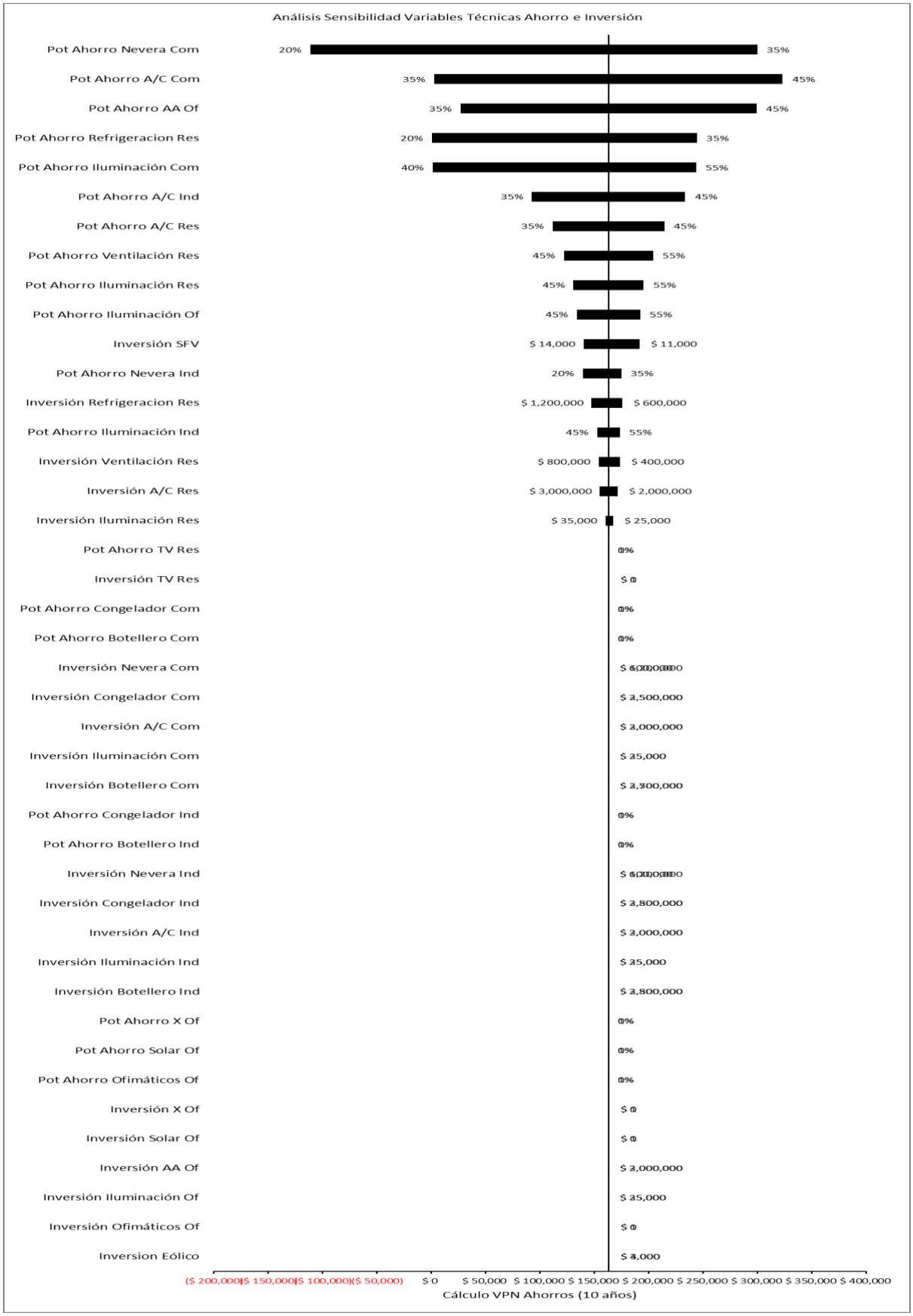
Net Present Value of cash flows over the program duration of ten years, in accordance with the assumptions discussed in previous sections.

The first sensitivity analysis is conducted for all input variables, which indicates that the most sensitive variables are the ones related to the distribution of beneficiaries that measure energy efficiency in governmental, commercial and tiers 4-6 of residential sectors. The discount rate of the program and the prevailing market exchange rate for the dollar are the most important financial variables. On the other hand, variables related to consumption saving by technology and investment, result in a negative change in the net present value without creating any advantage for the model.


Análisis Sensibilidad Variables de Entrada
EE Oficial
0.0%
47.0%
EE Industrial
0.0%
100.0%
EE Comercial
0.0%
38.0%
SFV Comercial
22.1%
SFV Residencial 1-3
4.0%
EE Residencial 4-6
0.0%
100.0%
Tasa descuento
16.0%
6.0%
EE Residencial 1-3
0.0%
55.0%
TRM
$ 3,500
$ 2,500
SFV Residencial 4-6
27.4%
% Ahorro Cuota Otros Usuarios
60.0%
100.0%
% Cartera No recobrada
50.0%
20.0%
SFV Industrial
20.0%
100.0%
Pot Ahorro Nevera Com
20%
35%
Costo Chatarrización Asumido
$ 100
$ 20
Pot Ahorro A/C Com
35%
45%
Pot Ahorro AA Of
35%
45%
Pot Ahorro Refrigeracion Res
20%
35%
Pot Ahorro Iluminación Com
40%
55%
Inversión AA Of
$ 3,000,000
Inversión Iluminación Of
$ 35,000
Inversión Ofimáticos Of
$ 0
Inversion Eólico
$ 8,000
($ 4,000,000)
($ 2,000,000)
$ 0
$ 2,000,000
$ 4,000,000
$ 6,000,000
$ 8,000,000
$ 10,000,000
$ 12,000,000
Cálculo VPN Ahorros (10 años)



Financial variables with discount rates over 12.4% lead to potentially negative NPVs. The Market Exchange Rate (*Tasa Representativa de Mercado,* or TRM, which refers to exchange rates higher than 1 USD=3100 COP) and the percentage of savings that users allocate toward credit fee payment (under 75%) can also result in negative NPVs, but to a lesser extent. Ideally, the percentage of risky portfolio should be maintained below 30%, a preference consistent with consultations conducted with credit program operators on the Island.


Análisis Sensibilidad Variables Técnicas Ahorro e Inversión
Pot Ahorro Nevera Com
Pot Ahorro A/C Com
Pot Ahorro AA Of
Pot Ahorro Refrigeracion Res
Pot Ahorro Iluminación Com
Pot Ahorro A/C Ind
Pot Ahorro A/C Res
Pot Ahorro Ventilación Res
Pot Ahorro Iluminación Res
Pot Ahorro Iluminación Of
Inversión SFV
Pot Ahorro Nevera Ind
Inversión Refrigeracion Res
Pot Ahorro Iluminación Ind
Inversión Ventilación Res
Inversión A/C Res
Inversión Iluminación Res
Pot Ahorro TV Res
Inversión TV Res
Pot Ahorro Congelador Com
Pot Ahorro Botellero Com
Inversión Nevera Com
Inversión Congelador Com
Inversión A/C Com
Inversión Iluminación Com
Inversión Botellero Com
Pot Ahorro Congelador Ind
Pot Ahorro Botellero Ind
Inversión Nevera Ind
Inversión Congelador Ind
Inversión A/C Ind
Inversión Iluminación Ind
Inversión Botellero Ind
Pot Ahorro X Of
Pot Ahorro Solar Of
Pot Ahorro Ofimáticos Of
Inversión X Of
Inversión Solar Of
Inversión AA Of
Inversión Iluminación Of
Inversión Ofimáticos Of
Inversion Eólico
20%
35%
35%
45%
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$ 14,000
$ 11,000
20%
35%
$ 1,200,000
$ 600,000
45%
55%
$ 800,000
$ 400,000
$ 3,000,000
$ 2,000,000
$ 35,000
$ 25,000
($ 200,000)
($ 150,000)
($ 100,000)
($ 50,000)
$ 0
$ 50,000
$ 100,000
$ 150,000
$ 200,000
$ 250,000
$ 300,000
$ 350,000
$ 400,000
Cálculo VPN Ahorros (10 años)

In summary, the sensitivity analysis performed on the economic model makes it possible to validate the most important parameters in the program implementation proposal. The most sensitive input variables are the ones related to the adoption rate of EE measures in user segments. An adoption rate in the government sector over 5% results in a positive net present value of the program, with a wide range of positive values – above 44% of the total variation in variables, followed by the commercial sector (15% adoption rate) and tiers 4-6 of the residential sector (10% adoption rate, with 14% and 4% in variations, respectively). These variations are consistent with the consumption levels and subsidies associated with each of the sectors and with the proposed payment model with funds from savings.

Among the financial variables, discount rate and dollar/Colombian Peso Exchange rate generate the highest impact. Discount rate over 12.4% or exchange rate over 1 USD=3100 COP leads to negative net present value. With the two variables defined at the above-mentioned values, and based on the ranges identified in the sensitivity analysis, the scope of the program was adjusted in terms of users, segments and other variables to ensure economic viability.

VII. Conclusions

According to the cost-benefit analysis presented in this document, the EE program for SAPSC Archipelago is viable based on the proposed operational model, technologies and savings defined in the technical analysis and the target users defined by the Government of Colombia.

Results achieved in terms of saving in subsidies represent a payback period of 5.7 years for the US$10 million invested by the Government of Colombia through CTF, which can lead to US$9.7 million of savings from accumulated subsidies expenditure over the program duration of ten years. In addition, the program can lead to a reduction of 9,426 tons in of CO_2 emitted per year (56,017 tons of CO_2 over the course of the program) if the program is fully implemented during ten years.

Refrigeration (fridges), air conditioning (roof turbine vents and air conditioners) and lighting technologies result in the best investment returns. The Government of Colombia defined tiers 1 to 3 residential users and hotel industry users of the Archipelago as priority users. The analysis also included small-scale solar solutions for public sector and for industrial (hotel) sector. In the latter case, hotels will benefit economically from the program due to reduced expenditure in energy and better reputation, as the use of alternative energy in a place like San Andres Island in the Caribbean can project a positive image of sustainability.

To optimize program impact, a credit model should be structured to target different users. Investment in institutional (government) users is treated as a sunk cost. The amount of credit fees to be paid the rest of the users is determined as a percentage of savings generated by the reduction in energy consumption as reflected in their electricity bills. It is recommended that tiers 1 to 3 users pay 50% of energy consumption savings as credit fees during 24 months, while all other users pay 85%

during 48 months (medium-scale industrial users will pay 85% of energy savings in credit fees over 24 months). This modality is calculated based on an estimated 30% of risky portfolio.

The operational model depends largely on the definition of the FENOGE manual and its regulation. Nevertheless, FENOGE's fiduciary fund for the program is set up to facilitate fund management, special loans administration, and the definition of technologies included within the scope of the program.

The program should be operated by an institution with the capacity to manage funds, convene and recruit equipment suppliers in accordance to technical standards, track program progress to reflect equipment delivery and loan disbursement, bill end users and collect corresponding credit fees, as well as prepare a report on the results of consumption reduction in accordance with the status of progress throughout the program. With that in mind, the option is left open as to whether the operator of the exclusive service area or a third party will assume the role of the program operator, whose designation should be legally reviewed and approved by the grantor – in this case the Ministry of Mines and Energy.

Given the operational credit structure, by the end of the program there should be approximately US$8.6 million in cash balance, which can be allocated to electricity generation projects using non-conventional energy sources in lower tiers, as well as health and government sector.