

**CLEAN TECHNOLOGY FUND
REVISED INVESTMENT PLAN FOR COLOMBIA**

Revision

February 2017

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List of Abbreviations

BAU	business-as-usual
BP	World Bank Policy
BRT	Bus Rapid Transit system
CIURE	<i>Comisión Intersectorial para el Uso Racional y Eficiente de la Energía y Fuentes no Convencionales</i> (Inter-Sectoral Commission for the Rational and Efficient Use of Energy and Non-Conventional Energy Sources)
CO ₂	Carbon Dioxide
CONPES	<i>Consejo Nacional de Política Económica y Social</i> (National Economic and Social Policy Council)
COP	Colombian Peso
CREG	<i>Comisión de Regulación de Energía y Gas</i> (Energy and Gas Regulatory Commission)
CTF	Clean Technology Fund
DNP	<i>Departamento Nacional de Planeación</i> (National Planning Department)
ECDBC	<i>Estrategia Colombiana de Desarrollo de Bajo Carbono</i> (Colombian Strategy for Low-Carbon Development)
EE	Energy Efficiency
EIA	Environmental Impact Assessment
ESW	Economic and Sector Work
FDN	<i>Financiera de Desarrollo Nacional</i>
GAC	Governance and Anti-Corruption
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GoC	Government of Colombia
GW	Gigawatt
IBRD	International Bank for Reconstruction and Development (World Bank)
IDB	Inter-American Development Bank
IP	Investment Plan
IPP	independent power producer
kWh	Kilowatt-hour
LCOE	Levelized Cost of Electricity
MINMINAS	Ministry of Mines and Energy
MDB	Multilateral Development Bank
mn	Million
Mt	Million tons
MW	Megawatt
NCRE	non-conventional renewable energy
NDC	Nationally-Determined Contribution
O&M	Operations and Maintenance
PAD	Project Appraisal Document
PAI	<i>Plan de Acción Indicativo</i> (Indicative Action Plan)
PCN	Project Concept Note
PMU	Project Management Unit
PPA	Power Purchase Agreement
PEN	<i>Plan Energético Nacional</i> (National Energy Plan)
PND	<i>Plan Nacional de Desarrollo</i> (National Development Plan)
PPP	Public Private Partnership
PROURE	<i>Programa de Uso Racional y Eficiente de Energía y Fuentes No Convencionales</i> (Program for the Rational and Efficient Use of Energy and Non-Conventional Energy Sources)
QER	Quality Enhancement Review (World Bank)
RE	Renewable Energy
SETP	<i>Sistema Estratégico de Transporte Público</i> (Strategic Public Transportation System)
SITP	<i>Sistema Integrado de Transporte Público</i> (Integrated Public Transport System)
TFC	Trust Fund Committee
UPME	<i>Unidad de Planeación Minero Energética</i> (Energy and Mining Planning Unit)
WB	World Bank
WBG	World Bank Group

EXECUTIVE SUMMARY

1. This note revises the Clean Technology Fund (CTF) Investment Plan (IP) for Colombia. The Trust Fund Committee (TFC) of the CTF first endorsed the original CTF Investment Plan for Colombia in a meeting held on March 15 – 16, 2010; the IP included an envelope of up to US\$150 million in CTF funding. Later, in May 2013, the CTF TFC endorsed a first revision of the CTF Investment Plan, which included the addition of a new program on non-conventional renewable energy (distributed generation) and the reallocation of CTF funding among components within the original envelope of US\$ 150 million.
2. Since the first revision of the CTF Investment Plan of Colombia, the implementation of the activities has been accelerated. As of February 2017, the Trust Fund Committee has committed US\$109 million out of the US\$150 million originally endorsed for Colombia, except for the sustainable urban transport project that was to be implemented by the World Bank. About 70% of the committed CTF funding, or US\$70 million, has obtained subsequent MDB Board approval and is under implementation.
3. The Government of Colombia (GoC) hereby proposes the reallocation of CTF resources from the above mentioned urban transport project to support the development of large-scale renewable energy and industrial energy efficiency in Colombia. The proposed reallocation of CTF resources is summarized in Table 1 below.

Table 1: Proposed Reallocation of CTF Resources (US\$ million)

CTF IP Component	MDB	CTF Funding (CTF IP Revision April 2013)	CTF Funding Reallocation	CTF Funding (CTF IP Revision February 2017)
Sustainable Urban Transport	IDB	60.00	-	60.00
	WB	41.00	(-41.00)	-
Energy Efficiency	IDB	32.26	-	32.26
	IFC	6.74	-	6.74
Non-Conventional Renewable Energy	IDB	10.00	-	10.00
Large-Scale Renewable Energy and Industrial Energy Efficiency	WB	-	(+41.00)	41.00
Total		150.00	-	150.00

4. A fundamental characteristic of the Colombian electricity market is that it is hydro dominated and thus highly vulnerable to climate change, which is amplifying the impacts of El Niño Southern Oscillation (ENSO) events. About two-thirds of the installed capacity is hydro-based and roughly 68% of Colombia's energy is produced from hydro resources. To ensure the availability of firm energy, the Energy and Gas Regulatory Commission (CREG) introduced a capacity payment mechanism – whose design and procurement has gone through a series of restructurings – to create incentives for the availability of “firm energy services” during times of hydro scarcity. The original capacity payment has evolved into an auction for “firm energy” (reliability payment).
5. Despite the hydro-dominant electricity market in Colombia, the GoC plans to meet a large part of growing electricity demand using fossil fuel, mainly coal and natural gas, under the business-as-

usual scenario of the generation expansion plan for the period 2015-2029. As the contribution of hydropower to the system continues in a declining trend, due to the limited growth potential of hydropower capacity and its vulnerability to climate change, the use of fossil fuels to cover for the electricity deficits will continue to increase, impacting the level of GHG emissions in the long term.

6. Recently, the country endured a prolonged and intense drought, which lowered average hydro reservoir levels to a record 30 percent, threatening the stability of the market and increasing the risk of potential rationing. The length of the episode (coupled to other events, such as an accident in a key hydropower plant, as well as problems with the availability of natural gas) has tested indeed the effectiveness of the regulatory framework (specifically the reliability payment) and the ability of reserve generators to deliver “firm capacity”.
7. Looking forward, Colombia has two different pathways to address the growing electricity demand and ensure security of supply in the context of the declining trend in the relative contribution of hydropower. The “business-as-usual” (BAU) scenario of the generation expansion plan for the period 2015-2029 involves a substantial increase in the use of fossil fuels (mainly coal and natural gas) for the generation of electricity. The alternative scenario involves an increased diversification of the energy mix with non-conventional renewable energy sources, coupled with an increased energy efficiency through demand side management.
8. The power system lacks resource diversity and therefore flexibility to cope with seasonal and weather shocks. It is now recognized that Colombia needs to ensure security of supply through increased diversification of the energy mix - here including non-conventional renewables - and demand side management.
9. To address these challenges, the GoC has committed, through various legal and policy instruments and plans - including the 1715 Law, National Development Plan (PND) 2014-2018, National Energy Plan 2015 (PEN 2015) and Nationally Determined Contribution (NDC) to the development of renewable energy and the diversification of electricity generation sources and emissions reductions. In the generation and transmission expansion plan developed by the Energy Planning Unit (Unidad de Planeación Minero Energética, UPME), the alternative scenario with renewable energy development demonstrates that the generation capacity of wind and solar would mainly replace the planned expansion of coal and gas in the conventional business as usual scenario.
10. As part of meeting the market needs, and to make the system more resilient, the GoC has been building strong institutional policy framework to promote energy efficiency across sectors and it has gradually implemented a number of strategic actions in this space. In particular, the “Promotion of Rational and Efficient Use of Energy and Non-Conventional Energy” (PROURE) and Indicative Action Plans (PAIs, 2010-2015 and later on 2016-2021 ¹) include specific targets by consumer segment. The PAI includes an analysis of the potential electric and other energy savings and actual targets by sector and by year (residential, industrial, commercial, and transportation sectors). Energy efficiency in the industrial sector, among other consumer segments, offers a huge potential to reduce and defer the expansion of generation capacity and reduce greenhouse gases via efficiency improvements in the operations of energy intensive industrial processes that make extensive use of both electricity and hydrocarbons. Improving energy efficiency in the industrial sector is also

¹ The 2010-2015 Plan has already been updated covering the 2017-2022 horizon, and approved by MME (Resolution 41,286 of December 30, 2016)

expected to contribute to diversifying the energy mix and enhancing reliability of electricity supply. During the 2016 power crisis, the GoC resorted to a very fast and effective program to promote energy efficiency to reduce consumption thus minimizing the risks of black outs or supply disruptions.

11. There is also a pipeline of renewable energy and industrial energy efficiency projects that has been identified to be well prepared and suitable for solicited procurement. In the La Guajira region, there are already from 1.5 to 3 GW of wind projects identified by some developers. Transmission lines strengthening connection with wind-producing La Guajira region have been assessed and the bidding process is expected to initiate soon.
12. The market for industrial energy efficiency is still nascent with a number of barriers that impede investment at scale in Colombia. There is limited track record in either long term lending to such projects or providing regular payments based on energy savings. There exist investment risks such as institutional coordination between various government agencies, clear policy and regulatory framework, open, competitive and transparent procurement framework along with long term financing, and credit risks that limit the bankability of projects. Addressing investment risks through targeted intervention is essential to establish and scale-up the development of renewable energy and industrial energy efficiency. The GoC has identified and assessed 16 large industrial energy efficiency projects in the industrial zone of North Region (Caribbean Coast). Upon the establishment of an appropriate financing mechanism to support investment, these projects can be quickly developed and create open the door for more investments in this space.
13. The proposed Large Scale Renewable Energy and Industrial Energy Efficiency program under the Revised CTF IP will be developed and design in coordination with the Ministry of Mines and Energy (MINMINAS), the National Mining and Energy Planning Unit (UPME), National Planning Department (DNP), and Financiera de Desarrollo Nacional (FDN), to directly address these barriers and risks through a combination of technical assistance, capacity building, and the provision of adequate risk mitigation guarantee products.
14. The use of CTF and IBRD financial support for the clean energy intervention in Colombia is expected to leverage an additional amount in the range of US\$ 400-780 million from other financing sources, including private sector lending and equity of Independent Power Producers. Furthermore, the use of risk mitigation guarantees using CTF finance will help: (i) provide risk-reducing instruments or innovative financial products to improve access to commercial financing and attract competitive pricing, (ii) guarantee investment recovery associated with renewable electricity, and (iii) enhance the project risk profile for high quality private investors.
15. It is expected that CTF funds of about US\$ 1 million will be provided as project preparation grant (PPG) for recipient executed technical assistance to the GoC under coordination of FDN. This activity would contribute to develop the much needed local operational, technical, and financial capacity for scaling up clean energy and energy efficiency, thereby contributing to making the technological solutions viable and operational in Colombia.
16. A comparison between the original and the proposed allocations, along with associated co-financing leveraged, is presented in Table 2 and 3 below. The total investment of the entire Investment Plan, including co-financing, will increase as a result of the proposed revision.

Table 2: CTF IP for Colombia May 2013 – Indicative Financing Plan (US\$150 million)

Financing Source → Component ↓	CTF			MDBs			Others	Total (US\$ mn)
	WB	IDB	IFC	WB	IDB	IFC		
Sustainable Urban Transport	41	60		100	305.8		555.3	1,062.1
Energy Efficiency		32.26	6.74		10	24.7	73.5	147.2
Non-Conventional Renewable Energy		10			10		24.0	44.0
Total	41	102.26	6.74	100	325.8	24.7	652.8	1,253.3

Table 3: Revised CTF IP for Colombia - Indicative Financing Plan After Reallocation (US\$150 million)

Financing Source → Component ↓	CTF			MDBs			FDN	Others	Total (US\$ mn)
	WB	IDB	IFC	WB	IDB	IFC			
Sustainable Urban Transport**		60			305.8		0	45.8	411.6
Energy Efficiency**		32.26	6.74		122.5	24.7	0	82.3	268.5
Non-Conventional Renewable Energy**		10			25.8		0	25.8	61.6
Large Scale Renewable Energy and Industrial Energy Efficiency	41			41			100*	398 - 784	580-966
Total	41	102.26	6.74	41	454.1	24.7	100	551.9-937.9	1321.7 - 1707.7

* Assumes average FDN contribution of US\$ 100 million either in loans or guarantees – likely range between US\$68-140 million.

** Co-financing figures of the existing three components (Sustainable Urban Transport, Energy Efficiency, and Non-Conventional Renewable Energy) are updated based on the information reported at project approval.

17. FDN contribution will likely range from US\$68 million to US\$ 140 million, and are assumed at a level of US\$ 100 million. FDN may either provide direct lending to the beneficiaries of the renewable and energy efficiency subprograms or, alternatively, FDN may provide guarantees like CTF and IBRD, leveraging the use of capital and allowing participation of private developers (i.e. IPPs) or other financial institutions as lenders to smaller energy efficiency projects. Given the lack of clarity at this stage, and since the FDN program is flexible to provide lending and/or guarantees, the impact of FDN resources in terms of mobilization of private resources are expressed as a range in Table 3 above.

INTRODUCTION

18. The Clean Technology Fund (CTF) Colombia Investment Plan (IP) is a “business plan” owned by the Government of Colombia (GoC), and prepared in cooperation with the Inter-American Development Bank (IDB), the International Finance Corporation (IFC), and the World Bank (WB), in order to provide support for the low-carbon objectives contained in Colombia’s National Development Plan (2006 – 2010) discussed and adjusted by Colombian civil society through the National Planning Council, defined for this purpose by law. The IP identifies the components that are proposed to be co-financed by the CTF jointly with the IDB, IFC and WB, private sector, and other partners.
19. After the endorsement of the IP by the CTF Trust Fund Committee in March 2010, the first revision, proposed by the GoC, was approved in May 2013. The revised IP included an additional project to promote a larger presence in the energy market for non-conventional renewable energy (NCRE) sources (distributed generation), which was to be implemented by the IDB, and reallocated US\$ 10 million from the original energy efficiency program
20. This note presents the second revision of the CTF Investment Plan of Colombia. Specifically, this note provides an update of the status of project implementation under the IP revised in May 2013, and proposes the inclusion of a new component focused on large scale renewable energy and industrial energy efficiency and the reallocation of funds from urban transport to the new component. This note includes also an assessment of the impact of the proposed changes on the objectives and targets originally proposed in the IP. The selected CTF co-financing activities under the current IP included the following:
 - Component 1 – Sustainable Urban Transport (IBRD, IDB): The first IDB project approved by TFC in August 2011 included support to Strategic Public Transport Systems (SETPs) in seven of Colombia’s medium-sized cities. Execution began in 2015 in the city of Armenia, and is expected to continue through 2017 in Popayán, Pasto, and Santa Marta. The Bogotá’s Integrated Public Transport System (SITP) (US\$ 40 million) project led also by the IDB was approved by TFC in July 2013. In this case, Bancóldex launched a credit line in 2014 with the resources allocated to the activity, and has disbursed so far USD 18 million, equivalent to 45% of the total amount allocated to the project, supporting the financing of 180 hybrid buses. The remaining US\$ 41 million CTF fund, originally allocated for the IBRD SITP project to benefit one or two of Colombia’s largest cities, is proposed by the GoC in this revised IP to support Large Scale Renewable Energy and Industrial Energy Efficiency Project being led by Financiera de Desarrollo Nacional (FDN).
 - Component 2 – Energy Efficiency (IDB, IFC): The US\$ 17.5 million IDB/IFC Colombia’s Sustainable energy Finance Program (C-SEF) was approved by the TFC in December 2010. In November 2012, a US\$ 262,500 Preparation Grant for Bancóldex Energy Efficiency Financing Program was approved by the TFC. In June 2013, the US\$ 10.7875 million CTF-IDB Energy Efficiency Financing Program for the Services Sector (the Bancóldex Energy Efficiency Financing Program) was approved. The TFC approved US\$ 4.31 million for Innovative Instruments to Foster Energy Efficiency in SMEs in Colombia in January 2015 and US\$ 10 million for Efficient Energy Demand Management in Non-Interconnected Zones - San Andres, Providencia and Santa Catalina Archipelago Pilot Program in December 2015. Finally, by endorsing the revised IP in May 2013, TFC reallocated US\$ 11 million of this Program as follows: (i) US\$ 1 million to

the Sustainable Urban Transport Program, and (ii) US\$ 10 million to the new component focused on Non-conventional Renewable Energy (most notably on distributed generation) to be developed by IDB.

- Component 3 – Non-Conventional Renewable Energy (IDB): US\$ 10 million was recently approved by TFC in June 2016 for this Program that was newly included in the first revised IP. This Program is aimed to promote a larger presence in the energy market for NCRE sources, to a large extent in distributed generation schemes. CTF funds, blended with other sources, will contribute to investments that will help catalyze the adoption of various NCRE technologies at scale. CTF financial resources will be mostly used as first-loss guarantees, deployed to provide risk mitigation associated with the technologies and the energy off-takers in the context of the new, untested regulatory environment.

STATUS OF INVESTMENT PLAN IMPLEMENTATION

21. Since the first revision of the CTF Investment Plan of Colombia in May 2013, the Trust Fund Committee has committed US\$109 million out of US\$150 million originally endorsed for Colombia. The remaining US\$ 41 million were allocated to a sustainable transport project to be led by the World Bank. 70% of the committed CTF funding, or US\$88.5 million, has obtained subsequent MDB Board approval and is under implementation.
22. Table 4 shows the status of project approval and financing allocation of the revised CTF IP endorsed in May 2013.

Table 4: Status of Project Approvals

CTF Component / Program or Project Title	MDB	TFC Approval Date	MDB Board Approval Date	CTF Funding (US\$ mn)
Program 1. Sustainable Urban Transport				101
1.1 Bogotá's SITP	IDB	Q3-2013	Q4-2013	40
1.2 SITP in other largest cities	WB	n/a	n/a	41
1.3 SETPs	IDB	Q3-2011	Q3-2011	20
Program 2. Energy Efficiency				39
2.1 EE in the San Andres Archipelago	IDB	Q4-2015	Q3-2016	10.58
2.2 EE for the Services Sector	IDB	Q2-2013	Q3-2013	11.05
2.3 Innovative Instruments for SMEs	IDB	Q1-2015	Q4-2016*	4.52
2.4 C-SEF: IDB Loans - Innovative Instruments for SMEs	IDB	Q4-2010	Q4-2016*	5.095
2.4 C-SEF: IDB TA and fees	IDB	Q4-2010	Q1-2013	1.015
2.4 C-SEF: IFC Loan	IFC	Q4-2010	Q2-2011	5.4
2.4 C-SEF: IFC TA and fees	IFC	Q4-2010	Q1-2011	1.34
Program 3. Non-Conventional Renewable Energy				10
3.1 Renewable Energy Program	IDB	Q2-2016	TBD	10
Total				150

* Planned

❖ Sustainable Urban Transport (IDB, World Bank)

23. **Description:** The CTF IP proposed to support Colombia in transitioning to the next generation of urban transport investments, by scaling up its hitherto successful efforts in promoting investments in BRTs and preventing a reversal in the strong gains in modal share of public transport. The GoC proposed to use CTF financing for i) accelerating low-carbon-related investments in Bogotá's SITP, ii) incentivizing the implementation of SITPs in Colombia's other large cities, and iii) accelerating low-carbon-related investments in SETPs for at least seven (of the twelve) medium-sized cities.
24. **Rationale:** CTF resources can help to overcome cost and institutional barriers to the realization of modal shift towards sustainable, low-carbon urban transport systems. These barriers include i) lack of sufficient public funds given their multiple demands, ii) institutional barriers in regulatory authorities, and iii) high upfront capital cost needed for the adoption of low-carbon technologies such as hybrid or compressed natural gas (CNG) drives. Blending CTF resources with IDB and WB loans and other financing sources would facilitate integration of low-carbon technologies within the SITP and SETPs.

25. **Progress IDB:** The “Financing Program for the Technological Transformation of the Integrated Public Transport System (SITP)-CTF/IDB” was approved by the CTF TFC in July 2013, and by the IDB in October 2013. The activity is financing the purchase of a pilot fleet of clean technology buses for Bogotá’s Integrated Public Transport System (SITP). Bancóldex, a national development bank, provides financing to local financial institutions, which in turn directly finance SITP concessionaire firms through credit lines. CTF resources finance 50% of the buses, and the remaining 50% is financed by the local financial institutions. The loan agreement between the IDB and Bancóldex was signed in December 2014. (95% of the funds were disbursed in December 2014 to Bancóldex under the modality of advance of funds). With these resources, Bancóldex launched the credit line in 2014, and up to date 287 clean technology buses have been incorporated into the SITP fleet, including 180 buses directly financed with US\$18 million of CTF resources (equivalent to 45% of the disbursed amount).
26. The US\$ 20 million “Strategic Public Transport Systems (SETP)” project was approved by the CTF TFC in August 2011 and by the IDB Board in September 2011. The loan contract was signed in June 2013. No disbursements took place during 2013 and 2014 due to delays in budget allocation from the national government to the cities. Execution began in 2015 in the city of Armenia. The delays in the execution of this project are due to limits in budget allocation from the national government to the cities (which requires developing a policy document for the use of the resources), and to difficulties at the city level, including access to land, resettlements, lack of Engineering blueprints, challenges involved by modifications to utility infrastructure, and changes in the local administrations. The four cities are currently undertaking a technical, legal and financial restructuring of transport systems, with a view to redefine the infrastructure needs and the use of CTF resources (considering the components that are eligible for these resources—mainly infrastructure for non-motorized transport). An extension to the loan contract will be requested in due time.
27. **Progress World Bank:** The GoC has decided to cancel the project to support SITPs in other large cities of Colombia and requested the reallocation of the CTF funding to a new clean energy initiative (to be described later).

❖ Energy Efficiency (IDB, IFC)

28. **Description:** Colombia possesses significant opportunities for scaling up the implementation of energy efficiency for both electricity and thermal end-uses across all sectors of the economy. This can include the introduction of efficient technologies and processes, end-use renewable energy technologies (in particular solar water heating), and cogeneration systems. The proposed IP focuses its efforts on the three main energy consuming sectors, namely industrial, commercial and residential. The CTF Energy Efficiency Component 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 the barriers that stand in the way of scaling-up energy efficiency investments throughout the economy.
29. **Rationale:** CTF financing was necessary to address capacity, cost and risk barriers among financial institutions, increase end user demand, and build local technical expertise among key stakeholders in order to scale up energy-efficient investments in a systematic and sustainable way in Colombia. The CTF program was set to coordinate existing small, balkanized policies programs and actors in energy efficiency, as well as unlock latent financial resources which are currently constrained by risk perceptions. Because the benefits of efficiency technologies had not been demonstrated in this

market sufficiently, and because the required technical capacity did not exist in the market, scaled investment in an efficiency market under current conditions was not taking place. Launching such a coordinated effort required significant financial resources and know-how, which were not being mobilized in the market.

30. **Progress IDB:** The “Innovative Instruments to Foster Energy Efficiency in SMEs” Program has been jointly executed by the IDB’s Multilateral Investment Fund (MIF) (with resources approved by the CTF Trust Fund Committee in January 2015) and by the Inter-American Investment Corporation (IIC) (with resources originally approved in December 2010 and merged with the MIF component in January 2015). The project team signed in the first half of 2016 Letters of Mandate with 3 local energy service companies (and has an expression of interest from a 4th ESCO), for the provision of pipeline and project equity for the projects to be financed by the Program. Given a requirement that emerged from preliminary consultations with the project risk officers, the Inter-American Investment Corporation (IIC) retained a consultant to perform financial and legal due diligence prior to credit committee. The IIC team expects to present the project to the credit and risk committee in December 2016, after which the project lending component will be automatically approved (it already has delegated authority, including both IIC and CTF financing). The MIF approval is expected to take place one month afterwards.
31. The “Energy Efficiency Financing Program for the Services Sector” Program was approved by the CTF Trust Fund Committee in June 2013, and by the IDB Board in September 2013. The Program, which was successfully launched on June 1st 2016, provides a comprehensive financing strategy to promote investments in energy efficiency in hotels, hospitals and private clinics.² The activity is expected to support about 124 firms (90 hotels and 34 clinics/hospitals) in investing for energy efficiency projects. The energy savings insurance (ESI) approach promoted by this Program combines a medium and long term financing line with adequate conditions for energy efficiency projects (supply of financing) with a series of non-financial and risk sharing instruments supporting the identification and structuring of a pipeline of technically-robust, bankable, energy efficiency projects (demand of financing), including a performance contract for energy efficiency projects, adequate protocols for the monitoring, reporting and verification of energy savings, and an energy savings insurance/surety product. The ESI approach was recognized by the Global Climate Finance Innovation Lab³ as one of the most promising and innovative financing instruments to scale up investments from small and medium-sized enterprises (SMEs) in energy efficiency. It is now being replicated in a number of countries in the Latin American region⁴.
32. The “Efficient Energy Demand Management in Non-Interconnected Zones-San Andrés, Providencia and Santa Catalina Archipelago Pilot Program”, was approved by the CTF Trust Fund Committee in December 2015, and by the IDB Board in September 2016. The delay in IDB approval was mainly due to the need to get the endorsement from Colombia’s National Economic and Social Policy Council (CONPES). This endorsement was granted in April.⁵ The Energy Ministry and the IDB are currently working on the preparation of the operational regulations for the program, which constitute a special contractual condition prior to the first disbursement. The operational

² Public information about the Program is available at: bit.ly/Bancoldex14.

³ See bit.ly/TheLabEsi.

⁴ With support from IDB and funds from CTF and the government of Denmark the same approach is being developed with national development banks in Brazil, El Salvador, Mexico and Peru, see: <http://bit.ly/IDB-ESI>.

⁵ CONPES 3855

regulations will define the mechanism for participation in the Program, the criteria for prioritizing the beneficiaries, the formulae that will be used to assess energy savings, and the technical specifications for the eligible appliances.

33. **Progress IFC:** In December 2010, IFC approved its advisory services component of the Colombian Sustainable Energy Finance (C-SEF) program (USD 1.07 million). This advisory project was designed to support the development of SEF programs with financial institutions in Colombia, thereby contributing to the overall development of the sustainable energy market in the country. The project is progressing successfully and has already met number of objectives, engaging with several financial institutions, recommending changes to regulations and practices, and conducting various well-attended training events and workshops.
34. In September 2011, IFC implemented a first investment project under the C-SEF Program. The first of its kind project consists of a risk sharing facility to cover up to COP 200,000 million (USD 100 million) portfolio of sustainable assets originated by Bancolombia. IFC's project is currently under execution and has already contributed to increasing the financing available to SEF projects in Colombia through facilitating Bancolombia to develop its SEF lending business. USD 5.4 million of CTF resources leveraged USD 25 million from IFC and another USD 25 million from the IDB, along with resources from Bancolombia. Under this facility, IFC and the IDB cover the risk of 50% of that portfolio (25% each). Later, the 2013 revision of the Colombia IP reallocated the remaining unused funds under the IFC component to two IDB's Non-conventional Renewable Energy Program and WB's Sustainable Urban Transport program.

❖ **Non-Conventional Renewable Energy (IDB)**

35. **Description:** This component is aimed at supporting the government's recently announced regulatory efforts to increase the penetration of NCRE, mainly by providing risk mitigation support for private companies developing NCRE projects. CTF funds will finance about 28 MW of NCRE generation through multiple projects, leveraging over US\$50 million of investment. This new installation will improve awareness by the market on the specificities of a renewable energy project, provide information for further additional investments and allow the adoption of a number of measures and initiatives to accelerate the rate of technology change in the sector. Furthermore, the Program will support the introduction to Colombia of third party solar development models, such as those successfully developed in the US, Europe and more incipiently in some other Latin American countries.
36. **Rationale:** CTF funds blended with other sources, will contribute to investments that will pioneer and catalyze a larger adoption of a particular NCRE technology. The component will also help to overcome the information barriers that prevent a larger presence in the market of NCRE and will allow the country to maintain a balanced energy mix with a low-level of GHG emissions.
37. **Progress IDB:** "Renewable Energy Program in Colombia (PERC)" was approved by the CTF Trust Fund Committee recently in June 2016. CTF financial resources will be mostly used as first-loss guarantees, deployed to provide risk mitigation associated with the technologies and the energy off-takers in the context of the new, untested regulatory environment.

CIRCUMSTANCES AND RATIONALE FOR THE REVISION OF THE INVESTMENT PLAN

Growing Energy Demand

38. Colombia has exhibited a solid economic performance over the past years. Its gross domestic product (GDP) based on constant local currency has been growing at 4.2 percent per annum on average since 2000.⁶ The IMF forecasts Colombia's medium term growth to reach 4.3 percent by 2020, recovering from a weakening in global conditions and a decline in oil price.⁷ On a par with economic growth, annual electricity demand is projected to grow at an average of 2.8 percent over the period of 2015-2029, according to the expansion plan prepared by the Energy Planning Unit (UPME) of the Ministry of Mines and Energy (MINMINAS).

High Dependence on Variable Hydropower and Increase in Fossil Fuel Generation

39. A fundamental characteristic of the Colombian electricity market is its hydro dominance and thus high vulnerability to weather variability, in particular caused by El Niño Southern Oscillation, or ENSO events. About 70 percent of the installed capacity is hydro-based and roughly 68% of Colombia's electricity is produced from hydro resources. (As a result, emissions have been relatively low, with an emissions intensity of 0.136 kg per PPP \$ of GDP in 2011.) Growth of hydropower capacity is also limited due to the high social and environmental risks associated with the construction of new large dams. In order to ensure the availability of firm energy, the regulator introduced a capacity payment mechanism – whose design and procurement has gone through a series of adjustments – to create incentives for the availability “firm energy services” during times of hydro scarcity. The original capacity payment evolved into an auction for “firm energy” (*cargo de confiabilidad* or reliability payment).
40. Over the last year, the country endured a prolonged and intense drought, which has lowered hydro reservoir levels threatening the stability of the market and increasing the risk of potential rationing. The length of the episode has indeed tested the effectiveness of the regulatory framework (specifically the reliability payment) and the ability of reserve generators to deliver “firm capacity” under dire conditions. In March 2016, the aggregated hydro reservoir capacity lowered to a record 30 percent. To aggravate matters, an accident involving one of existing reserve generators reduced capacity and further strained the depletion of hydro reservoirs. As a result, the electricity system has been placed in tremendous distress. In the last six months, the spot price exhibited spikes of US\$ 370/MWh (November 2015) and US\$ 270/MWh (March 2016), while the scarcity price remained at US\$100/MWh. The costs to reduce the risk of shortfalls during periods of low hydrology via reliability payments made between September 2015 and March 2016, has been estimated in about US\$5 billion.
41. The recent crisis has only assured that the system is especially vulnerable to extreme hydrologic conditions and particularly to El Niño, which may be linked and exacerbated by climate change. The power system lacks resource diversity and thus flexibility to cope with seasonal and weather

⁶ World Development Indicators, World Bank

⁷ Colombia: Concluding Statement of the 2016 Article IV Mission, IMF

shocks. Colombia needs to strengthen the regulatory framework to ensure security of supply through increased diversification of the energy mix and demand side management.

42. The most recent national expansion plan for the electricity sector in Colombia shows an increase in the share of fossil fuel under a business-as-usual (BAU) scenario, most notably to maintain minimum levels of reliability and hedge against the variability of hydro based generation. Growth of hydropower capacity is also limited due to the high social and environmental risks associated with the construction of new large dams and/or plants. As the contribution of hydropower to the system continues to lower, the use of fossil fuels to cover for this deficit is expected to increase, impacting the level of GHG emissions in the long term. In fact, in its BAU or conventional mix scenario, the generation expansion plan prepared by the UPME projects that the share of hydropower in total installed capacity will lower to around 60 percent with the increasing share of coal and gas by 2029.

National Plans Supporting Renewable Energy Development

43. The National Development Plan (PND) 2014-2018 acknowledges that the increase in residential and industrial energy demand can produce a deficit in the supply-demand balance during adverse hydrologic conditions, and that in this case the supply will increase in thermal based power generation. At the same time, the PND also recognizes the need to introduce new generation plants with lower operating costs and less intensive use of liquid fuels, in order to reduce prices in the spot and forward markets. For this reason, the Government of Colombia has been interested in maximizing the use of its natural resources, while at the same time complying with the highest environmental and social standards, in order to prevent an ever increasing need for thermal power generation, especially during adverse weather conditions. The Government has enacted a law to promote renewable energy (Law 1715, revised in May 2014) and committed to the target of adding 1,220 MW between 2013 and 2018 in the PND 2014-2018. In addition, the new legal framework includes fiscal and financial incentives for large scale grid connected renewables as well as a price incentive for distributed generation.
44. The National Energy Plan 2015 (PEN 2015) further details the strategic directions for the intended development of the energy industry and its subsectors. The specific objectives of the energy sector in the PEN 2015 include reliable supply, diversification of the energy basket and efficient energy demand, among others. The development of renewable energy would contribute to both diversification of the generation mix and GHG emission reduction.
45. In the Nationally Determined Contribution (NDC) ratified in April 2016, Colombia committed to reduce 20 percent of its carbon emissions level by 2030 when compared to a projected BAU scenario. The sectors targeted for mitigation purposes are energy, transport, agriculture, land use/land use change and forestry (LULUCF), and industry. Colombia has laid out specific mitigation actions in its Strategy for Low-Carbon Development (Estrategia Colombiana de Desarrollo de Bajo Carbono, ECDBC), which includes actions to promote energy efficiency and renewable energy. On the adaptation front, the NDC also committed to implement measures in sectors with high exposure and degree of vulnerability to climate change, including energy.
46. In UPME's expansion plan for the period 2015-2029, the alternative scenario with renewable energy development demonstrates that the generation capacity of wind and solar would mainly replace

the planned expansion of coal and gas in the conventional BAU scenario. Despite the overall low emission level of the power sector, the scenario analysis of the expansion plan confirms that the contribution of renewable energy development to GHG emission reduction will be much higher in the medium to long terms by directly displacing new coal and gas generation capacity.

Government Commitment to Energy Efficiency

47. The Government of Colombia has also built a strong institutional policy framework to promote energy efficiency across sectors and it has gradually implemented a number of strategic actions. Colombia enacted Law 697 “Promotion of Rational and Efficient Use of Energy” in 2001, and since then it has issued a number of key regulatory decrees, most notably: i) a resolution for the creation of the Inter-sectoral Commission for the Rational and Efficient Use of Energy and Non-Conventional Energy Sources (CIURE) that reports to the Ministry of Energy and Mines, and ii) resolutions to introduce the Program for the Rational and Efficient Use of Energy and Non-Conventional Energy Sources (PROURE) and Indicative Action Plans (PAIs, 2010-2015 and later on 2016-2021), which include specific targets by consumer segment.
48. The PAI-PROURE establishes five strategic sub-programs of cross-sectorial nature: i) institutional and financial markets strengthening, ii) capacity building, innovation and technology development, iii) promotion and monitoring of NCRE, and iv) four priority sector programs (transport, industry, residential and tertiary sectors). The national target for electric energy consumption (kWh) was set at 14.8% cumulated savings by 2015, with a 2010 baseline. The PAI includes an analysis of the potential electric and other energy savings and actual targets by sector and by year (residential, industrial, commercial, and transportation sectors). The GoC has also introduced financing mechanisms to support energy efficiency (for example, through a Bancóldex credit line supported with CTF resources via the IDB, and the Bancolombia’s environmental sustainability line).
49. Energy efficiency in the industrial sector (including improvements in industrial processes that make intensive use of both electricity and hydrocarbons) offers a huge potential to reduce energy consumption, defer investments in the expansion of generation & transmission capacity, and reduce GHG emissions. The industrial sector represents about 28.89% of the total energy consumption and 31% of the consumption of electricity in Colombia. The potential for energy savings was evaluated for various industries, such as food, beverages, tobacco, textile, leather, clothing, wood, paper and printing. Preliminary results indicate an energy savings potential of between 8 and 15% due to the adoption of best operational practices and an average of 25% if more modern, energy efficient technologies are introduced. UPME has recently carried out detailed energy audits in sixteen industrial companies located in the Caribbean coastal areas of Colombia. Improving energy efficiency in those areas has the additional benefit of contributing to improve reliability in the supply of electricity given the poor performance of the utility servicing the region. UPME expects that the experience in promoting energy efficiency in large industries can be replicated and be scaled up at the national level.

Investment Pipeline Ready for Investment

50. Colombia’s policy in clean energy provides an opportunity to attract investment in both renewable energy and energy efficiency, both of which would contribute to climate change mitigation but also to resilience and adaptation to extreme and increasing climate variability. Successful deployment

of clean energy resources and their integration into the grid will displace thermal generation on the margin in the short term and will reduce the need for new coal based generation over time. If implemented properly, the project will contribute to the provision of sustainable, reliable and high quality electricity services to the consumers. Attracting private resources to generation will also free up scarce public resources for other urgent needs, such as enabling energy access to hard-to-reach customers (those in rural and peri-urban areas).

51. The most immediate measure to attract non-conventional renewables in Colombia is to foster the development of the 3 GW wind potential in the La Guajira region, which presents the best wind patterns in the country and one of the best in Latin America, second only to the Patagonia region. There are already at least 1.5 GW of projects identified by private developers in La Guajira, but the estimated potential exceeds 3 GW.
52. However, there are regulatory and technical challenges to be addressed - such as integration of non-conventional renewable energy into the overall system (in both technical and commercial aspects), potential off takers, the terms of the PPA, and policy and pricing mechanism (via auctions, feed-in-tariffs, or clean energy certificates). All those need to be addressed before NCRE reaches critical mass. Colombia has been discussing for quite some time how to accommodate the contracting of new renewable energy projects into the existing auction mechanism for reliability payments, but other regulatory and commercial alternatives need to be considered and studied in detail. There is a concern that the product defined in the existing auction is not suitable to remunerated variable renewable energy (VRE), including both wind and solar. The reliability payment, purely based on energy delivered during times of scarcity, would not capture the value and benefits that VRE brings to the system (for example, to hedge against extreme climatic variability). Other countries in the LCR region have found market-based solutions, involving the auctioning of long-term PPAs and special commercial arrangements to mitigate market risk to private developers. Colombia would benefit from those experiences, in particular from the business models, from the design of the PPAs and of the corresponding auction system, and in general from the strengthening of its long term contract market and future price curves.
53. The Government of Colombia is in the process of developing the “Caribbean Sustainable Energy” strategy, which will include a component to enhance energy efficiency in the industrial sector. This strategy will promote energy efficiency measures in the industrial sector located in the Northern region (Caribbean Coast). These measures will likely promote the upgrade or replacement of old inefficient equipment, including i) a shift towards the use of steam and waste heat and cogeneration, ii) replacement of inefficient motors and upgrading of furnaces and boilers, and iii) adopting good operational practices. Initially, the strategy will address sixteen large industrial companies located in the industrial zone of North Region (Caribbean Coast), with the largest potential for energy savings in the area. The idea is that the program will expand to other industries in the region.

Rationale for the Proposed Revised IP

54. Investments in the range of US\$ 2.6-3.5 billion will be needed to scale-up non-conventional renewable energy in the period 2015-2029, as per Colombia’s UPME electricity generation and transmission expansion plan. Improving energy efficiency in the industrial sector and other sectors calls for investment at scale, given that the investment needs for the proposed sixteen large

industrial companies in the industrial zone of North Region (Caribbean Coast) are estimated at about US\$ 55 million. It is expected that a significant proportion of this financing with adequate credit enhancement will come from the commercial banks and private sector. The intervention proposed in this revised CTF IP is aimed at creating an enabling environment for private investment in clean energy as well as providing adequate credit enhancement and risk mitigation products to mobilize the required level of investments.

55. The market for long term investment in industrial energy efficiency and renewable energy is still nascent in Colombia. There is limited track record in both long term financing and the provision of regular payments against energy savings. Private investors are required to overcome a number of barriers such as high development costs of non-proven technologies and practices in the local market as well as high first-mover costs. Furthermore, there have been traditionally a number of country risk factors related to proper legal and regulatory frameworks, which have limited project bankability in the energy efficiency sector. The development of this program has to consider a number of investment risks such as the lack of institutional coordination between various government agencies, of a clear policy and regulatory framework, and of an open, competitive and transparent procurement framework, along with long term financing and credit risks. Addressing investment risks through targeted intervention is essential to the establishment and scale-up of the program. The World Bank's intervention, which will be fully coordinated with MINMINAS, UPME, DNP and FDN, includes a combination of technical assistance, capacity building, and provision of adequate risk mitigation guarantee products. The project is also part of the overall energy sector engagement of the World Bank in Colombia.
56. Considering the early stage of development of this program, the most appropriate forms of providing risk mitigation support to de-risk projects and attract competitive financing to the projects remain to be identified and designed. FDN has been tasked with coordinating this program on behalf of the Government of Colombia. FDN is also an infrastructure development bank that provides different forms of structuring and financial support to underlying projects. From the experience of infrastructure finance, Colombia has a reasonable private financing market from both commercial banks and capital markets. However, credit enhancements are required to improve bankability and affordability of infrastructure projects. FDN has been providing various types of financing instruments to the fourth generation (4G) toll road program, so the institution has built enough capacity and experience to support the proposed program in clean energy. In the proposed program arrangements, FDN is expected to be the guarantor for the investment market by providing partial coverage to ongoing PPA payment protection to IPPs, cover lender's debt service default or other contingent finance support. The combination of CTF and IBRD resources is expected to be designed to provide guarantees (technically, a CTF and IBRD funded contingent finance facility) to backstop FDN's guarantee obligations to underlying projects.
57. The renewable energy subprogram would require an estimate of USD\$ 1,452 Million, to comply with the UPME projections. The use of CTF and IBRD guarantees in clean energy interventions in Colombia is expected to leverage additional resources ranging from about US\$ 400 – 780 million from other financing sources, including MDB/DFI and private sector (under an IPP-like modality or as other private lenders). Furthermore, the use of guarantees with CTF finance will help: (i) provide risk-reducing instruments or innovative financial products to improve access to commercial financing and attract competitive pricing, (ii) guarantee investment recovery associated with renewable electricity, and (iii) enhance the project risk profile to attract high quality private investors. The projects supported by the CTF would also help develop the much needed local

operational, technical and financial capacity needed to integrate clean energy (in both supply and demand side), thereby contributing to making the technology solutions viable and operational in Colombia.

58. In the long run, the newly proposed CTF supported project is expected to achieve transformational impacts on the development of renewable energy and energy efficiency in Colombia. The project will influence the planning, regulatory design, procurement, financing, operation and integration of clean energy in the electricity market; in other words, the business environment and financing of renewable energy and energy efficiency. It will lay down foundations to further unlock the huge potential of clean energy beyond the scope of the project. Ultimately, the project will bring a critical impact on the market, on both climate change mitigation and resilience, as well as on overall social and economic development at the National and Subnational levels.
59. The business and financial models as well integration methodologies and studies to be set forth as part of the wind energy program in La Guajira region will have a wider application to other non-conventional renewable sources and to other regions in Colombia. The idea is that the models can be replicated to PV utility scale, biomass co-generation, and other sources of energy – or even combinations thereof. Other countries in LAC also started a similar process focusing on one source of energy and technology-specific auctions, which were then applied (with minor modifications) to other non-conventional renewables. The ultimate goal is that different technologies may be combined into a single auction to foster competitiveness and enable the selection of the most advantageous sources of energy to meet the specific needs of the market. Colombia has already mapped the solar, wind and biomass resource potential in the country, and there are very promising areas to be explored. The work on scaling up wind should open the door for the development of other endogenous, non-conventional resources.

PROPOSED CHANGES TO THE INVESTMENT PLAN

60. The Government of Colombia is proposing a second revision of the Clean Technology Fund's Investment Plan. The modification proposed is to substitute the activity in sustainable transport previously led by the World Bank, by a new activity in clean energy that supports two initiatives: i) creation of a renewable energy market at a scale (focused on both wind in La Guajira area and utility-scale solar energy mainly in coastal areas), and ii) energy efficiency.
61. The proposed intervention intends to address barriers to scaling up investment in clean energy, initiate pathways for public-private sector processes, and deploy market-based mechanisms to mitigate risks to attract private sector investors, ensuring the sustainability of the sector and demonstrating financing solutions that can be replicated over time. It is expected that the activity will unlock the larger potential of renewable energy and energy efficiency in the country, contributing to GHG emission reductions through the displacement of future fossil fuel based generation, increased technology and fuel diversity in the generation mix, and enhanced resilience of the electricity system.

Table 5: Proposed Reallocation of CTF Resources (US\$ million)

CTF Program	MDB	CTF Funding (CTF IP Revision May 2013)	CTF Funding Reallocation	CTF Funding (CTF IP Revision February 2017)
Sustainable Urban Transport System	IDB	60.00	-	60.00
	WB	41.00	(-41.00)	-
Energy Efficiency	IDB	32.26	-	32.26
	IFC	6.74	-	6.74
Non-Conventional Renewable Energy	IDB	10.00	-	10.00
Large Scale Renewable Energy and Industrial Energy Efficiency	WB	-	(+41.00)	41.00
Total		150.00	-	150.00

62. As a result of this requested change, the Revised CTF IP of Colombia would be as follows:

Table 6: Colombia Revised CTF IP, February 2017 – Indicative Financing Plan (US\$ million)

Financing Source	Sustainable Urban Transport	Energy Efficiency	Non-Conventional RE	(New) Large Scale RE and Industrial EE	TOTAL
CTF executed by IDB	60	32.26	10	-	102.26
CTF executed by IFC	-	6.74	-	-	6.74
CTF executed by WB	-	-	-	41	41
CTF total	60	39	10	41	150
IDB	305.8	122.5	25.8	-	454.1
IFC	-	24.7	-	-	24.7
WB	-	-	-	41.0	41.0
Bilateral donors	-	1.3	12.9	-	14.2
FDN				100*	100

Private sector	45.8	81	12.9	398 – 784	537.7 – 923.7
TOTAL	411.6	268.5	61.6	580 – 966	1321.7 - 1707.7

*Assuming a contribution from FDN in the range of US\$68 to 140 million

63. **Technical Assistance.** It is estimated that out of the US\$ 41 million CTF contribution, about US\$1 million will be provided as project preparation grant (PPG) for technical assistance to the GoC under the coordination of FDN. This activity would contribute to develop the much needed local operational, technical, and financial capacity necessary for scaling up clean energy and energy efficiency, thereby contributing to making the technological solutions viable and operational in Colombia. The technical assistance on renewable energy will support the design of a feasible business and contractual model, as well as auction mechanisms to procure energy competitively. It will also include the identification of key risks and the implementation of key financial risk mitigation instruments using CTF, WB and possibly FDN resources to mitigate those risks. The technical assistance on the energy efficiency component will help identify technically and commercially feasible projects and their potential developers, and to implement financial instruments to mitigate credit and other key risks to be identified. FDN will play a key role in working with local partner banks who will then provide resources to multiple industrial companies. Technical assistance will also support those local institutions in the technical selection and risk assessment of projects in the industrial energy efficiency space.

POTENTIAL IMPACTS OF PROPOSED CHANGES ON INVESTMENT PLAN OBJECTIVES

64. The overall impact expected from this proposed Revised CTF IP, is comparable to the impact estimated in the CTF IP revised in May 2013. This new proposed revision only substitutes the SITP project (to be implemented by the World Bank, later on canceled by the GoC) for the Large Scale Renewable Energy and Industrial Energy efficiency project, also to be implemented by the World Bank. Table 7 below compares the two projects in terms of CTF investment criteria. The comparison of the results framework of the overall CTF IP is shown on Table 9.

Table 7: Assessment of Proposed Change ⁸

CTF Investment Criteria	CTF IP – SITP in 1 or 2 large cities of Colombia (Revision in April 2013)	CTF IP – Large Scale RE and Industrial EE (Revision in February 2017) (new project)
Transformative Impact	The transformative impact of the SITP project in one or two selected large cities will be achieved through combining policy reform and institutional capacity development packages, alongside CTF co-financing aimed at reducing the cost of measures for reducing GHG emissions within urban transport investment plans. Over the 20-year lifetime of the investments, the cumulative reductions of the SITP project in other cities were estimated at around 13.4 Mt CO _{2e} .	The transformative impact of the proposed Large Scale Renewable Energy and Industrial Energy Efficiency program will be achieved through activities that scale up the markets for grid connected renewables, starting with wind generation in La Guajira region and large industries in the industrial zone of North Region (Caribbean Coast), to build upon a solid foundation to expand the business, commercial, financial and technical model to scale up and utility-scale solar (located mainly in coastal areas), co-generation (mainly biomass) and energy efficiency in multiple areas in the country, enabling competition for long-term contracts across a variety of technologies.
Potential for GHG Emissions Savings	According to recent available data, by 2030 sustainable, the SITP project in other cities, along with the implementation of low technology vehicles, could result in about 0.67 Mt CO _{2e} per year of abatement.	Based on the expected deployment of coal based generation in the future generation expansion of the electricity system, low-carbon energy strategies in Colombia (industrial energy efficiency and renewable energy) could result in about 0.55 Mt CO _{2e} per year of abatement. In the 25-year lifetime of the Revised Program investments, the cumulative reductions of GHG emission have been estimated at about 13.65 Mt CO _{2e} (2.25 Mt CO _{2e} for energy efficiency and 11.4 Mt CO _{2e} for renewables).
Cost-effectiveness	Cost effectiveness of reductions was estimated at US\$45.30/ton for the entire financing, or about US\$4.32 of CTF resources/ton.	Cost effectiveness of reductions is estimated at US\$57.43/ton for the entire financing (US\$24.51/ton for energy efficiency and US\$

⁸ Assumes an FDN contribution of US\$ 100 million as guarantees. Exact figures and allocation are yet to be determined.

		63.93 for wind energy), resulting on an average of US\$2.93 of CTF resources/ton.
Demonstration Potential at Scale	The proposed changes will enforce the replication and scalability potential estimated for the original CTF Plan, considering that new SITP projects in one or two of the largest cities will increase replication and scalability potential adding on Bogotá’s SITP as well as the programmed SETPs. Information on this experience has been asked for by other Latin-American countries and other countries as Egypt, Turkey, South Africa, Indonesia and Vietnam.	The proposed change will focus on a program with strong potential for replication and scalability. The 520 MW supported by this project will establish a track record and expected to trigger additional investments to develop more than 3 GW of feasible wind projects in La Guajira region as well as several hundred MW of solar PV projects in coastal areas as well as biomass co-generation. On the energy efficiency front, positive results achieved and business models adopted in selected high-energy intensive industries in coastal areas have also the potential for replication and scalability in a broad range of industries across the country.
Development Impact	Promoting more sustainable transport systems through the SITPs can provide substantial co-benefits in addition to climate change mitigation, including reductions in traffic congestion (from reduced travel time) and improvements in public health (from reduced air pollution, noise, accidents, and stress). The support for additional activities such as the scrapping of old buses prevents transferring these costs to the passengers, a critical aspect in a very elastic market, where any small change to the fares turns a number of passengers away from public transit. Low-income passengers are particularly vulnerable, since they risk turning to more polluting and dangerous modes of transport: motorcycles and old used private cars. Furthermore, additional benefits related with urban transformation and employment generation, as well as eco driving were identified through the analysis done for the new National Development Plan 2010 -2014.	Scaling up investment in the energy sector, particularly renewable energy and energy efficiency, will bring substantial development impacts and other co-benefits. The development of wind energy to replace the future expansion of coal plants will reduce local air pollution and GHG emissions and thus provide health benefits to the public. Improved energy efficiency in the industrial sector will also result in similar impacts on air pollution and public health. In addition, the reduction of cost through higher energy efficiency will directly provide economic benefits to businesses, and consumers. The development of the clean energy sector is expected to contribute to job creation (e.g.; manufacturing, supplying of new equipment, operation of new generation facilities, new opportunities in energy efficiency related businesses such as ESCOs or energy auditors, among other). Moreover, the diversification of electricity generation will lead to a more stable energy system in Colombia, addressing the vulnerability of the sector to extreme weather variability and strengthening its resilience against climate change.
Implementation Potential	In the larger cities, there is a strong and long track record of implementing SITPs among the national and local governments. Since 2005, the IBRD and the IDB have supported the implementation of SITPs by providing more than one billion dollars of investment loans. Technical and feasibility studies have been already done. The IDB is also supporting the development of an	For both renewable energy and energy efficiency in the industrial sector, an investment pipeline has been identified for implementation. In the La Guajira region where a strong potential of wind power development exists, there are already 1.5 GW of projects in preparation, with 3 GW identified. Transmission lines to evacuate that would connect the wind resources area

	<p>integrated land-use and transport planning strategy for the city, including the reformulation of the regulation that establishes the financial and management land-based instruments.</p>	<p>of La Guajira with load centers can be put for bid as soon as wind projects develop and justify the investment. Detailed energy audits in sixteen industrial companies located in the industrial zone of North Region (Caribbean Coast) have been conducted by UPME to assess the potential of energy savings. Upon the CTF approval by TFC, the proposed project can be rapidly taken forward to address the challenges in these sectors and leverage investment in renewable energy and industrial energy efficiency.</p>
CTF Additionality	<p>The SITP project in other cities was aimed at accelerating the adoption of sustainable, low-carbon investments in the sector in order to maximize modal shift towards public and non-motorized transport. The proposed investments were outside the scope of existing budgeted costs for the SITP programs. At the same time, costs associated with scrapping programs and with the introduction of low-carbon bus technologies in the systems could not be fully transferred to transit fares without adversely reducing the affordability of the transport system, particularly for the poor, making public transit far less attractive. Blending CTF resources with IBRD loans and other financing sources would make available investment capital in infrastructure, which may otherwise not be readily available for facilitating the integration of low-carbon technologies within the roll-out of the SITPs in selected large cities. Thus, CTF financing would be instrumental in fostering the introduction of low-carbon bus technologies, scrapping programs, and related measures for optimizing and promoting an integrated land-use and transport system.</p>	<p>The proposed Large Scale RE and Industrial EE program is aimed at eliminating some key regulatory, institutional and investment constraints for significant scale up of investment in renewable energy and energy efficiency in Colombia. In spite of the existence of competitive and clean non-conventional renewable resources, Colombia has not yet been able to include those resources in the energy matrix. Conversely, other countries in the region such as Brazil, Chile, Mexico, Panama, Peru and Uruguay have been able to scale up non-conventional renewables in a competitive way, using energy auctions. On the energy efficiency front, UPME has been promoting energy efficiency audits in energy intensive industrial companies in coastal areas. The success of those projects and some innovative business models developed by this project, have the potential to raise awareness and create appetite for more, both in other industries and across the entire country.</p> <p>Blending CTF resources with IBRD guarantees, and FDN loans or guarantees would provide a reasonable size risk mitigation amount to unlock the potential to scale up significant investments in this area, from developers, commercial banks and energy users, through specific technical assistance to implement new business model for renewables and energy efficiency, and by mitigating key risks that prohibit further investment.</p>

65. The overall risk of the proposed in the Revised CTF IP for Colombia is Moderate. In addition to the risks and mitigation measures identified in the previous CTF IPs, the following risks should be considered:

Table 8: Risks and Mitigation Measures

Risk	Risk Mitigation	Residual Risk
Policy and regulatory framework	<p>Currently it is not clear how renewable energy will be integrated into the system, who the buyers of electricity will be, the terms of the PPA, and how prices will be set (via auctions, capacity charge, or feed-in-tariffs). Colombia’s existing auction mechanisms for reliability payment does not capture the benefits to be brought by renewable energy to the system. Several analytical products and assessments are being prepared to address barriers on the policy and regulatory front, including World Bank’s Programmatic Approach for energy sector engagement as well as the PPIAF’s activity “Review of institutional, policy and regulatory framework to support private sector participation in clean energy”.</p> <p>Colombia has built considerable institutional experience in the design, management and launching of auctions to allocate energy and capacity. However, the country has never launched a specific auction in renewable energy. Indeed, Colombia would benefit from the experience with RE auctions to allocate long term PPAs, most notably the learning acquired in Brazil, Chile, Peru, and Mexico; as well as globally. This international experience will be transferred via specific assessments and workshops under the Bank’s and PPIAF technical assistance.</p> <p>Reflecting the experience of other countries in the region that have found market-based solutions, involving the auctioning of long-term PPAs and special commercial arrangements to mitigate market risk to developers will be particularly important. Together with other ongoing supports, the proposed intervention is designed, in coordination with MINMINAS, UPME, DNP and FDN, to provide a combination of technical assistance and capacity building to mitigate the risk to enable actual investments by private sector.</p>	Moderate
Transmission capacity	<p>The existing transmission capacity to evacuate electricity from La Guajira region could accommodate about 300-400 MW of new wind generation capacity, however, the scaling up of wind energy (considering the large existing resource potential) will depend on the construction of two transmission lines (500 kV each), which would connect La Guajira with high demand urban centers. The transmission lines have been technically and economically assessed and the bidding process is expected to initiate soon; however, the bidding could be delayed subject to the extent to which new wind projects become a reality.</p> <p>A mitigation factor for the project is the fact that solar generation and energy efficiency are also being targeted.</p>	Moderate
Implementation capacity	<p>FDN is appointed by the GoC as the financial intermediary to operate the financing mechanisms to be established under this project and to mobilize private capital to renewable energy and industrial energy efficiency projects. FDN is a national infrastructure bank with a proven track record of financial</p>	Moderate

	<p>operations in infrastructure, such as its successful Fourth Generation Toll Road Program. FDN has the capacity to conduct the full appraisal, due diligence and monitoring of projects subject to CTF support. All projects supported by the activity will be required to meet the World Bank environmental, social, governance and other compliance requirements as well as all Colombian legal and regulatory requirements. As this will be FDN's first program in the energy sector, the World Bank technical assistance is needed. The World Bank will work in close coordination with FDN to design targeted instruments to mitigate key investment risks for lenders and sponsors of clean energy projects, and to ensure the sufficient implementation capacity. FDN has also created a task force within the institution with experts in renewable energy, energy policy and social/environmental safeguards.</p>	
<p>Replicability of investment components</p>	<p>Considering the relative inexperience of project financing and scale of investments needed in renewable energy and energy efficiency, the proposed intervention is designed to develop and provide appropriate financial instruments to identify and mitigate investment risks and to enable private investments. The program will contribute to Colombia's learning experience in developing renewable energy and industrial energy efficiency and unlocking potential investments from the private sector. After the project is closed, FDN, the national development bank, is expected to continue to operate the established financing mechanism with other climate finance supports or own resources, to effectively apply lessons learned to further development and to scale up investments beyond the project scope in order to achieve GoC's target on renewable energy and energy efficiency in a long run.</p>	<p>Moderate</p>
<p>Overall</p>		<p>Moderate</p>

MONITORING AND EVALUATION

66. Table 9 below presents a summary of the expected Results Indicators and their target values of the IP, comparing the expected results in the CTF IP revised in 2013 and proposed revision. It should be noted that the expected results of the proposed revision have incorporated updated results indicators of each project at the time of CTF TFC or MDB approval, as all other projects under the IP were already approved by the CTF TFC or MDBs. The monitoring and evaluation will be carried out by the implementing agency as part of the monitoring process for the entire project, including co-financing and other contributions.

Table 9: Results Framework – Colombia CTF IP After Proposed Reallocation (February 2017)

Results	Indicator	Expected Results in CTF IP (Revision May 2013) ⁹	Expected Results in CTF IP (1) (Revision February 2017) ¹⁰
Avoided GHG emissions	Tons of GHG emissions reduced or avoided:		
	- MtCO ₂ eq/yr	1.8	0.76 – 0.94 (2)
	- MtCO ₂ eq over lifetime of the project	36.4	14.7 – 19.1 (2)
Increased finance for low carbon development	Volume of direct finance leveraged through CTF funding (US\$ Million)		
	- Public	580.5	634
	- Private	522.8	532 - 918
Cost effectiveness	Cost effectiveness of GHG reduction		
	- CTF cost effectiveness [\$/CTF/tCO ₂ eq avoided over lifetime]	4.1	7.8 – 10.1
	- Total project cost effectiveness [\$/Total Project /tCO ₂ eq avoided over lifetime]	34.4	88.7 – 89.5

⁹ The values for avoided GHG emissions in the 2013 column are taken directly from the IP revised in 2013.

¹⁰ The values for avoided GHG emissions in the 2017 column reflect the sum of GHG emission reductions of other projects under the IP that are estimated at the time of their submission for CTF approval, i.e. Sustainable Urban Transport (IDB), Non-Conventional Renewable Energy (IDB) and Energy Efficiency (IDB/IFC), as well as estimated GHG reductions from this revision, which replaces the Sustainable Urban Transport (WB) with the proposed Large Scale Renewable Energy & Industrial Energy Efficiency project (WB). The sum of GHG emission reductions of the projects that have been already approved by the CTF TFC is 0.39 MtCO₂eq per year or 5.5 MtCO₂eq over the lifetime of the projects. The proposed project is expected to result in additional GHG emission reduction of 0.37-0.55 MtCO₂eq per year or 9.2-13.7 MtCO₂eq over lifetime. Please note that the methodology of calculating GHG emissions from the transport sector has changed, reflecting a much greater degree of conservatism, which represents a large portion of the differences between the GHG emission reductions in the IP revised in 2013 and in the actual project approval.

Increased supply of renewable energy	Installed capacity as a result of CTF interventions (MW)	28	344 - 548
Increased energy efficiency	Annual savings as a result of CTF interventions (GWh)	224	1,042

(1) Assumes an average FDN contribution of US\$ 100 million, via loans, guarantees or combinations thereof. For more information see Annex 1.1.

(2) The calculation for carbon emissions reductions for the restructured component resulting from the diffusion of renewable energy is based on an emissions factor of 0.283. This is based on dispatch factors and information from expansion plans (simulated via SDDP dispatch optimization modelling run by UPME). See Annex 1.2.

ANNEXES

ANNEX I: Large Scale Renewable Energy and Industrial Energy Efficiency Program (World Bank)

Problem Statement

67. Colombia's electricity sector is hydro dominated and thus highly vulnerable to weather variability and extreme hydrologic conditions, which have been recently increased due to El Niño Southern Oscillation (ENSO) and other extreme weather events caused by climate change. On one hand, this will lead to the increasing use of fossil fuels to cover for the deficits of electricity supply from the unstable generation of hydropower. The additional generation capacity needed will be mainly provided by fossil fuel, specifically coal and gas, under the BAU scenario of the latest generation expansion plan prepared by the UPME, impacting the level of GHG emissions in the long term. On the other hand, the power system needs to be strengthened, by improving diversity and flexibility of energy supply, to cope with seasonal and weather shocks and to ensure security of electricity supply without placing the sector in tremendous distress.
68. To address these problems in the electricity sector, the development of renewable energy and energy efficiency is essential to diversify the electricity generation mix, to replace the potential expansion of coal and gas based generation over time, and to improve stability and resilience of the electricity sector against weather variability and climate change. The Government of Colombia has also committed, through various national plans and policy frameworks, to promoting renewable energy and energy efficiency.
69. The potential of renewable energy is significant in Colombia. International Renewable Energy Agency estimates that Colombia has a "high" resource potential to develop wind, solar, hydro and geothermal generation. Recent assessments, conducted by the UPME, suggests that Colombia has a wind resource with the potential to develop 30 GW of installed capacity, geothermal resources to develop 1-2 GW, as well as regions with very high solar irradiation such as the Guajira and Costa Atlántica. In addition, renewable resources in Colombia present a high degree of seasonal complementarity which enables the country to produce energy more reliably and at a lower cost.
70. Energy efficiency in the industrial sector also offers a huge potential to reduce/defer the expansion of generation capacity and reduce greenhouse gases due efficiency improvements of energy intensive industrial processes that make extensive use of both electricity and hydrocarbons. The industrial sector represents about 23.7% of the total energy consumption and 31% of the consumption of electricity in Colombia. The most energy intensive processes are in heat generation (34%), steam generation (24%), self & co-generation of steam (14%), and in electric motors (6%).¹¹
71. The Government of Colombia has carried a comprehensive program to identify and quantify the potential of energy efficiency in the industrial sector. This program, called *Gestión Integral de Energía en el Sector Industrial*, was carried out by Universidad Nacional and financed by

¹¹ Representing 41.9% in direct, 43.3% in indirect heat transfer systems, 12.4% in driving force and motive power, and 2.4% in other uses.

COLCIENCIAS, EPM, Grupo Endesa, and E2. The National University executed the project with support from 15 universities in several regions in Colombia. The potential for energy savings was evaluated for various industries, such as food, beverages, tobacco, textile, leather, clothing, wood, paper and printing. Preliminary results indicate an energy savings potential between 8-15% due to the adoption of best operational practices and an average of 25% if more modern, energy efficient technologies are to be used.

72. UPME has recently carried out more detailed energy audits in industrial companies located in the industrial zone of North Region (Caribbean Coast). Improving energy efficiency in those areas has the additional benefit of contributing to improve reliability in the supply of electricity. Due to the high economic growth in those areas, current reserve margins are very thin. Sixteen industrial companies have been selected to be financed under this project, including activities such as agrochemicals, cement, waste management, plastics, packaging, and chemicals, among others. The idea from the UPME is that the experience in promoting energy efficiency in those industries can be scaled up on a nation-wide basis. The success of the technical solutions, business models and results achieved has the potential to raise awareness and create appetite for more, both in other industries in the region and across the entire country.
73. The markets for industrial energy efficiency and renewable energy are still nascent in Colombia. There is limited track record in either lending long term to such projects or providing regular payments through long term PPA. Private investors are required to overcome a number of barriers such as high development costs of a non-proven technology in the local market as well as higher first-mover costs. Furthermore, there have traditionally been a number of country risk factors related to proper legal and regulatory frameworks, which have limited bankability of projects. The development of this program has to consider number of investment risks such as institutional coordination between various government agencies, clear policy and regulatory framework, open, competitive and transparent procurement framework along with long term financing, offtake and PPA payment risk. Addressing investment risks through targeted intervention is essential to establish and scale-up the program. The design of World Bank's intervention, in coordination with DoE, DNP and FDN, includes combination of technical assistance, capacity building and provision of risk mitigation guarantee products. The program is also part of overall energy sector engagement of the World Bank in Colombia.

Proposed Transformation

74. The Large Scale Renewable Energy and Industrial Energy Efficiency project, supported by CTF and World Bank financing, would support to unlock the potential of renewable energy and energy efficiency in the industrial sector in Colombia and to mobilize private sector investment at scale. The proposed intervention is aimed at creating an enabling environment as well as provide adequate credit enhancement and risk mitigation products to address existing barriers that impede investment at scale and to mobilize required level of investments in renewable energy and energy efficiency in the industrial sector.
75. The proposed project will help create enabling environment for private sector participation in renewable energy and industrial energy efficiency by providing technical assistance to i) support the review and design of appropriate regulatory/procurement mechanisms to attract investment in renewable energy development, ii) support the development and procurement of transmission infrastructure, and iii) support energy efficiency in the industrial sector. Furthermore, the CTF

funding, blended with the IBRD resources, will establish a Risk Mitigation Facility to support the development of renewable energy and energy efficiency in the industrial sector.

76. The support for renewable energy development will mainly focus on pipeline projects that are currently under development in the industrial zone of North Region (Caribbean Coast). There are already 1.5 GW of wind projects in preparation, with 3 GW of wind potential. On energy efficiency, four large industrial companies in the industrial zone of North Region (Caribbean Coast), representing the largest potential for energy saving, will be the initial target, with potential expansion to 16 industrial companies in the region, supporting the “Caribbean Sustainable Energy” strategy under development by the GoC. These measures will likely promote the upgrade and/or replacement of old inefficient equipment, including: i) a movement towards the use of steam and waste heat and cogeneration, ii) replacement of inefficient motors and upgrading of furnaces and boilers, and iii) good operational practices.
77. A combination of World Bank and CTF guarantees would be complementary and suitable for a Risk Mitigation Facility that will have the broadest coverage of risks to enable investments in a relatively new renewable energy and energy efficiency program in Colombia. The Facility will have two windows – for Renewable Energy and Energy Efficiency projects. Considering the early stage of development of this program, CTF retains flexibility in identifying and designing the most appropriate form of provision of risk mitigation support to de-risk projects and attract competitive financing to the projects. As a Program Manager of the Facility, FDN is expected to be the guarantor for the investment market by providing partial coverage to ongoing PPA payment protection to IPPs, cover lender’s debt service default or other contingent finance support. The combination of CTF and IBRD will be designed to provide callable capital (technically, a CTF and IBRD funded contingent finance facility) to backstop FDN’s guarantee obligations to underlying projects as per the following structure shown in Figure 1.
78. By design, FDN exposure could be a first loss; and the CTF-IBRD guarantee could be second loss, and would only be drawn upon in the event that FDN’s cash is insufficient to pay for a guarantee call. The CTF-IBRD and FDN guarantee will be able to leverage more than 4 times the callable capital base. The default rate of FDN will be closely monitored and, if the defaults remain low, higher levels of leverage can be allowed. Figure 1 illustrates a tentative structure, which will be confirmed during project preparation in discussion with the GoC.

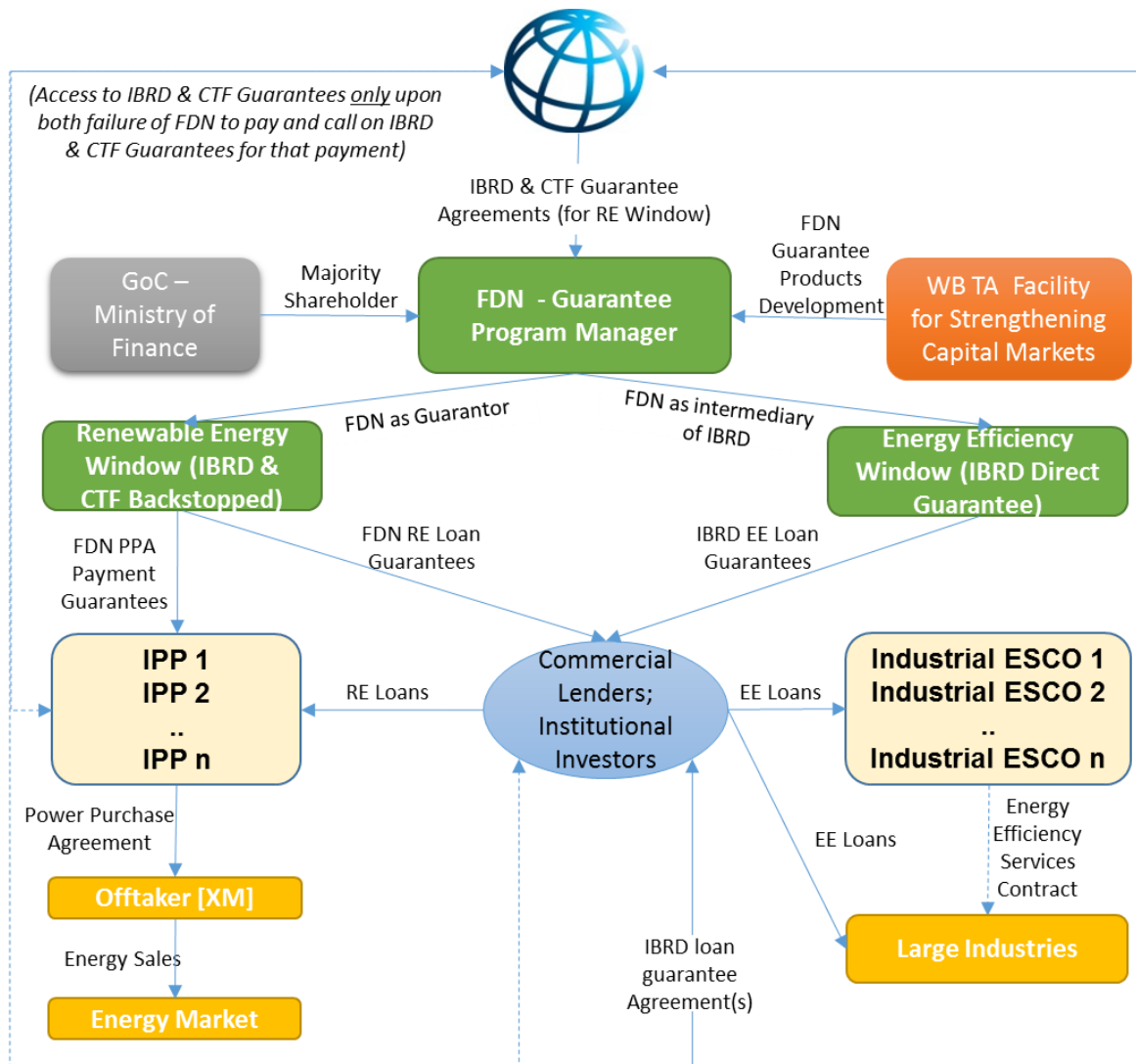
Implementation Readiness

79. In the La Guajira region, about 3 GW of wind projects were identified by private developers. Two transmission lines of 500 kV have already been put for bid to evacuate part of this generation capacity. The GoC is conducting an analysis to select and deploy the optimal policy instruments to make contracts with the newly developed facilities and to integrate them into the existing power system. In principle, there is a preference for competitive procurement for long term electricity contracts via reverse auctions. On energy efficiency, 16 large industrial companies in the industrial zone of North Region (Caribbean Coast) have already been assessed to figure out their energy saving potential. Upon the establishment of an appropriate financing mechanism to support investment, these projects can be quickly developed.
80. The GoC is highly committed to the development of renewable energy and energy efficiency, particularly while going through the latest prolonged and intense drought which has lowered hydro

reservoir levels threatening the stability of the market and increasing the risk of potential rationing. GoC is committed to implement the necessary regulatory and commercial changes to enable the adoption of large scale renewable projects, starting with La Guajira and leveraging the experience and know how to scale up other non-conventional renewables in other areas of the country where those resources are more abundant and competitive. The GoC is also committed to implement new policies and successful business models to scale up energy efficiency and demand side management, starting with large industries and expand to other segments in the future.

81. FDN has been tasked by the Ministry of Energy and Mines to be the focal point to implement all dimensions of this program on behalf of the GoC. FDN has extensive experience as an infrastructure bank to provide different forms of financial support to underlying projects. Upon the approval of the revised CTF IP by TFC, the proposed project can be rapidly taken forward to address the challenges in these sectors.

Figure 1: Indicative Structure of the Proposed CTF-IBRD Guarantee



*Note: Structure to be confirmed after discussions with the GoC

Rationale for CTF Financing

82. The financial intervention, through a combination of CTF and IBRD, proposed for the program meets the core principles of CTF. The CTF and IBRD support will be used to provide a second-loss guarantee to Renewable Energy and Energy Efficiency projects to improve credit profile of projects by mitigating risks related to investment returns from off-taker creditworthiness, untested policy and regulatory framework, institutional coordination risks and economic performance of technologies.
83. Studies¹² have identified the need to de-risk projects and to deploy risk-mitigation tools to attract private capital at scale to support climate friendly projects. Global experience demonstrates that while the costs of many clean technologies such as wind, solar PV has declined, the barriers remaining that impede their deployment remain largely related to the availability and affordability of financing and the business models to sustain them. The risk perceptions of clean energy projects have been one of the main barriers in scaling up such programs. In addition, policy, regulatory and counterparty credit risks have prevented mobilizing private capital in projects.
84. It is expected that the combination of CTF and WB guarantees should help mitigate some of the major perceived risks at the outset of the renewable and energy efficiency programs. The proposed operation consists of IBRD and CTF guarantees to FDN aimed at backstopping FDN's guarantee payment obligations to private investors and lenders of renewable energy IPPs and industrial energy efficiency projects. Furthermore, the use of risk mitigation guarantees using IBRD-CTF to backstop FDN's guarantee obligations will help: (i) provide risk-reducing instruments or innovative financial products to improve access to commercial financing and attract competitive pricing, (ii) guarantee investment recovery associated with renewable electricity for long-term institutional investors, and (iii) enhance the project risk profile to attract long term institutional investors.
85. On the renewable space, the program should help mitigate two major risks: (i) the first is related to the creditworthiness of the off taker (Power Purchase Agreement). One of possibilities still being discussed is that XM (or a ring-fenced account) will be the central buyer for all energy produced by renewable energy sources. This energy will be resold in the wholesale market, on a merchant basis. There are several benefits in centralizing the procurement and diversifying renewable variability across the entire market. Other countries in LAC have adopted this scheme and it has been working satisfactorily. However, investors may perceive that XM is not as creditworthy and institution as a distribution company, as its sources of revenues depend on effective functioning of the wholesale market and its settlement rules. Furthermore, there may be a financial mismatch between the payment by XM to generators and the funds collected via sales of energy in the spot market. Any mismatch needs to be recovered through retail rates via an uplift, which needs to be operationalized. All those are factors that increase the perception of risk among investors; (ii) the second is a more traditional loan guarantee to reduce the risk to lenders and bondholders who support the development of the renewable energy IPPs.
86. On the energy efficiency space, the program is still being discussed. One possibility is to mitigate two perceived risks: (i) the first is the typical credit risk faced by financial institutions who are assigned to provide financial resources to industrial customers to develop their energy efficiency projects. FDN will likely provide loans or guarantees to commercial banks who on-lend to those

¹² SE4ALL Finance committee Report (SE4ALL Report: http://www.se4all.org/wp-content/uploads/2014/12/SE4ALL-Advisory-Board-Finance-Committee-Report_04072015.pdf)

industrial companies. CTF and the WB can provide risk guarantees, on a portfolio basis, to FDN; (ii) the second perceived risk is typical to energy efficiency projects, particularly in the industrial sector, where credit-officers of financial institutions are less familiar with the technicalities of efficiency projects, expected savings, how those savings can be monetized and similar issues. The Technical Assistance component of the CTF project should help FDN and financial intermediaries to better assess the project in terms of technical performance and expected savings.

87. In the context of Colombia, the financial market is relatively deep and liquid in the region nevertheless concentrated within commercial few banks. There is also a potential to have an active capital market with the participation of long term institutional investors in the debt market space. However, lack of track record in clean energy projects in Colombia presents a significant financing market gap to finance this program. The gap will be covered through program design and provision CTF and IBRD guarantees to mitigate key risks and build a track record in risk-return profile. CTF guarantees can be an effective tool in mitigating risks and mobilizing private investments in clean energy projects. CTF guarantees can also help in achieving improved financing terms to improve affordability of projects that can be shared with end-consumers and beneficiaries.
88. The concessional terms provided by the CTF guarantees in the program is well placed and can be more effective by increasing the financial viability of the projects and thereby enable scaling up of clean energy investments, bring in international best practice standards such as standard PPAs to attract domestic and international investments, design targeted risk mitigation products to alleviate investor concerns to invest in a new program. The CTF guarantee can help achieve leveraging effect (above 1:8, taking into account the contributions from IBRD, FDN and private sector) in attracting competitive long term private capital from a large pool of investors and lenders.
89. This project is expected to achieve transformational impact in the renewable energy and energy efficiency sectors. The technical and financial support to be provided by this project has the potential to unveil the non-conventional renewable energy in Colombia, which has been lagging behind comparing to other countries in the region. While the project will also focus on the development of wind energy primarily in the La Guajira Region, which has a huge potential and presents the best wind patterns in the country, the regulatory, land permits, environmental licenses, financial and contractual mechanisms to be put in place will likely be applicable, with adjustments, to the development of other renewable technologies, including utility scale solar energy in other parts of the country.
90. The proposed change will also seek to support the scaling up of energy efficiency in industry. The transformational impact will be reflected in increasing energy efficiency of industries by replacing or upgrading equipment, switching to low-carbon and cleaner fuels, and encourage industrial energy efficiency measures. As far as energy efficiency is concerned, the efficiency improvements in 16 selected large-energy intensive industries in coastal areas will result in significant savings and GHG reduction, and should create appetite for more, among other financial institutions and large energy users in Colombia.
91. As mentioned above, the renewable energy capacity identified for immediate investment potential is around 3 GW of feasible wind projects in La Guajira region as well as several hundred MW of solar PV projects in coastal areas and biomass co-generation. However, the proposed project supports only the first 520 MW of the program, that still leaves significant unmet demand for credit

enhancement to support the full program. The following table illustrates the total credit enhancement requirement to support the development of 3 GW capacity.

Description	Amount (US \$)	Remarks
Indicative total investment required to support the program of 3 GW (identified capacity)	US\$ 4,200 million	(average US\$ 1.4 million per MW, approximately)
Expected leverage from CTF Guarantees	1:8	(total investment/size of CTF Guarantees)
Total size of Guarantees needed to support 3 GW program	US\$ 525 million	
Proposed Guarantee amounts under this project/IP	US\$ 70 million	Joint CTF and IBRD guarantee amounts, after reducing IBRD amount for Energy Efficiency projects
Additional Guarantee amounts potentially needed to support the remaining capacity	US\$ 455 million	

92. Both FDN and IBRD are exploring other sources for additional guarantee amounts to support the remaining program, however, it is expected that the proposed support under this project will help build a solid track record for the initial phase of the renewable energy program.

Results Framework (*)

Results	Indicator	Baseline	Target
Avoided GHG emissions	Tons of GHG emissions reduced or avoided over lifetime of the project (MtCO ₂ e)	-	9.18 -13.65
Increased finance for low carbon development	Volume of direct finance leveraged through CTF and IBRD guarantees (US\$ million)		
	- Public	-	181
	- Private	-	398 - 784
Cost effectiveness	Cost effectiveness of GHG reduction		
	- CTF cost effectiveness [\$CTF/tCO ₂ eq avoided over lifetime]	-	2.93 – 4.36
	- Total project cost effectiveness [\$Total Project /tCO ₂ eq avoided over lifetime]	-	54.26 – 57.43
Increased supply of renewable energy	Installed capacity as a result of CTF interventions (MW)	-	316 – 520
Increased energy efficiency	Annual savings as a result of CTF interventions (GWh)	-	818

(1) Assumes a total of US\$ 100 million. Range represents the impact of 100% loans versus 100% guarantees

(2) The calculation for carbon emissions reductions resulting from the diffusion of renewable energy is based on an emissions factor of 0.2833. This is based on dispatch factors and information from expansion plans (simulated via SDDP dispatch optimization modelling).

Financing Plan¹³

Financing	Amount (US\$ million) (*)	Comments
CTF	41	\$40 million of Guarantees & \$1 million of TA
World Bank	41	\$41 million of Guarantees
FDN ⁽¹⁾	100	Likely range between US\$ 68 - US\$ 140 million of guarantees
Private sector	398-784	Direct equity and debt investments
DFI and ECA tranches	138	Direct equity and debt investments
Total	580-966	

(1) Assumes a total FDN contribution of US\$ 100 million (to be confirmed), via loans, guarantees of combinations thereof.

Project Preparation Timetable

Milestone	Due Date
Quality Enhancement Review meeting	March 2017
CTF Trust Fund Committee approval	May 2017
World Bank Board approval	September 2017

¹³ The Financing Plan proposed here indicates the expected amount of private investment that could be mobilized using the level of proposed CTF-IBRD guarantees. However, the amount of total guarantees potentially needed to support the overall program of 3GW is significantly higher, about US\$ 450 million.

Request for CTF Project Preparation Grant (PPG)

A. TASK MANAGER FOR CTF FUNDING REQUEST

Name: Gabriela Elizondo Azuela		Position: Senior Energy Specialist
Organization/Unit: World Bank/Energy & Extractives Global Practice		
Address: 1850 I Street NW, Washington DC, 20433		
Telephone: x87761	Fax:	Email: gazuela@worldbank.org

B. PROPOSAL SUMMARY

1. Geographic Focus of Proposed Activity:

<input checked="" type="checkbox"/>	Individual Country (<i>please specify</i>): Colombia
<input type="checkbox"/>	Regional or Multi-Country (<i>please specify</i>):
<input type="checkbox"/>	Global

2. Project Title:

Colombia: Clean Energy Development Project
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3. List of Deliverables from CTF Project Preparation Grant: (*e.g., analysis, study/report, training, seminar, etc.*)

<ol style="list-style-type: none">1. Market/risk assessment and pipeline identification2. Technical support and inputs for the preparation of the Environmental and Social Management System / Framework3. Technical support to prefeasibility and or other technical studies to projects in the pipeline with high probability of success4. Financial advisory and structuring5. Strengthening of integration analysis and grid code6. Training, knowledge sharing, and dissemination

C. PROPOSAL DETAILS

4. Summary of Proposed Activities¹⁴:

¹⁴ CTF preparation funding may be used for:
(a) Analytic work to inform a country's policies and programs
(b) Design of policy reforms and preparation of legislation and regulations
(c) Consultation workshops
(d) Training
(e) Institutional development
(f) Feasibility Studies
(g) Environmental and social impact assessments
(h) Technical, managerial and financial project design

1. Market/risk assessment and pipeline identification

- Market sounding and identification and quantification of risks
- Pipeline creation: identification of projects and business opportunities in renewable energy and energy efficiency (data collection and structuring of potential pipeline)
- Design specific process to subscribe Energy Renewable and Energy Efficiency Projects and qualify them

2. Technical support and inputs for the preparation of the Environmental and Social Management System / Framework

- Review of national social and environmental policies/regulations
- Development of inputs for the ESMF or ESMS to be implemented by FDN
- Organization of Consultation processes to assess environment and social impacts

3. Technical support to prefeasibility and or other technical studies to projects in the pipeline with high probability of success

- Limited support to pre-feasibility and technical studies for renewable energy projects and energy efficiency
 - Review existing studies, support or strengthen technical assessments for project with high probability of success

4. Financial advisory and structuring

- Conduct market testing
- Design and develop appropriate credit enhancement and risk mitigation products to de-risk projects and attract long term investments
- Analyze implementation and customizing of the CTF guarantee in projects with feasibility studies funded by USAID
- FDN will work with a third party to provide the structuring advisory required for the financial closing.

5. Strengthening of integration analysis and grid code

- Review of existing renewable energy integration study and recommendations for amendments to grid code or other technical protocols

6. Training, knowledge sharing, and dissemination

- Development and launching of a communications strategy to disseminate and inform on the Clean Energy Development Program (risk mitigation facilities)
- Dissemination seminars and training. Knowledge sharing activities and materials

5. Rationale for CTF grant funding, including consistency with CTF Investment Plan:

The proposed CTF Project Preparation Grant (PPG) will support the technical assistance (TA) component of the CTF Clean Energy Development Project, which is newly proposed to be added in the second revision of the CTF Investment Plan for Colombia, submitted for approval of the CTF Trust Fund Committee in October 2016. As dialogue picked up with the new government, a few important factors emerged as critical for project preparation.

First, it is important to prepare the projects in the technical field in order to provide qualified information to investors to obtain the financial closing. Also, it is important to give a first signal to the market and companies interested in the renewable energy and energy efficiency projects that appropriate structuring will allow to have the financial closings and facilitate the investor’s and financial institutions decision making process.

Second, there is a need to inform and educate the market on the objectives of the renewable energy subprogram which create a path to make financial closings viable and to enable the development of project opportunities.

Third, it is crucial to design a proactive strategy to increase the number of projects and create an attractive pipeline to the private sector, so when the program implementation starts, results can be delivered expeditiously.

Fourth, expert know-how and advisory is required for the preparation of the regulatory, technical and commercial environments, including the design of mechanisms to authorize and contract renewable energy (e.g. Feed-in-Tariffs or auctions), and a revision on the technical rules necessary for the dispatch and integration of variable renewable energy (grid code).

Finally, it is also crucial to develop an appropriate ESMS (aligned to WBG policies).

CTF project preparation support is critical so that a new project can be designed that is fully aligned with the three factors explained above.

6. Government Approval of Country-Specific Activities: details for the approving authority.

Name of responsible official: Carlos Alberto Sandoval		
Position: Vice President of Advisory and Structure Development		
Ministry/Agency: Financiera de Desarrollo Nacional (FDN)		Country: Colombia
Tel: 57-1-3264999	Fax: 57-1-3122161	Email: csandoval@fdn.com.co

D. IMPLEMENTATION AND FINANCING PLAN

7. Implementation Approach: (a) the implementing entity (e.g. consultants, government officials, etc.); (b) for country-specific activities, key counterpart institutions; (c) measures to involve key stakeholders; and (d) how the output of the activity is proposed to be disseminated, including its target audience.

The executing agency of the PPG will be the Financiera de Desarrollo Nacional (FDN), the executing agency of the project.

The FDN has a coordinator in charge of aligning the program with the different stakeholders from the government, private sector, financial institutions, and the World Bank.

The program may require specialized consultants and studies that will be coordinated by FDN.

The key counterpart institutions are the Ministry of Mining and Energy, the UPME, CREG, DNP and ANLA.

For the dissemination and education of the market the main target audience and stakeholders are the municipalities, financial institutions, institutional investors, private investors, industrial sector, academy, and energy companies, among others.

8. Implementation Schedule: *beginning and end dates, as well as major activity milestones.*

Task	Dates
Pipeline identification	Dec 2016 - Aug 2017
Renewable Energy Subprogram execution (Phase 1)	Dec 2017 - July 2019
Prefeasibility, feasibility and technical studies for energy renewables projects and energy efficiency	August 2017 - August 2019
Organization of Consultation processes to assess environment and social impacts	December 2017 - August 2019
Structuring advisory	March 2017 – October 2019
Dissemination seminars and training. Knowledge sharing activities and materials	July 2017 – June 2019

9. Financing Plan: a summary of the financing plan by the major components (the detailed budget should provide further breakdown by these components).

Major Components	CTF Request (USD)	Co-financing		Total Cost (USD)
		US\$	Source (e.g., gov't cash or in-kind contributions; donor funds)	
Market Assessment/sounding	200,000	200,000	FDN in kind	400,000
Studies (technical, feasibility, E&S studies) for Energy Efficiency and Renewable Projects	330,000	847,462	USAID, UPME and Companies	1,177,462
Support the preparation of an ESMP	200,000	50,000	FDN in kind	250,000
Structuring Advisory	100,000	100,000	FDN in kind	200,000
Program Dissemination	20,000	15,000	FDN in kind	35,000
Consultant Services - Advisory related to PER preparation	150,000	20,000	FDN in kind	170,000
<i>Total Financing/Costs</i>	1,000,000	1,232,462		2,232,862

E. SUPPLEMENTARY INFORMATION and Materials

10. Additional Information: any additional information that may be useful in evaluating the proposal (e.g., related activities which may have been undertaken; planned follow-on activities; etc.).

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11. Supporting Material: List all supporting material including, where appropriate, government approval letters, terms of reference, and detailed budget.

Supporting Material - ANNEX	
Letter from Ministry of Finance (MinHacienda) Letter from FDN	See Attachments



Bogotá D.C., 2 de noviembre de 2016

Señor
ISSAM ABOUSLEIMAN
Representante para Colombia
BANCO INTERNACIONAL DE RECONSTRUCCIÓN Y FOMENTO
Carrera 7 # 71 - 21, Torre a Piso 16, Bogotá D. C.
Bogotá D.C.

Asunto: FDN – Programa de Energías Renovables y Eficiencia Energética

Estimado Señor Abousleiman:

Nos referimos a la comunicación remitida por el Gobierno de Colombia al Banco el pasado 19 de septiembre, a través de la cual solicitamos la inclusión de un crédito de inversión por USD 41 millones en el año fiscal 2018, para financiamiento de un programa financiero de energías renovables y eficiencia energética que tiene previsto adelantar la Financiera de Desarrollo Nacional (FDN) con recursos del Clean Technology Fund.

En consideración a que impulsar financiamiento de energías renovables no convencionales hace parte de una ambiciosa estrategia que tiene el país para recomponer en el mediano y largo plazo su matriz energética hacia una con mayor participación de fuentes de energía limpia, y a que impulsar mecanismos innovadores para promover el uso eficiente de energía e invertir en proyectos que promuevan el desarrollo sostenible y el crecimiento verde es uno de los ejes transversales del Plan Nacional de Desarrollo 2014-2018 'Todos por un nuevo país', damos alcance a nuestra solicitud inicial para solicitar en adición y para el mismo año fiscal 2018, otros USD 41 millones que provengan de recursos de capital ordinario del Banco que tengan como fin la misma línea de trabajo que está prevista para el crédito ya solicitado.

Como resultado de lo anterior, el Gobierno Nacional reitera su compromiso y disposición para respaldar a la FDN con una garantía soberana a las obligaciones de pago que se deriven de las dos operaciones con el Banco Mundial por un total de USD 82 millones de dólares, así como para apoyar, a través de las entidades gubernamentales competentes, la estructuración técnica del programa de financiamiento, de tal manera que esté en línea con las políticas públicas que se han definido en materia energética.

Estamos convencidos de que estas operaciones de crédito para la FDN constituyen un esfuerzo inicial significativo para que esta entidad pueda contar un acompañamiento técnico permanente y de primer nivel como el que tiene a disposición el Grupo Banco Mundial en

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materia de energías renovables y eficiencia energética. Adicionalmente, y gracias a las condiciones financieras favorables a las que podrá tener acceso este banco de desarrollo como resultado de esta solicitud, el país estará en mayor capacidad de impulsar de manera eficiente y competitiva el financiamiento de proyectos efectivos, innovadores y transformadores.

Sea esta la oportunidad para agradecerles su incondicional apoyo y permanente disposición para la concreción de nuestros objetivos y metas de desarrollo.

Agradecemos su colaboración y la atención prestada.


Ana Milena López Rocha
Directora General de Crédito Público
y Tesoro Nacional
Ministerio de Hacienda y Crédito Público


José Mauricio Cuello
Director de Inversiones y Finanzas Públicas
Departamento Nacional de Planeación

ELABORO

Mónica Peñuela/Lina Menéndez

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Bogotá, 28 de noviembre de 2016

Señor
ISSAM ABOUSLEIMAN
Representante para Colombia
BANCO INTERNACIONAL DE RECONSTRUCCIÓN Y FOMENTO
Carrera 7 # 71-21. Torre A Piso 16
Bogotá D.C.

Referencia: Contrapartida FDN operación Clean Technology Fund -CTF

Estimado Representante:

En relación con las conversaciones adelantadas entre la Financiera de Desarrollo Nacional S.A. – FDN y El Banco Mundial con respecto a la posibilidad de que la FDN acceda a recursos del Clean Technology Fund, nos permitimos informar lo siguiente:

La FDN, en su estrategia de diversificación hacia otros sectores como el de energía limpia, firmó el 2 de septiembre del 2016 un convenio con el Ministerio de Minas con el objetivo de adelantar el denominado Programa de Energía Renovable (PER), el cual permitirá: i) generar las acciones regulatorias necesarias para el impulso de los proyectos de infraestructura energética, ii) proponer el mecanismo más adecuado para la inserción de la energía renovable en la matriz eléctrica colombiana, iii) diseñar productos financieros especializados, iv) calcular las necesidades actuales del país y estimar un tamaño ambicioso para el desarrollo de un programa de Energía Renovable mediante fases similar al programa de Carreteras 4G y v) trabajar conjuntamente con los actores del mercado e inversionistas para difundir de manera adecuada las reglas del programa y objetivos del mismo.

Para el desarrollo de dicho programa, consideramos de vital importancia el apoyo del Banco Mundial, debido a la amplia experiencia que tiene el Banco en el diseño e implementación de programas similares en diversos países y el desarrollo de garantías para mitigar riesgos y atraer soluciones competitivas de financiación que ayuden a facilitar el desarrollo de proyectos de energía renovable en Colombia.

La FDN ha sostenido conversaciones con los equipos de Energía, Medio Ambiente, Finanzas y Mercado de Capitales, y CTF del Banco Mundial, con el ánimo de obtener asistencia técnica y fondos del CTF para apoyo en la estructuración de proyectos, financiación y garantías.



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Teniendo en cuenta lo anterior y en el marco de la solicitud al Clean Technology Fund ("CTF") por USD\$41 Millones, complementado con un cupo de crédito del IBRD por USD\$41 millones aprobado por el Ministerio de Hacienda de Colombia para la vigencia 2017, la FDN, comprometida con el impulso y coordinación de este programa, estima un monto indicativo de contrapartida propia, en un rango entre USD\$68M y USD\$140M equivalentes en pesos colombianos, para la estructuración, diseño de productos financieros de la FDN y financiación (créditos), que permitan promover el desarrollo de proyectos en el sector de Energía Renovable, Eficiencia Energética, o proyectos con impacto en la mitigación y adaptación al cambio climático en Colombia. Es importante aclarar que este monto está sujeto al desarrollo exitoso del programa de Energía Renovable y las decisiones de política pública y regulatorias que tomen las entidades competentes.

Sea esta la oportunidad para reiterar el agradecimiento por el valioso apoyo y permanente disposición para trabajar conjuntamente en el desarrollo de la infraestructura en Colombia.

Cordialmente,

CLEMENTE DEL VALLE BORRÁEZ
Presidente

Annex 1.1: Large Scale Renewable Energy and Industrial Energy Efficiency, FDN Contribution

Scenario I - FDN Providing US\$ 100 Million in Loans			
World Bank Guarantees	41,000,000	World Bank Loans	0
FDN Guarantees	0	FDN Loans	100,000,000
CTF Program	41,000,000		
CTF Technical Assistance	1,000,000		
CTF Guarantees	40,000,000	CTF Loans	0
Total Guarantees	81,000,000	Total Loans	100,000,000
	ENERGY EFFICIENCY	RENEWABLES (WIND)	TOTAL
Scope	16 Industrial Companies in the Cartagena Area	Wind Generation in La Guajira Area	
	Investments of (95+66) million COP		
Investments (Millions COP)	161		
Exchange Rate	2919.71	2919.71	
Unit Cost (US\$/MW)		1,400,000	
Total Installed Capacity (MW)		316	
Investments (US\$)	55,142,463	442,735,032	497,877,495
Equity (US\$)	22,056,985	132,820,510	154,877,495
Debt (US\$)	33,085,478	209,914,522	243,000,000
Private Investments		342,735,032	
FDN Loan (Public Investment)	0	100,000,000	
Guarantees (US\$)			
CTF	11,028,493	28,971,507	40,000,000
World Bank		41,000,000	41,000,000
FDN		0	0
Total Guarantees (1:3)	11,028,493	69,971,507	81,000,000
Energy Savings	(25+25) million COP		
Savings (MWh/year)	818,182		
Generation (MWh/year)		1,108,103	
Emission Reduction (Tons)	Total	Average	CTF Contribution
	Tons @ 25 years	US\$/Ton	US\$/Ton
Energy Efficiency (MtonCO2)	2.250	24.51	4.90
Renewables (MtonCO2)	6.926	63.93	4.18
Total (MtonCO2)	9.18	54.26	4.36
Avoided GHG emission (MtCO2/yr)	0.37		

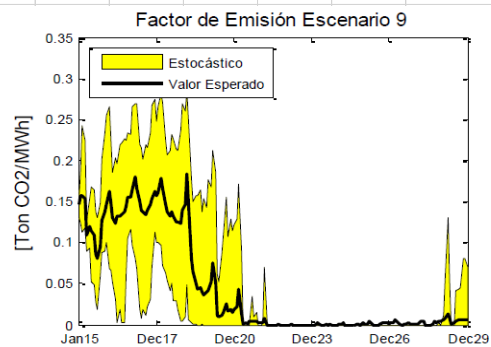
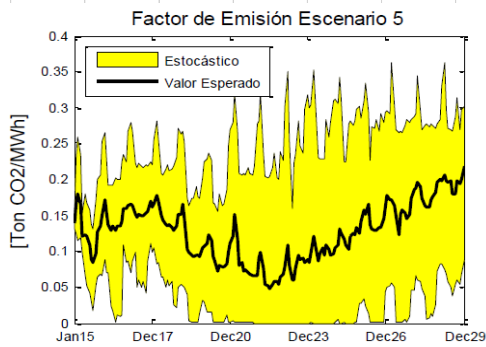
Scenario 2 - FDN Providing US\$ 100 Million in Guarantees			
World Bank Guarantees	41,000,000	World Bank Loans	0
FDN Guarantees	100,000,000	FDN Loans	0
CTF Program	41,000,000		
CTF Technical Assistance	1,000,000		
CTF Guarantees	40,000,000	CTF Loans	0
Total Guarantees	181,000,000	Total Loans	0
	ENERGY EFFICIENCY	RENEWABLES (WIND)	TOTAL
Scope	16 Industrial Companies in the Cartagena Investments of (95+66) million COP	Wind Generation in La Guajira Area	
Investments (Millions COP)	161		
Exchange Rate	2919.71	2919.71	
Unit Cost (US\$/MW)		1,400,000	
Total Installed Capacity (MW)		520	
Investments (US\$)	55,142,463	728,449,318	783,591,780
Equity (US\$)	22,056,985	218,534,795	240,591,780
Debt (US\$)	33,085,478	509,914,522	543,000,000
Private Investments		728,449,318	
FDN Loan (Public Investment)	0	0	
Guarantees (US\$)			
CTF	11,028,493	28,971,507	40,000,000
World Bank		41,000,000	41,000,000
FDN		100,000,000	100,000,000
Total Guarantees (1:3)	11,028,493	169,971,507	181,000,000
Energy Savings	(25+25) million COP		
Savings (MWh/year)	818,182		
Generation (MWh/year)		1,823,205	
Emission Reduction (Tons)	Total	Average	CTF Contribution
	Tons @ 25 years	US\$/Ton	US\$/Ton
Energy Efficiency (MtonCO2)	2.250	24.51	4.90
Renewables (MtonCO2)	11.395	63.93	2.54
Total (MtonCO2)	13.65	57.43	2.93
Avoided GHG emission (MtCO2/yr)	0.55		

Annex 1.2

Calculation of Average Emission Factors for Renewable Generation

Assumptions:

- 1) Comparison of Two Stochastic Expansion/Dispatch Scenarios prepared by UPME (Planning Agency for Colombia Energy and Mining Sector)
 - a) Scenario 5 - Continued Expansion of Thermal (Coal) Generation, limited expansion of renewables
 - b) Scenario 9 - Significant Expansion of Renewables, displacing coal
- 2) The CTF+WB Program will directly support 700 MW of Wind Generation, but will have a transformational impact on the introduction and scaling up of renewables in the country
- 3) Therefore it was assumed that the program will result in the difference in average emission factors between scenarios 5 and 9 over the life of the wind projects
- 4) The trajectory of Scenarios 5 and 9 was extrapolated for the life of the project (2044)
- 5) The (non-discounted) weighted average emission factor took into account the expected dates for commissioning of the wind plants and resulted in 0.283 (see calculations below)



Source: UPME Plan de Expansión de Referencia. Generación Transmisión 2015 - 2029.

Year #	1	2	3	4	5	6	7	8	9	20	21	22	23	24	25
Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2039	2040	2041	2042	2043	2044
Expected EF	0.09	0.08	0.06	0.08	0.1	0.12	0.14	0.16	0.18	0.4	0.42	0.44	0.46	0.48	0.5
MW Yr. 1	200														
MW Yr. 2		250													
MW Yr. 3			250												
								Avg. EF	MW Installed						
								For MW Yr. 1	0.264	200					
								For MW Yr. 2	0.282	250					
								For MW Yr. 3	0.300	250					
								Weighted Average	0.283						