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The World Bank

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Report No: PAD2657

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF
US$200 MILLION
WITH THE GUARANTEE OF THE FEDERATIVE REPUBLIC OF BRAZIL
AND

A PROPOSED CLEAN TECHNOLOGY FUND CONTINGENT RECOVERY GRANT

IN THE AMOUNT OF
US$20 MILLION

TO THE

CAIXA ECONOMICA FEDERAL

FOR A

FINANCIAL INSTRUMENTS FOR BRAZIL ENERGY EFFICIENT CITIES - FinBRAZEEC PROJECT
June 1, 2018

Energy and Extractives Global Practice
Latin America and Caribbean Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective May 30, 2018)

Currency Unit =	Brazilian Real (BRL)
BRL 3.72 =	US$1

FISCAL YEAR
July 1–June 30

ABBREVIATIONS AND ACRONYMS

ABESCO	Brazilian ESCOs Association
ABRACE	Brazilian Association of Large Industrial Energy Consumers (*Associação Brasileira de Grandes Consumidores Industriais de Energia e de Consumidores Livres*)
ACEEE	American Council for an Energy-Efficient Economy
ANEEL	National Electric Power Agency (*Agência Nacional de Energia Elétrica*)
BCB	Central Bank of Brazil *(Banco Central do Brasil)*
BNDES	Brazilian National Development Bank
BRAZEEC	Brazil Energy Efficient Cities
CAPEX	Capital Expenditures
CDI	Interbank Certificate of Deposit *(Certificado de Depósito Interbancário)*
CEF	*Caixa Econômica Federal*
CET-1	Common Equity Tier 1
CGU	General Controller of the Union *(Controladoria-Geral da União)*
CNI	National Confederation of Industry Brazil *(Conferação Nacional de Indústrias)*
CONPET	National Program for the Rationalization of the Use of Petroleum Products and Gas (*Programa Nacional de Racionalização do Uso dos Derivados do Petróleo e do Gás Natural)*
COP	Conference of the Parties, United Nations Framework Convention on Climate Change
COSIP	Contribution for the Cost of Public Lighting (*Contribuição para Custeio do Serviço de Iluminação Pública*)
CTF	Clean Technology Fund
DDO	Deferred Drawdown Option
DPF	Development Project Financing
DSCR	Debt Service Coverage Ratio
D-SIB	Domestic Sistemically Important Banks
DSRA	Debt Service Reserve Account
EE	Energy Efficiency
ERTO	Energy Real-time Optimization
ESCO	Energy Service Company

ESMAP	Energy Sector Management Assistance Program
ESMF	Environmental and Social Management Framework
ESL	Efficient Public Street Lighting
F2E	Energy Efficiency Fund *(Fundo de Eficiência Energética)*
FGTS	Severance Indemnity Fund (*Fundo de Garantia do Tempo e Serviço)*
FI	Financial Intermediary
FinBRAZEEC	Financial Instruments for Brazil Energy Efficient Cities
FM	Financial Management
FNP	National Front of Mayors *(Frente Nacional de Prefeitos)*
FIP	Equity Investment Fund *(Fundos de Investimento em Participações)*
FIDC	Receivables Investment Funds *(Fundos de Investimento em Direitos Creditórios)*
GCF	Green Climate Fund
GDP	Gross Domestic Product
GECOA	National Department of Sanitation and Infrastructure Products *(Gerência Nacional de Produtos de Saneamento e Infraestrutura)*, Caixa
GEF	Grid Emission Factor
GERSA	National Department of Sustainability and Social Environmental Responsibility *(Gerência Nacional de Sustentibilidade e Responsibilidade Socioambiental)*
GF	Guarantee Facility
GHG	Greenhouse Gas
GIF	Global Infrastructure Facility
GoB	Government of Brazil
HPS	High-pressure Sodium
HQLA	High-quality Liquid Asset
IEE	Industrial Energy Efficiency
IFR	Interim Financial Reports
IFRS	International Financial Reporting Standards
IIA	Institute of Internal Auditors
IPEA	Institute of Applied Economic Research (*Instituto de Pesquisa Econômica Aplicada*
IPF	Investment Project Financing
ISP	Implementation Support Plan
LED	Light-emitting Diode
LoC	Letter of Credit
LTV	Loan to Value
M&E	Monitoring and Evaluation
M&V	Monitoring and Verification
MDA	Master Derivatives Agreement
META	Energy and Mineral Sector Strengthening
MFD	Maximizing Finance for Development
MME	Ministry of Mines and Energy (*Ministério de Minas e Energia*)
MSMEs	Micro, Small, and Medium Enterprises
MTR	Midterm Review
NDC	Nationally Determined Contribution

NPL	Nonperforming Loan
NPV	Net Present Value
O&M	Operation and Maintenance
OM	Operations Manual
PDEE	Electricity Generation Expansion Plan, Tenth Edition *(Plano Decenal de Expansão de Energia)*
PEE	Energy Efficiency Program *(Programa de Eficiência Energética)*
PES	Primary Energy Supply
PFI	Participating Financial Institution
PIU	Project Implementation Unit
PPI	Program for Partnerships and Investments (*Programa de Parcerias e Investimentos*)
PPP	Public-Private Partnerships
PPSA	Project Preparation and Structuring
PPSD	Project Procurement Strategy for Development
PROCEL	National Energy Conservation Program (*Programa Nacional de Conservação de Energia Elétrica*)
PRSA	Environmental and Social Responsibility Policy (*Política de Responsibilidade Socioambiental*)
RAROC	Risk-adjusted Return on Capital
RWA	Risk-weighted Asset
SELIC	Special System of Settlement and Liquidation *(Sistema Especial de Liquidação e Custodia)*
SIAPF	Development Programs Tracking System *(Sistema de Acompanhamento de Programas de Fomento)*
SINAN	Information System for Notifiable Diseases
SPM	Secretariat for Policies for Women *(Secretaria Nacional de Políticas para Mulheres)*
SPV	Special-purpose Vehicle
STEP	Systematic Tracking of Exchanges in Procurement
TCAF	Transformative Carbon Asset Facility
TFEC	Total Final Energy Consumption
TJLP	Long-term Interest Rate (*Taxa de Juros de Longo Prazo*)
TLP	Long-term Interest Rate (*Taxa de Longo Prazo)*
VFD	Variable Frequency Driver
VICOR	Vice Presidency of Risk *(Vice-Presidência de Riscos)*, Caixa
WACC	Weighted Average Cost of Capital

Regional Vice President:	Jorge Familiar
Country Director:	Martin Raiser
Senior Global Practice Director:	Riccardo Puliti
Practice Manager:	Antonio Alexandre Rodrigues Barbalho
Task Team Leader(s):	Silvia Martinez Romero, Megan Meyer, Christophe de Gouvello

BASIC INFORMATION

Country(ies)	Project Name	
Brazil	Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC	
Project ID	Financing Instrument	Environmental Assessment Category
P162455	Investment Project Financing	F-Financial Intermediary Assessment

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Disbursement-linked Indicators (DLIs)	[ ] Small State(s)
[✓] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[✓] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	

Expected Approval Date	Expected Closing Date
29-Jun-2018	31-May-2033
Bank/IFC Collaboration	Joint Level
Yes	Complementary or Interdependent project requiring active coordination

Proposed Development Objective(s)

The Project Development Objective is to unlock private financing for urban energy efficiency projects in Brazil by reducing the credit risk and enhancing the technical quality of Efficient Street Lighting subprojects and Industrial Energy Efficiency subprojects.

Components

Component Name	Cost (US$, millions)
EE Facility for Efficient Street Lighting and Industrial Energy Efficiency	1,319.00
Technical Assistance	5.00

Organizations

Borrower:	Caixa Economica Federal
Implementing Agency:	Caixa Economica Federal

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	1,324.00
Total Financing	1,324.00
of which IBRD/IDA	200.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	200.00

Non-World Bank Group Financing

Counterpart Funding	180.00
Borrowing Country's Fin. Intermediary/ies	180.00
Trust Funds	216.00
Clean Technology Fund	20.00
Energy Sector Management Assistance Program	0.50
Green Climate Fund	195.00
GLOBAL INFRASTRUCTURE FACILITY	0.50
Commercial Financing	400.00
Commercial Financing Guaranteed	400.00

Other Sources	328.00
Sub-borrower(s)	328.00

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2018	2019	2020	2021	2022	2023	2024
Annual	0.00	0.00	0.00	10.00	0.00	0.00	0.00
Cumulative	0.00	0.00	0.00	10.00	10.00	10.00	10.00

INSTITUTIONAL DATA

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Climate Change, Finance, Competitiveness and Innovation, Infrastructure, PPP's & Guarantees

Climate Change and Disaster Screening

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

Gender Tag

Does the project plan to undertake any of the following?	
a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF	Yes
b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment	Yes
c. Include Indicators in results framework to monitor outcomes from actions identified in (b)	Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Substantial
2. Macroeconomic	Substantial

3. Sector Strategies and Policies	Low
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Moderate
9. Other	
10. Overall	Substantial

COMPLIANCE

Policy

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

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[✓] Yes [ ] No

Have these been approved by Bank management?

[✓] Yes [ ] No

Is approval for any policy waiver sought from the Board?

[✓] Yes [ ] No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✓	
Performance Standards for Private Sector Activities OP/BP 4.03		✓
Natural Habitats OP/BP 4.04	✓	
Forests OP/BP 4.36		✓
Pest Management OP 4.09	✓	
Physical Cultural Resources OP/BP 4.11	✓	

Indigenous Peoples OP/BP 4.10	✓
Involuntary Resettlement OP/BP 4.12	✓
Safety of Dams OP/BP 4.37	✓
Projects on International Waterways OP/BP 7.50	✓
Projects in Disputed Areas OP/BP 7.60	✓

Legal Covenants

Sections and Description

The Borrower shall carry out the overall implementation, management, monitoring and evaluation of the Project through the Gerência Nacional de Produtos de Saneamento e Infraestrutura (GECOA), with terms of reference, key staff, powers and functions satisfactory to the Bank as further detailed in the Project Operations Manual.

(Schedule 2, Section I.A of the Loan Agreement)
(Schedule 2, Section I.A of the Clean Technology Fund [CTF] Grant Agreement)

Sections and Description

Sections and Description

1. The Borrower shall carry out the Project, and/or cause the Project to be carried out, in accordance with the Project Operations Manual, which consists of different schedules setting forth, respectively, rules, methods, guidelines, specific development plans, standard documents, and procedures for the carrying out of the Project, including the following, inter alia:

(a) the detailed description of Project implementation activities, their sequencing and the prospective timetable and benchmarks in relation thereto;
(b) the Project administrative, accounting, auditing, reporting, financial system reporting requirements, flow of funds, reimbursement and disbursement procedures, including all pertinent standard documents and model contracts;
(c) a business and implementation plan for planning and implementing the Project;
(d) plan for capacity building and training activities under the Project;
(e) the plan for the monitoring, evaluation and supervision of the Project;
(f) the eligibility criteria for Subprojects, Beneficiaries, Commercial Lenders and Subproject Sponsors (if any);
(g) the model forms of the Sub-loan Agreements, including framework of financial terms and conditions;
(h) the methodologies for (i) applying the concessionality under the Green Climate Fund (GCF) Funding to the Beneficiaries; and (ii) to ensure that GCF Reimbursable Funds used for Subprojects do not exceed 25% of the total volume of Sub-loans on average over the implementation of the Project;
(i) the indicative disbursement schedules for this Agreement, the CTF Agreement and the GCF Funding;

(j) the negative list, including inter alia, Category A Subprojects and Subprojects in international waterways;
(k) the Safeguard Documents;
(l) the grievance mechanisms and the code of conduct;
(m) the monitoring and evaluation framework;
(n) the staffing plan for GECOA;
(o) the Guarantee Facility's Legal Framework;
(p) the methodology and process to ensure that the maximum cumulative value of the Credit Enhancement Products to Commercial Lenders under the Guarantee Facility supported by the Loan does not exceed the total Loan amount; and
(q) the Guarantee Facility Manual, when available.

(Schedule 2, Section I.B of the Loan Agreement)
(Schedule 2, Section I.B of the CTF Grant Agreement)

Sections and Description

1. To facilitate the carrying out of Part 1.2 of the Project, the Borrower shall make part of the proceeds of the Loan available to the Guarantee Facility under the Guarantee Facility Legal Framework and under terms and conditions approved by the Bank, including (a) the Borrower's obligation to transfer adequate resources to the Guarantee Facility; and (b) the Borrower's obligation (or the Guarantee Facility's obligation, if need be) to: (i) open a Segregated Account under terms and conditions approved by the Bank; (ii) ensure that the maximum cumulative value of the Credit Enhancement Products to Commercial Lenders under the Guarantee Facility supported by the Loan does not exceed the total Loan amount; and (iii) send the Exposure Reports to the Bank on a regular basis; all as further detailed in the Project Operations Manual and/or in the Guarantee Facility Manual.

(Schedule 2, Section I.C of the Loan Agreement)
(Schedule 2, Section I.C of the CTF Grant Agreement)

Sections and Description

1. The Borrower shall carry out Part 1.2 of the Project, and/or cause the Project to be carried out, in accordance with the Guarantee Facility Manual, which consists of different schedules setting forth, inter alia governance rules, methods, guidelines, procedures, specific development plans, exchange rate issues, seniority of funds, rules for replenishment of concessional funds, limitation on the issuance of new Credit Enhancement Products, Segregated Account guidelines, reimbursement conditions, restriction on the use of funds under the Capitalization of the Guarantee Facility, approved types of amendments and waivers for the Sub-loan Agreements, standard documents, and any other procedures necessary for the operation of the Guarantee Facility, including the detailed content and frequency of the Exposure Reports, detailed content of the Applicable Charges and Costs and the detailed content

and scope of the Annual Technical Audits, for the carrying out of Part 1.2 of the Project, in accordance with the provisions of the Project Operations Manual.

(Schedule 2, Section I.D of the Loan Agreement)
(Schedule 2, Section I.D of the CTF Grant Agreement)

Sections and Description

1. To facilitate the carrying out of Part 1.1 of the Project, the Borrower shall make Sub-loans to the Beneficiaries in accordance with eligibility criteria and procedures acceptable to the Bank, as further detailed in the Project Operations Manual.

2. The Borrower shall make each Sub-loan under a Sub–loan Agreement with the respective Beneficiary on general terms and conditions approved by the Bank, as further described in principle in the Project Operations Manual.

3. The Borrower shall obtain rights adequate to protect its interests and those of the Bank, including the right to: (i) suspend or terminate the right of the Beneficiary to use the proceeds of the Sub-loan, or declare to be immediately due and payable or obtain a refund of all or any part of the amount of the Sub-loan then withdrawn, upon the Beneficiary's failure to perform any of its obligations under the Sub-loan Agreement; and (ii) require each Beneficiary to: (A) carry out its Subproject with due diligence and efficiency and in accordance with sound technical, economic, financial, managerial, environmental and social standards and practices satisfactory to the Bank, including in accordance with the provisions of the Anti-Corruption Guidelines applicable to recipients of loan proceeds other than the Borrower; (B) provide, promptly as needed, the resources required for the purpose; (C) procure the goods, works and services to be financed out of the Sub-loan in accordance with the provisions of this Agreement; (D) maintain policies and procedures adequate to enable it to monitor and evaluate in accordance with indicators acceptable to the Bank, the progress of the Subproject and the achievement of its objectives; (E) (1) maintain a financial management system and prepare financial statements in accordance with consistently applied accounting standards acceptable to the Bank, both in a manner adequate to reflect the operations, resources and expenditures related to the Subproject; and (2) at the Bank's or the Borrower's request, have such financial statements audited by independent auditors acceptable to the Bank, in accordance with consistently applied auditing standards acceptable to the Bank, and promptly furnish the statements as so audited to the Borrower and the Bank; (F) enable the Borrower and the Bank to inspect the Subproject, its operation and any relevant records and documents; and (G) prepare and furnish to the Borrower and the Bank all such information as the Borrower or the Bank shall reasonably request relating to the foregoing.

(Schedule 2, Section I.E of the Loan Agreement)
(Schedule 2, Section I.E of the CTF Grant Agreement)

Sections and Description

1. The Borrower, through GECOA, shall ensure that the Project are carried out in accordance with the Safeguard Documents, including the guidelines, rules and procedures defined in said Safeguard Documents, Borrower's Social and Environmental Procedures, and in the Safeguard Policies.

2. The Borrower shall ensure that the terms of reference for any consultancy in respect of any Project activity shall be satisfactory to the Bank following its review thereof and, to that end, such terms of reference shall duly incorporate the requirements of the Safeguards Policies then in force, as applied to the advice conveyed through such technical assistance.

(Schedule 2, Section I.F of the Loan Agreement)
(Schedule 2, Section I.F of the CTF Grant Agreement)

Sections and Description

A. Not later than forty-two months after the Effective Date, or such other date as the Bank shall agree upon, the Borrower shall: (i) carry out jointly with the Bank and with the Guarantee Facility, if need be, a mid-term review of the implementation of operations under the Project, which shall cover the progress achieved in the implementation of the Project; and (ii) following such mid-term review, act promptly and diligently to take any corrective action as shall be agreed by the Bank.

B. With respect to the Withdrawals under Category 2(b) (and under Category 2(a) if the amount of the first Withdrawal under Category 2(a) is lower than the full amount allocated to said Category 2(a)), payments shall be made as needed during Project implementation upon submission by the Borrower to the Bank of an Exposure Report in form and substance acceptable to the Bank (as further detailed in Section III B.1 (c) of this Schedule and in the Guarantee Facility Manual).

C. The Borrower shall furnish to the Bank an Annual Technical Audit starting from the calendar year 2021 and during the entire implementation of the Project thereafter, in form and substance satisfactory to the Bank and in accordance with the provisions of the Guarantee Facility Manual.

D. The Borrower shall, no later than June 30, 2021, hire independent auditors based on terms of reference acceptable to the Bank to carry out the Annual Technical Audits referred to in Section C above.

(Schedule 2, Section IV of the Loan Agreement)

A. Not later than forty two months after the Effective Date, or such other date as the World Bank shall agree upon, the Recipient shall: (i) carry out jointly with the World Bank and with the Guarantee Facility, if need be, a

mid-term review of the implementation of operations under the Project, which shall cover the progress achieved in the implementation of the Project; and (ii) following such mid-term review, act promptly and diligently to take any corrective action as shall be agreed by the World Bank.

B. The Recipient shall not later than six months after the Closing Date reimburse to the Grant Account any amounts remaining or deposited in the Segregated Account (minus Applicable Charges and Costs) as of the Closing Date, said reimbursement not to exceed the total disbursed amount of the Grant, as further detailed in the Guarantee Facility Manual.

C. With respect to the withdrawals under Category 2 if the amount of the first withdrawal under Category 2 is lower than the full amount allocated to said Category 2, payments shall be made as needed during Project implementation upon submission by the Recipient to the World Bank of an Exposure Report in form and substance acceptable to the World Bank (as further detailed in Section IV B.1(b) of this Schedule and in the Guarantee Facility Manual).

D. The Recipient shall furnish to the World Bank an Annual Technical Audit starting from the calendar year 2021 and during the entire implementation of the Project thereafter, in form and substance satisfactory to the World Bank and in accordance with the provisions of the Guarantee Facility Manual.

E. The Recipient shall, no later than June 30, 2021, hire independent auditors based on terms of reference acceptable to the World Bank to carry out the Annual Technical Audits referred to in Section D above.

(Schedule 2, Section V of the CTF Grant Agreement)

Conditions

Type	Description
Effectiveness	(a) The GCF Funding Agreements have been executed and delivered and all conditions precedent to its effectiveness or to the right of the Borrower to make withdrawals under them (other than the effectiveness of this Agreement) have been fulfilled. (b) The CTF Agreement has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Borrower to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled. (for the Loan Agreement) OR for the CTF Grant Agreement: The Loan Agreement has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Recipient to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled. (c) The Counterpart Funding has been approved and confirmed by the Borrower in form

	and substance satisfactory to the Bank. (d) The Borrower has furnished to the Bank satisfactory evidence that market readiness has been reached to implement Part 1.1 of the Project, in form and substance satisfactory to the Bank and with criteria and content detailed in the Project Operations Manual. (e) The Project Operations Manual has been adopted by the Borrower in form and substance satisfactory to the Bank. (Article V of the Loan Agreement) (Article V of the CTF Grant Agreement)
Type Disbursement	Description FOR THE LOAN AGREEMENT 1. Notwithstanding the provisions of Part A above, no Withdrawal shall be made: (a) for payments made prior to the Signature Date; (b) under Category 2(a) until and unless the Bank has received adequate and satisfactory evidence in form and substance that: (i) the Guarantee Facility has been created and is operational in accordance with the Guarantee Facility's Legal Framework; (ii) the Segregated Account has been opened; and (iii) the Guarantee Facility Manual has been approved; all in form and substance satisfactory to the Borrower and the Bank. If the amount of the first Withdrawal under Category 2(a) is lower than the full amount allocated to said Category 2(a), subsequent Withdrawals under said Category 2(a) will be subject to the presentation of satisfactory Exposure Reports, in accordance with the provisions of Section IV B below; or (c) under Category 2(b) until and unless: (i) all the conditions under Category 2(a) have been complied with and all the Loan proceeds allocated to said Category 2(a) have been withdrawn; (ii) the Bank has received an Exposure Report in form and substance satisfactory to the Bank; and (iii) the Withdrawal request complies with the maximum Withdrawal amount referred to in the Exposure Report. 2. The Closing Date is December 31, 2033. (Schedule 2, Section III B of the Loan Agreement) FOR THE CTF GRANT AGREEMENT 1. Notwithstanding the provisions of Part A of this Section no withdrawal shall be made: (a) for payments made prior to the Signature Date; or (b) under Category 2 until and unless the World Bank has received adequate and satisfactory evidence in form and substance that: (i) the Guarantee Facility has been created

	and is operational in accordance with the Guarantee Facility's Legal Framework; (ii) the Segregated Account has been opened; and (iii) the Guarantee Facility Manual has been approved; all in form and substance satisfactory to the Recipient and the World Bank. If the amount of the first withdrawal under Category 2 is lower than the full amount allocated to said Category 2, subsequent withdrawals under said Category 2 will be subject to the presentation of satisfactory Exposure Reports, in accordance with the provisions of Section IV B below. 2. The Closing Date is December 31, 2033. (Schedule 2, Section III B of the CTF Grant Agreement)

BRAZIL
FINANCIAL INSTRUMENTS FOR BRAZIL ENERGY EFFICIENT CITIES - FINBRAZEEC

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I. STRATEGIC CONTEXT

A. Country Context

1. **Brazil is an upper-middle-income country that has made significant gains in poverty reduction in recent decades, but inequality and macroeconomic instability have hampered economic growth.** It has a population of approximately 200 million people, most of them living in coastal areas. Brazil's economy is the seventh largest in the world, with a GDP of US$2.2 trillion (2013). Brazil's economic and social progress between 2003 and 2015 lifted 25.4 million people out of poverty, and inequality dropped significantly. After this decade of social progress, Brazil's economy entered a deep rececession from 2006 through 2016. After fiscal and monetary policy adjustments, Brazil returned to low growth in 2017 and the first half of 2018.

2. **Underinvestment in infrastructure is one of the key reasons for Brazil's lagging growth.** Since the 1980s, investment in infrastructure in Brazil has declined from over 5 percent of GDP to just above 2 percent of GDP between 2000 and 2013, insufficient to cover depreciation and maintenance of existing infrastructure, let alone keep pace with expected demand growth[1]. This underinvestment has created a widening infrastructure deficit and is believed to be one of the main reasons for low productivity and the lack of robust economic growth.

3. **Brazil needs more private financing to help close the infrastructure gap** while it still seeks to further strengthen its capacity for planning, budgeting and managing infrastructure assets. As public funding will remain constrained by Brazil's ongoing fiscal adjustment, private investment is needed but unlikely to be an effective substitute without appropriate institutions, regulation and financing mechanisms in place. While private investments have been attracted to infrastructure sectors, the financing sources of infrastructure have remained predominantly public (currently around 70 percent), including state banks[2]. In the context of fiscal consolidation over the medium term, Brazil will not be able to cover its full investment needs through its limited public resources. Private financing is required to close the gap.

4. **The authorities have recently embarked on significant reforms of long-term financing by public banks, a critical first step to crowd in private finance.** After the onset of the macro-fiscal crisis in 2014, the National Treasury is no longer able provide the same levels of low-cost funding to public banks, and their disbursements have fallen drastically. To adjust to these constraints, in 2017 Congress approved a reform of the rate charged on long-term directed credits – the *Taxa de Juros de Longo Prazo* (TJLP), replacing it with the *Taxa de Longo Prazo* (TLP), which is linked to long-term market rates. As a result, long-term lending rates of public banks will converge towards the market rate on inflation-linked government bonds over a period of five years. Together with the sharp fall in policy rates during the 2016-2018 easing cycle, this has created an environment in which commercial banks and institutional investors are increasingly looking for alternative assets, including infrastructure investments.

5. **However, this reform on its own is not sufficient to kick-start private infrastructure finance.** Better planning and project preparation is essential to improve the efficiency of public spending and

[1] *See Clarke, Procee and Raiser (2017, ed): Back to Planning: How to Close Brazil's Infrastructure Gap in Times of Austerity.*
[2] *Ibid.*

attract private funding[3]**.** Substantial gains in infrastructure performance could be achieved through better project preparation and financial structuring, which would make infrastructure much more attractive to private investors. The current policy focus of Brazil's authorities on mobilizing commercial financing for infrastructure and strengthening its Public Private Partnership (PPP) program needs to be complemented with much stronger efforts in planning, pipeline development, contract management, regulation, public oversight and other aspects of infrastructure governance.

6. **Moreover, innovative financing mechanisms are needed to mobilize private investments.** Brazil has extensive domestic capital markets that could be leveraged for long-term infrastructure financing, which would reduce the burden on public coffers and avoid the need to mobilize foreign investment, with the associated foreign exchange (FX) risks. Despite the search for yield as market rates have come down, the scope of private investments in infrastructure has remained very limited to date, concentrating predominately on refinancing existing projects. Brazilian financial institutions are not accustomed to assessing and taking project risk, and lending relies heavily on corporate guarantees (which are constrained by stretched balance sheets). To encourage Brazilian banks to move into the limited-recourse, project finance paradigm, new and innovative de-risking approaches are required, such as collateralization of project receivables and access to partial credit guarantees.

B. Sectoral and Institutional Context

7. **Brazil needs to invest more in energy efficiency (EE) to meet its greenhouse gas (GHG) emission reduction targets.** To meet Brazil's Nationally Determined Contributions (NDC) targets for GHG emission reductions in EE (10 percent efficiency gains in the energy sector by 2030, equivalent to approximately 105 TWh saved), supply-side reforms are not sufficient, nor would they be cost-effective on their own. It is estimated that only half of this target will be achived given the existing regulatory, institutional and financial arrangements. Demand-side management interventions, particularly in urban areas, must play a larger role in managing the Brazilian energy system. Brazil has two primary public financing lines for EE projects – the National Energy Conservation Program (PROCEL) and the Energy Efficiency Program (PEE). These EE programs have achieved results in a few targeted areas, but their budgets and sectoral scope are insufficient to address the investment needed to meet Brazil's demand-side EE potential.[4] In terms of industrial energy efficiency (IEE), in 2016 Brazil was ranked last among the 16 largest economies analyzed by the American Council for an Energy Efficient Economy (ACEEE) with enormous potential for cost-effective EE investments[5].

8. **There is enormous potential for private investments in efficient street lightning (ESL) and industrial energy efficiency (IEE).** World Bank engagement with the Energy Sector Management Assistance Program (ESMAP) and the Public-Private Infrastructure Advisory Facility (PPIAF), particularly through the ongoing Brazil Energy Efficient Cities analytical activity (BRAZEEC, P150942), has shown that these sectors have unique potential to attract private sector investment given the maturity of the business models, the potentially large efficiency gains and the scalability in the near-term**.** The World Bank estimates that Brazil has more than 18.5 million light-point which represent about 3 to 4 percent of total

[3] *Ibid.*

[4] For example, PROCEL RELUZ invested in EE street lighting, but the program's funding was cut significantly in 2015 (it has recently launched a new line of financing, but with a focus on small projects). PEE has ample resources but has historically focused predominantly on EE in low-income households, and has channeled little to commercial EE and virtually no funds to industrial EE.

[5] https://aceee.org/research-report/e1602

electricity consumption in Brazil and close to 5 percent of peak consumption[6]. Investments in ESL are attractive due to decreasing technology costs, increased tariffs, and earmarked revenues from the municipal energy bill (the Contribution for the Cost of Public Lighting, or *Contribuição para Custeio do Serviço de Iluminação Pública* [COSIP]). Studies by key Brazilian industrial associations, namely the National Confederation of Industry Brazil (*Conferderação Nacional de Industrias,* [CNI]) and the Brazilian Association of Large Industrial Energy Consumers (*Associação Brasileira de Grandes Consumidores Industriais de Energia e de Consumidores Livres,* [ABRACE]), show that potential savings from IEE investments range from 8 to 40 percent depending on the sector, which would lead to considerable GHG emission reductions. More than 150 projects with high-return and short payback periods have already been identified among large industrial energy users.

9. **Despite attractive returns and high potential, so far little private funding has gone into EE**. With public funding through PROCEL limited, the realization of Brazil's investment potential in EE depends on private financing. A number of factors account for the lack of private financing in the sector. First, with respect to ESL, given well identified cash flows, there is ample scope for outsourcing the services to private concessionaires, a model that was first successfully tested in Belo Horizonte with the help of IFC advisory services. However, commercial banks in Brazil are not used to project finance and reluctant to take risks in a new sector with a new instrument, while project sponsors are often reluctant to offer corporate guarantees or have insufficiently strong balance sheets. Moreover, the lifetime of the envisaged street lighting concessions at 15 years exceed the maturity currently available on the Brazilian market. Without some form of credit enhancement, project finance structures may not be viable. In the IEE sector, corporate finance is also usually not feasible because industrial enterprises typically prefer using their limited borrowing space for investments in new capacity rather than EE enhancements. This issue can be addressed by special entities providing off-balance-sheet financing to industrial companies. Those entities would acquire, install and own the assets, carrying the debt in their balance sheet. Yet, here too, private funding faces constraints related to perceived high risks of a new market for those off-balance-financing entities, most of them yet to be established. Credit enhancement once again could help kick-start the market until its viability is tested and confirmed, with potentially large catalytic impact on the sector beyond the project.

10. **The Project responds to the country and sector context in aiming to mobilize private financing for EE investments, using credit enhancement to enable project finance structures to emerge.** Thereby it not only achieves important EE and carbon emission reduction benefits, but it also helps develop new market financing mechanisms at a time when Brazil is moving away from the dominant public funding model in infrastructure. The project is administered and implemented by *Caixa Econômica Federal* (CEF), second largest state-owned bank and the third largest bank in Brazil. CEF operates as a strategic partner with the Federal Government in the finance of municipal infrastructure, housing, and water and sanitation. As part of the Financial Instruments for Brazil Energy Efficient Cities (FinBRAZEEC) Project, CEF will establish a syndicated loan facility comprising of own finance, Green Climate Fund (GCF) funds and private investments, mainly from Brazilian lenders and investors, to finance ESL and IEE subprojects by private sponsors under a limited recourse financing approach, which has been virtually absent in EE projects in Brazil to date. Once proven, this model can be applied to other infrastructure sectors.

[6] "Lighting Brazilian Cities," Meyer et al.: http://documents.worldbank.org/curated/en/679281521548635917/Lighting-Brazilian-cities-business-models-for-energy-efficient-public-street-lighting

11. **Credit enhancement will be provided as a partial risk guarantee established by CEF, backed by a contingent IBRD investment loan.** IBRD support will help CEF address its capital constraints, while significantly enhancing the attractiveness of the facility for private lenders. The IBRD contingent loan will act as callable capital for CEF to ensure liquidity for CEF's obligations under its guarantee products offered to private investors over a ten-year investment period. This structure, which was piloted in the case of the World Bank 'Drought Events' Impact Migitating Investment Financing Project' in Uruguay (P149069), was preferred by CEF to a traditional IBRD guarantee, considering the costs and benefits compared to a traditional guarantee in the context of this project[7]. The credit enhancement mechanism will also be supported by a GCF grant and a Clean Technology Fund (CTF) contigent recovery grant. Pricing simulations have shown that the credit enhancement product will have competitive pricing in the Brazilian market to be attractive to private sponsors. Attractive pricing is critical to facilitate the paradigm shift towards project finance, as many private sponsors and commercial banks are still hesitant to make the shift in the expectation that public funding may return, when the rate cycle turns.

12. **The project will also contribute to strengthen the capacity of CEF to create a portfolio of bankable projects based on project finance.** FinBRAZEEC will develop a highly innovative financing model for the Brazilian market and help CEF move beyond its 'business-as-usual' approach into co-lending alongside commercial lenders on a project finance basis. Technical support will be provided to CEF and selected municipalities to develop a portfolio of bankable projects. As a result, the project will alleviate fiscal pressure on sub-national entities by increasing private investments in these sectors and reducing energy costs. In the IEE sector, the project can build on the substantial work already done by ABRACE as well as previous PPIAF funded technical assistance to identify bankable projects and a menu of possible investments. IFC co-investments in the equity of Energy Service Companies (ESCOs) is being explored. Ultimately, the project will help create new asset classes for EE investments in Brazil and help the country achieve its NDC targets.

13. **The EE sector is an excellent starting point for developing new financing approaches in infrastructure.** The ESL and IEE sector were chosen given the nature of investment with relatively low construction and safeguard risks (replacement of lightbulbs, retrofit of equipment), which allow to prove the model and later adapt it to other sectors in Brazil and possibly other countries. For the public banks, it will be the first structure in the market that provides significant leverage of scarce public capital with commercial funding, using a credit enhancement structure. The demonstration effects could be significant, and the project hence benefits from strong political support of the authorities.

[7] The IPF Loan offers a pro-active way to avert any potential default to the beneficiaries of CEF's partial credit guarantee, as CEF can disburse the IPF contingent loan if pre-defined funding requirements are reached. In contrast, a traditional IBRD guarantee would be deployed after a default is confirmed, and would carry the associated repercussions (e.g., possible rating implications, trigger of the federal government counter-guarantee, etc.). Moreover, this Project will finance many sub-loans, which would be difficult to manage in the traditional guarantee framework. Finally, market sounding with potential guarantee beneficiaries (i.e., domestic commercial lenders) revealed that they do not require an international AAA credit rating to invest (since they are capped at the BR sovereign rating), nor the irrevocability feature offered by a IBRD guarantee. These factors combined imply the coverage offered by a traditional IBRD guarantee would not result in sufficient benefits to the Project to justify the associated costs.

C. Higher Level Objectives to which the Project Contributes

14. **The Project is fully aligned with the World Bank Group's FY18–FY23 Country Partnership Framework (CPF) for Brazil (Report #113529-BR), discussed by the Executive Directors on July 13, 2017.** The Project chiefly supports Objective 3.1, under Focus Area 3, inclusive and sustainable development, supporting the achievement of Brazil's NDC by mobilizing external concessional resources to complement domestic funding for EE in urban areas. The preliminary assessment of the climate impact indicates that 100 percent of the project financing can be considered as positive climate co-benefits, as the intent of the project is to reduce energy-related GHG emissions in urban areas through EE interventions. The Project also supports Objective 2.3 under Focus Area 2, mobilize greater investment in infrastructure to improve services, particularly through PPPs, by encouraging such partnerships to take the lead in deploying EE street lighting. In addition, the Project will strengthen domestic capacity for planning, design, and implementation of concessions with a dedicated capacity-building component.

15. **The Project will be a key element of the World Bank Group support to Brazil's energy sector and represents a practical application of the infrastructure 'cascade' in line with the Maximizing Finance for Development (MFD) approach.** It is highly innovative in combining climate funding and other sources of public funding to attract private sector lenders to invest on a limited-recourse basis with the support of credit enhancement products. It is supporting the Financial intermediary (FI), CEF, to establish new lines of business to leverage private sector capital for clean infrastructure investments, with a focus on urban EE. These business lines developed under this Project will provide a demonstration effect for CEF and other market participants, after which they can become sustainable and continue operating without public support.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

16. **The Project Development Objective is to unlock private financing for urban energy efficiency projects in Brazil by reducing the credit risk and enhancing the technical quality of Efficient Street Lighting Subprojects and Industrial Energy Efficiency Subprojects.**

B. Project Beneficiaries

17. **The primary project beneficiaries are:** (a) private entities created for providing ESL through PPPs and ESCOs for IEE projects receiving sub-loans from the facility; (b) municipalities receiving the ESL services while the burden of energy bills and operation and maintenance (O&M) costs is on municipal budgets; (c) urban industrial enterprises benefiting from improved technologies and processes that optimize production, reducing energy consumption and production costs, and increasing competitiveness; (d) CEF, which will develop two new business lines, opening up markets and developing capacity to implement innovative financial solutions; and (e) the financial institutions providing loans to the subprojects and purchasing credit enhancement products from the EE Facility, allowing them to scale up investments in EE financing. Indirectly, the Project will benefit the country, as the project will lead to new asset classes for EE investments, which can be scaled up for other investments in other infrastructure

projects. The Project will contribute to the World Bank's twin-goals of poverty alleviation and shared prosperity by (i) contributing to climate change mitigation, whose impact disproportionately impacts the poor and vulnerable, (ii) improving the delivery of municipal services of public street lighting, which diproportionalely benefits women and other vulnerable populations through increased perception of safety, and (iii) reducing local air pollution through industrial EE, which also tends to disproportionately impact poor communities located near industrial activity.

C. PDO-Level Results Indicators

18. **The key project-level results indicators are:** (a) energy savings, in Mega Joules (MJs) per year, which will measure improved efficiency of public street lighting and industrial companies; (b) the associated GHG emissions avoided, measured in tCO_2e per year; and, (c) the cumulative value of debt finance mobilized for EE subprojects, in U.S. dollars.

III. PROJECT DESCRIPTION

A. Project Components

19. **The Project has two components:** Component 1: An EE Facility[8] for Efficient Public Street Lighting (ESL) Subprojects and Industrial Energy Efficiency (IEE) Subprojects, comprising Subcomponent 1.1 - Private Financing for ESL subprojects and IEE subprojects, in the form of a loan syndication among CEF and commercial lenders and Subcomponent 1.2 – Credit Enhancement Products, in the form of a Guarantee Facility (GF) established by CEF and Component 2: Technical Assistance to help increase CEF's internal capacity to implement the Project, support the startup costs of the EE Facility, and help develop a pipeline of high-quality subprojects, reducing the technical risk of the transactions.

20. **Component 1: EE Facility for ESL and IEE subprojects is structured into two subcomponents.** The schematic structure of the EE facility is provided in figure 1, and details are provided in annex 1.

21. **Subcomponent 1.1: Private financing for ESL and IEE subprojects, to provide sub-loans to beneficiaries for ESL subprojects and IEE subprojects through a loan syndication with commercial lenders, led by CEF.** CEF will blend US$180 million of its funds with a US$186 million GCF concessional loan, administered by the World Bank[9]. It will lead a syndication with domestic commercial lenders to leverage approximately US$400 million in private debt on a limited recourse finance basis. CEF and the syndicated lenders will provide parallel loans to: (a) special-purpose vehicles (SPVs) established to implement ESL subprojects; and (b) entities, such as dedicated funds, ESCOs, or other aggregators, for IEE investments on a limited-recourse basis. The sub-loans will be divided into two separate windows:

[8] The term 'EE Facility' is used in this document to refer to the set of financial arrangements for the lending by CEF and other domestic banks to the private sector sponsors of ESL and IEE subprojects (Subcomponent 1.1, Loan Syndication), as well as the associated credit enhancement products (Subcomponent 1.2, GF).

[9] The GCF loan was approved by the GCF Board on March 1, 2018. The World Bank and GCF are still in the process of negotiation the Funded Activity Agremeent (FAA), which will serve as the basis for the preparation of the GCF Loan Agreement, which will be negotiated and signed with CEF in a subsequent step (estimated Fall 2018).

Window 1 (sub-loan to ESL projects) and Window 2 (sub-loans to IEE projects), described in more detail in annex 1.

22. **Subcomponent 1.2: Credit enhancement products - the Project will capitalize the GF to allow credit enhancement products for ESL subprojects and IEE subprojects.** The GF may offer several credit enhancement products to derisk the loans under Subcomponent 1.1, including: (a) first-loss coverage; and (b) partial credit risk guarantees to cover up to 50 percent of sub-loan losses. Over time, the GF may also offer payment guarantees for subproject sponsors. See annex 1 for more details on the GF products. The GF will charge guarantee fees, priced to cover the expected value of guarantee payouts and ensure the GF is sustainable beyond the life of this project.

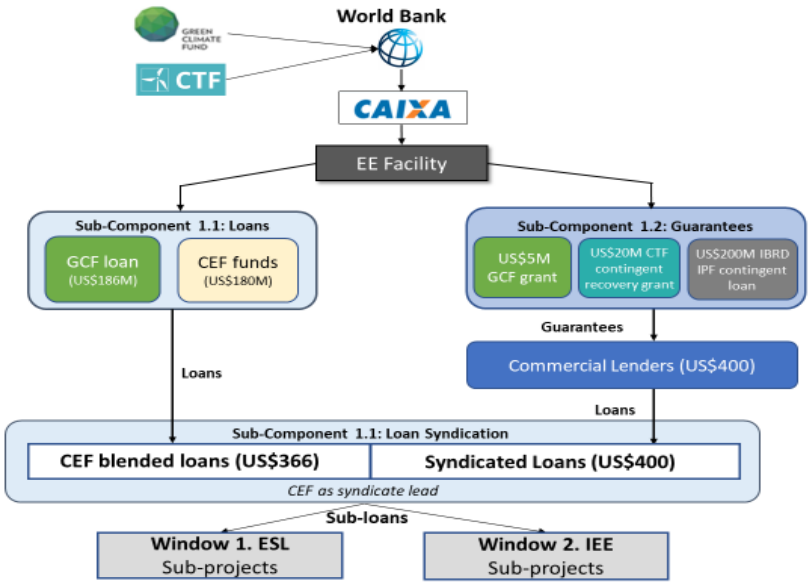
23. **To make the GF viable, grant funding and liquidity support are required to reduce funding costs and increase investor confidence.** The GF will benefit from a CTF contingent recovery grant (US$20 million) and GCF grant (US$5 million)[10] to provide liquidity to the GF and absorb initial payouts, thereby significantly reducing the cost of the GF operation. These savings will result in lower guarantee fees and, ultimately, lower sub-loan financing costs. CEF has never offered a credit enhancement mechanism of this type before, and market feedback indicates liquidity support from the World Bank will significantly increase market uptake. To this end, the GF will benefit from an IBRD contingent loan (US$200 million) with special financial features,[11] which will act as a credit line which CEF can draw down to support the GF's operation, in the event that the GF needs additional funds to meet its obligations to the guaranteed, syndicated lenders (for example, if sub-loan defaults are higher than expected). Disbursements of the IBRD contingent loan will be tied to the GF funding needs.[12] Because the GF will be designed to be sustainable (that is, guarantee fees charged should cover expected guarantee payouts), the need for disbursements from the IPF contingent loan are expected to be small and decreasing in the latter years of the projects as the sub-loans are repaid.

[10] The GCF grant was approved by the GCF Board on March 1, 2018. As with the GCF loan, the GCF Grant Agreement will be negotiated and signed with CEF in a subsequent step (estimated Fall 2018).

[11] The special financial features include allowing CEF the flexibility to change the repayment schedule and pricing at the time of disbursement, with the objective to allow CEF to select repayment terms that are linked as closely as possible to the underlying liabilities that are being covered. This approach is similar to that used for Development Project Financing (DPF) Deferred Drawdown Options (DDOs).

[12] The maximum disbursement amount in any period will be determined by the Guarantee Facility's cumulative outstanding value of guarantee payout liability. This will be regularly communicated to the World Bank through an Exposure Report, which will cap disbursements over the given period. To minimize the transaction costs associated with disbursements under the IPF contingent loan, there will be a maximum of 4 disbursements per year and 30 disbursements over the life of the Project.

Figure 1. Indicative Structure of Component 1 - EE Facility



24. **Component 2: Technical Assistance (TA) consisting of GCF US$4 million recipient executed grant, and US$1 million Bank executed grants provided by the Global Infrastructure Facility (GIF) and ESMAP.**[13] The TA component of this project will support essential technical studies, capacity building for the departments of CEF involved, and early operational costs. In the case of IEE, these funds will be used to support technical studies and initial implementation efforts (for example, structuring of off-balance-sheet funds to support scale-up of IEE investment). In the case of ESL, the TA will support cities' preparation of high-quality PPP subprojects. The GIF and ESMAP funds are being used to support financial structuring of the Project and to conduct pre-feasibility studies for PPPs for ESL subprojects in selected cities. A detailed Procurement Plan and procurement strategy for the recipient executed TA funds (GCF) have been prepared.

25. **Information regarding market sounding completed during project preparation and CEF's options for FX hedging are provided in annex 1.**

B. Project Costs and Financing

26. **The total estimated value of Subcomponent 1.1 (sub-loans of the EE Facility) is US$766 million**, including US$400 million in commercial loans, US$186 million GCF loan, and US$180 million in CEF's counterpart funds. It is expected that the subprojects will be financed with a 70:30 debt to equity ratio, and thus, the US$766 million of debt will mobilize a total of US$328 million in sponsor equity, for a total value of subproject investment of US$1,096 million.

[13] The World Bank has secured US$0.2 million from ESMAP and US$0.5 million from GIF in the form of Bank-executed trust funds. ESMAP funds are being used to inform the design/structure of the EE facility. The GIF resources, a project definition grant , are supporting EE Facility structuring and prefeasibility studies to identify candidate cities for ESL.

27. **The value of Subcomponent 1.2 (GF) will depend on the value of guarantees sold.** This component is supported by a US$200 million IBRD Investment Project Financing (IPF) contingent loan. The value of the IBRD loan is based on the assumption that CEF's partial guarantee—backstopped by the IBRD loan—will cover 50 percent of the US$400 million in commercial loans under Subcomponent 1.1. This subcomponent will also benefit from the US$5 million GCF nonreimbursable grant and the US$20 million CTF contingent recovery grant.[14]

28. **The TA component has an estimated value of US$5 million, with US$4 million from the GCF grant and US$1 million from already secured Bank-executed GIF and ESMAP trust funds.**

29. **An overview of the sources of project funding by subcomponent is provided below.**

Table 1. FinBRAZEEC Sources of Funding by Component

Project components	Total	IBRD IPF loan	GCF Loan	GCF grant	CTF contingent grant	CEF funds	Commercial lenders	Equity	Bank executed TA
Component 1: EE Facilty	**1319**	**200**	**186**	**5**	**20**	**180**	**400**	**328**	**-**
*Sub-component 1.1: Loan syndication**	1094	-	186	-	-	180	400	328	-
Sub-component 1.2: GF	225	200	-	5	20	-	-	-	-
Component 2: TA	**5**	**-**	**-**	**4**	**-**	**-**	**-**	**-**	**1**
Total Project Funding	**1324**	**200**	**186**	**9**	**20**	**180**	**400**	**328**	**1**

** This includes $766 of sub-loan debt from the EE facility, as well as $328 of sponsor equity expected to be part of the sub-project financing*

C. Lessons Learned and Reflected in the Project Design

30. **The project incorporates lessons learned from the implementation of similar projects and instruments.** The World Bank has experience working on EE projects, predominately through directly lending to governments, state-owned entities, and through FIs. Experience using credit enhancements products to promote EE investments has been more limited, but such projects under implementation include the IFC China Utility Energy Efficiency Program and the World Bank India Partial Risk Sharing Facility for Energy Efficiency project (P128921). There are also a number of projects currently under preparation.[15]Lessons from preparation and implementation of these projects have been considered, such as the importance of having a conducive EE regulatory framework, a mature commercial banking sector in the country, and a proactive and well-trained implementing institution that can assume the role of the guarantor.

31. **Identification of a robust pipeline of investments and TA is critical at the preparation stage.** Having a well-defined pipeline of eligible subprojects is critical to allow rapid implementation to begin once the project is effective. In this regard, the project has been informed by the BRAZEEC project that helped clearly identify the barriers to EE financing for the ESL and IEE sectors and informed the choice of financial instruments and project design. Building on this work, the World Bank has undertaken additional

[14] In the future, the Project may seek financing from Transformative Carbon Asset Facility (TCAF) to support the GF as well.
[15] India Energy Efficiency Scale-up Program (P162849/P165488, FY2018), Colombia CTF Clean Energy Development Project (P161713, expected FY2019), and Vietnam Scaling Up Energy Efficiency Guarantee (P164909, expected FY2019) use a credit risk mitigation instrument to cover private losses for financing EE investments.[16] Although the Project implementation period is 15 years in order to cover the entire period in which the credit enhancement products are available, the underlying subproject investments will be completed in the first five to seven years of the Project, therefore the MTR will take place after 3.5 years.

technical studies, including ongoing prefeasibility studies for 10 cities and workshops with industrial stakeholders, to begin the pipeline preparation process. CEF and the World Bank are also in regular dialogue with key stakeholders in both sectors to identify candidate projects to receive financing once the EE Facility is operational.

32. **Well-defined institutional arrangements and adequate portfolio risk management are needed to ensure timely implementation and the long-term viability of the EE Facility.** Most EE projects require complex institutional arrangements involving a variety of public agencies at different government levels. A dedicated project implementation unit (PIU) has been put in place and will need to be further trained. In FinBRAZEEC, CEF centralizes many of the responsibilities of the project. CEF has the technical, managerial, and financial resources needed to develop proper eligibility criteria for subprojects, conduct adequate subproject due diligence, and address residual risks through proper risk mitigation processes and products. The World Bank will support CEF by closely supervising the EE Facility's first few transactions. CEF has a dedicated unit (*Gerência Nacional de Produtos de Saneamento e Infraestrutura* [GECOA]) that will serve as the PIU for all multilateral development bank financing projects, and there will be a dedicated working group for this project, both of which will help ensure continuity over the life of the project.

33. **Measures will need to be put in place to mitigate risks associated with working with an institution of the size and the administrative complexity as CEF.** Based on the World Bank experience with the Caixa Solid Waste Management Project, the World Bank has and will continue to incorporate lessons learned when working with CEF. For example, the World Bank will ensure CEF has sufficient support to prepare the OM and receives timely training on the World Bank's new policies and procedures (for example, procurement and environmental and social safeguards). The TA provided under Component 2 will support training of CEF staff as well as specialized assistance through consultancies as needed. It will also be important to ensure CEF maintains focus and prioritizes implementation of this activity, particularly given the potential impact of upcoming elections and the long implementation period of the project. CEF has expressed a strong corporate commitment to the project, including this project, as part of its commitment to support the green agenda. This continued commitment will be supported by the high-profile nature of the operation (first GCF project approved for Brazil) and the project's alignment with CEF's mandate to innovate and leverage private sector investment—a strategy supported by the Federal Government and reinforced through a forum created by the Executive Secretary for Program for Partnerships and Investments (*Programa de Parcerias e Investimentos*, PPI). CEF will need to make a continuous effort to ensure that the right incentives are incorporated at different levels of the organization over the life of the project and that the project is well aligned with the medium- and long-term strategy of the institution.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

34. **CEF, as an FI, has the main function of implementing the project**. The project will be implemented over 15 years. The first 5 years will entail commitment of sub-loans under Subcomponent 1.1 and the issuance of associated guarantees under Subcomponent 1.2. Sub-loans are expected to have a tenor of approximately 10 years, meaning that a sub-loan issued in Year 5 will be fully repaid by Year 15.

The project will remain open over this entire period to ensure the IPF contingent loan is available to backstop guarantees for the full sub-loan tenor. However, project supervision requirements are expected to be less intensive after commitment of all sub-loans and associated guarantees supported by the IPF contingent loan (Year 5). The choice of the EE sector, with relatively low construction and safeguards risks also mitigate the potential costs and risks of a long-term supervision effort. World Bank presence throughout the life of the credit enhancement products is an important risk mitigant to give commercial lenders to invest, and thus it is critical to make limited recourse financing viable.

35. **CEF will supervise/monitor all EE Facility operations to ensure they are in compliance with Brazilian and World Bank requirements.** CEF will provide periodic reports, including fiduciary, technical, and safeguards reports to the Ministry of Finance and the World Bank. Independent auditors will be selected to conduct annual technical and financial project audits on the performance of CEF; this will be financed from the TA component using the GCF grant. CEF will form a PIU with dedicated teams supported by technical, environmental, social, and procurement experts. The PIU will lead implementation of the project and will act as CEF focal point to interact with the World Bank and other stakeholders as needed. CEF may delegate part of its roles to a third party selected competitively, where the third party has a competitive advantage.

36. **Under Subcomponent 1.1, CEF will have two roles:** (a) the leader of the loan syndication with participating financial institutions (PFIs); and (b) a lender to subprojects using GCF and its own funds. In its role as the syndication lead, CEF will identify and select subprojects and beneficiaries based on predefined eligibility criteria and conduct detailed due diligence on technical, economic, environmental, financial feasibility, and other project-related assessments. CEF will then present candidate projects to the syndicated banks for their own due diligence and, ultimately, decision on whether to co-invest. A transparent decision-making process should be put in place to allocate funding (and, if applicable, guarantees) to participating syndicated lenders. CEF will be responsible for leading the preparation of an intercreditor agreement that will establish the rules and procedures for the loan syndication with commercial financial institutions. In its role as a lender, CEF will have the responsibility to appraise and invest in the pipeline of EE subprojects and make investment decisions. For both activities, CEF will have full responsibility to ensure all activities are implemented in accordance with the OM, as approved by CEF and the World Bank.

37. **Under Subcomponent 1.2, CEF will be responsible for developing the new credit enhancement product(s) that will be offered by the GF.** CEF will have full responsibility to ensure the GF is implemented in accordance with the agreed OM. CEF may opt to implement the GF through an off-balance-sheet solution, in which case, CEF will become an investor in the GF. In this case, the GF will have its own governance structure, but CEF will continue to be responsible for ensuring the GF will operate according to the OM. Regardless of whether the GF is implemented through an on-balance-sheet or off-balance-sheet solution, CEF will assume the responsibility to draw down on the IBRD contingent loan to ensure the GF has sufficient funds to meet its obligations under guarantees sold to the commercial financial institutions.

38. **CEF will also be responsible for implementing the TA activities under Component 2.**

39. **Flow of funds for Subcomponent 1.1 (loan syndication).** GCF concessional loan funds of US$186 million will flow through the World Bank to CEF in the form of a GCF Loan Agreement, once the FAA

between the World Bank and GCF is effective (estimated Fall 2018). CEF will subsequently on-lend the GCF concessional loan to ESL and IEE subprojects, along with its own counterpart funds and other syndicated banks, in its role as a lender in the loan syndication. For Subcomponent 1.2 (GF), the flow of funds will involve the following: (a) US$5 million of GCF grant funds will flow through the World Bank to CEF in the form of a GCF Grant Agreement; (b) US$20 million of CTF contingent recovery grant will flow through the World Bank to CEF through a CTF Grant Agreement; and (c) US$200 million of IBRD contingent loan funds will provide additional capital to the GF, if needed. At least three subaccounts will be created within the GF to receive, manage, and report on the use of the proceeds of these funds separately. Guarantee products will be sold by the GF to syndicated lenders. Payouts made under guarantees that are called over the life of the project will be made according to preagreed seniority, using some or all of the following: GF revenues (for example, guarantee fees collected and interest income), GCF grant proceeds, CTF grant proceeds, and IBRD loan proceeds. If required, a subsidiary agreement will be signed between CEF and the GF to establish the responsibilities of CEF as a shareholder in the GF and potentially as a management agent. In addition, the GF governance rules will be finalized and included in the OM before project effectiveness.

40. **Implementation arrangements at the subproject level will be led by the private sector sponsors of the EE subprojects.**

41. **Detailed implementation arrangements can be found in annex 2.**

B. Results Monitoring and Evaluation

42. **During implementation, the monitoring and evaluation (M&E) of the project will involve:** (a) tracking performance indicators as included in annex 1, (b) periodic progress reports broken down by component and window, and (c) a midterm review (MTR) about 3.5 years after project effectiveness[16]. CEF will also report financial information, in line with domestic law, to allow assessment of the overall health of the institution.

43. **CEF, as the primary financial counterpart will be responsible for the overall Project M&E, including collection of sub-project loan and the GF performance information and reporting on the results and impacts of the Project.** CEF will develop a comprehensive M&E plan during the first year of implementation, and staff will be assigned to collect and collate information in a suitable format to monitor the implementation performance of all the Project components. Such continuous evaluation will permit the Project to be more responsive to issues that arise during implementation and promote accountability and transparency about the use of resources.

44. **CEF has the systems and capacity to implement the required M&E aspects of the Project.** To ensure it has access to all required information, CEF will ensure that all the required reporting responsibilities for the Project are passed to the sub-loan beneficiaries and the GF through legal or other relevant agreements.

[16] Although the Project implementation period is 15 years in order to cover the entire period in which the credit enhancement products are available, the underlying subproject investments will be completed in the first five to seven years of the Project, therefore the MTR will take place after 3.5 years.

C. Sustainability

45. **CEF is dedicated to developing new business lines in urban EE and the provision of credit enhancement products for project finance investments.** This Project provides CEF the opportunity to enter into new markets and, using the concessional funding available under the Project, take risks that otherwise would be considered too high. However, once the Project is under implementation and takes the risks/returns of investments in the ESL and IEE sectors, as well as the risks/returns of the provision of credit enhancements for project finance, CEF will be well placed to scale up these products. As such, the Project will serve as a demonstration project to allow CEF to develop innovative business lines that will grow well after the life of this Project.

46. **Moreover, the Project will result in the creation of new asset classes in Brazil for limited-recourse investments in energy infrastructure.** By leading a loan syndication with commercial lenders for project finance investments that benefit from credit enhancement mechanisms, the EE Facility established by CEF will crowd-in new investors to a highly scalable investment opportunity, establishing a new paradigm for investment in urban energy. Once those new asset classes are proven in the market, the potential for replication to other sectors and countries is enormous. At the sector level, the Project will test and prove new, off-balance-sheet business models for cities and industries and offer a template and toolkit that can be used by other entities not directly taking part in the Project, with the final outcome of unlocking the commercial urban EE potential in Brazil.

47. **Concessional funds will be used to derisk the development of new business models and business lines; however, they will be phased out over time.** CEF will benefit from the GCF concessional loan to provide a lower 'blended' cost of funding, benefits of which will be passed to sub-loan beneficiaries through a lower cost of debt financing. As there is no existing market for limited-recourse investment in the ESL and IEE sectors, the use of concessional funds will not crowd out private financing, but rather will serve the purpose of catalyzing a new market by bringing in the private sector as co-lenders. Once the Project is complete, subproject risks will be better understood, the market will be established, and concessional funding should no longer be needed to scale up further investments in these sectors. In terms of credit enhancements, the GF will initially benefit from grant funding to reduce its cost and support the provision of first-loss coverage to the commercial lenders. This will increase private sector participation and will allow for lower guarantee fees (a benefit ultimately passed on to the sub-loan beneficiaries). To ensure sustainability, the GF will charge fees to beneficiaries of guarantees sufficient to cover expected guarantee payouts over the long-term. The GF is expected to continue operations after the Project closes and will thus be designed to be sustainable.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

48. **The overall risk rating for the Project is considered *Substantial*.** This risk is assessed for the overall implementation of the Project (15 years).

49. **Political and governance risk**. **This risk is rated *Substantial*** in view of the current political and judicial context that has resulted from the ongoing Federal judicial investigation, which has affected many

politicians and construction companies (some of them traditional sponsors of infrastructure project), including several state-owned companies. Such volatile political and judicial environment might affect the top management and the policy priorities of CEF. To manage this risk, the Government and CEF have taken bold steps to improve CEF's corporate governance and mitigate political interference by adopting new bylaws on January 19, 2018,[17] which define among others that directors and vice presidents from now on will be selected by the Board based on experience, qualification, and the absence of judicial records.[18]

50. **Macroeconomic risk. This risk is rated *Substantial*.** Macroeconomic risks arise mainly from the uncertainty over the pace of reforms that underpin fiscal adjustment. Following the deep recession of 2015–16, the Brazilian economy has stabilized and returned to growth since 2017. Inflation has been well controlled over the past year, providing the Central Bank with space to significantly reduce policy interest rates. Notwithstanding currency depreciation and risks of contagion from events in recent months in Argentina, external vulnerabilities have also been reduced, with the current account deficit almost closed at 0.4 percent of GDP and reserves at US$380 billion (18 percent of GDP)[19]. Brazil's main remaining vulnerability is fiscal sustainability as the budget deficit remains large and public debt has reached 75 percent of GDP[20]. Risks stem from the uncertainty over the implementation of the Federal Government's gradual fiscal adjustment plan. The Federal Congress has enacted a Constitutional Amendment to enforce a sustainable fiscal path by controlling federal primary spending. Nevertheless, adherence to the expenditure ceiling will require the adoption of politically difficult measures, and therefore, there is a possibility that a future government may seek to deviate from the fiscal adjustment path imposed by the rule. As a consequence, inflation and nominal interest rates may increase, reducing the relative attractiveness of EE subproject investments under this Project. Mitigating against this possibility is the fact that any attempt to deviate from this path would affect investor perceptions and result in a loss of market confidence; trigger financial outflows; and result in a depreciating exchange rate, higher inflation, and interest rates, all of which would be equally or more unpopular. Further, the level of public debate and understanding about the need to adopt a reform of the pension system and to control civil servants' wages has increased sharply over the past few years, and therefore, these reforms are likely to be at the center of the Government after the October 2018 Presidential and Parliamentary elections.

51. **Technical design. This risk is rated *Substantial*.** The design of the EE Facility is based on experiences and lessons gained from similar operations. However, CEF's experience in limited-recourse financing and in the urban EE sector is limited. In addition, there are some risks associated to the Project design, including: (a) lack of EE subprojects willing to benefit from the proposed financing mechanism, in particular in IEE, given the new accounting rules (International Financial Reporting Standards [IFRS] 16), which limit the nature and extent of off-balance-sheet financing; (b) insufficient quality of subprojects applying to the facility; (c) lack of private investors willing to invest at facility or project level; (d) insufficient concessional funding; and (e) insufficient energy conservation and GHG mitigation

[17] These new bylaws (*Estatuto Social*) are aligned with the State-owned Companies Law (13.303/2016) and the State-owned Companies Program of B3, the São Paulo-based largest Brazilian exchange.
[18] The new bylaws implement a series of other governance improvements, which include the creation of a general assembly with competencies to appoint and designate Board members, decide Board members' remuneration, and approve financial statements, and, more broadly, improve the transparency of decision processes. In addition, the World Bank will implement its specific policies for supervising FIs.
[19] Brazil Central Bank.
[20] Brazil Ministry of Finance.

performance. To mitigate this risk, CEF is undertaking an in-depth assessment of how to optimally design the EE Facility before Project effectiveness, taking into account the domestic and international financial regulations, institutional coordination, and interests of potential commercial investors. It will also ensure a robust pipeline of subprojects in each of the targeted sectors. These activities will be supported by the TA funding under Component 2.

52. **Institutional capacity for implementation and sustainability. This risk is rated *Substantial*.** CEF could eventually face difficulties and internal resistance to implementing an innovative financing mechanism that departs from its usual lines of business; this might derive from the change of commitment and support from the top management and intermediary level and/or from the lack of capacity of staff. To mitigate this risk, CEF has been selected jointly with the PPI secretariat because of the commitment and previous experience with innovative projects involving multilaterals. CEF has demonstrated strong commitment to the Project at the highest management level and at the technical level; subproject assessment tools developed by the World Bank have already been shared with the relevant CEF units; TA activities will ensure continued support to building capacity with CEF; and the existence of a dedicated PIU in CEF (GECOA) will ensure continuity despite turnover in top management.

53. **Fiduciary risk. This risk is rated *Substantial*.** The Project entails an innovative design with multiple financial instruments that will require additional training for CEF's fiduciary staff, creating a risk of delays, particularly during the beginning of implementation. CEF will develop a detailed OM to describe, among other aspects, the financial management (FM) principles for this Project and implement any necessary fiduciary systems enhancements. Training will be provided to CEF supported by the TA funding under Component 2.

54. **Environmental and social risk. This risk is rated *Moderate*** as stated in the Environmental and Social Management Framework (ESMF). This is because of the low expected impact of the sub-project technologies associated with r, the fact that the EE retro-fits will be brown-field projects (no land acquisition required), and will exclude Category A projects. selection of low-impact projects, implemented in line with the ESMF, and benefiting from CEF's existing robust environmental social framework and experience would manage this risk.

VI. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

55. **The Project will support EE investments through the EE Facility (Component 1) and TA (Component 2).** Given the analytical constraints associated with quantifying benefits from Component 2 that cannot be measured in monetary terms, the economic and financial analyses focus on Component 1, which accounts for 100 percent of the value of the IBRD loan, 100 percent of the CTF grants, and 98 percent of the GCF funds.

(a) Financial and Economic Analysis of Subprojects, Subcomponent 1.1

56. **Financial and economic analysis of Subcomponent 1.1 of the EE Facility is captured by analysis of the ESL and IEE subprojects.** An analysis was conducted considering 'average' ESL and IEE subprojects.[21] The analysis is based on results of previous prefeasibility studies for ESL and industrial energy audits in Brazil. The detailed financial and economic analyses can be found in annex 7.

57. **In the economic analysis, investment, operating costs, and savings are adjusted to reflect economic values, excluding taxes and subsidies.** Benefits are estimated based on savings to end users. The main economic benefit from EE investments is the economic value of the saved energy and savings on operating expenditures, plus the social value associated with reductions in carbon emissions. The main economic costs are the capital investments. In the financial analysis, taxes and subsidies are considered, and the value of carbon emissions is excluded. The cost of the capital investment of financing for subprojects considers the blended cost of CEF loans (including on-lending of GCF funds and associated hedge costs) and commercial loans under the loan syndication. Other important benefits are expected but have not been quantified in this analysis, including improved provision of municipal services, improved perception of safety—particularly for women—improved industrial competitiveness, and improved capacity within CEF.

58. **The analysis shows that the subprojects are both economically and financially viable at the assumed financing terms of the EE Facility.** The EE Facility is expected to dedicate approximately 50–70 percent of its debt to subprojects in the ESL sub-sector and 30–50 percent to subprojects in the IEE sub-sector. The analysis assumes 70 percent of EE Facility sub-loans are dedicated to ESL subproject and 30 percent toward IEE subprojects. The economic internal rate of return (EIRR) of the ESL and IEE subprojects are estimated to be 39 percent and 37 percent, respectively; the financial internal rate of return (IRR) of the ESL and IEE subprojects is estimated at 12 percent and 17 percent, respectively. Expected direct reductions over the subprojects' lifetimes[22] are 12.5 $MtCO_2e$. Without the benefit of the GCF concessional loan, the cost of debt would increase by approximately 20 percent and the tenor would be shorter, compromising the viability of the subprojects. The results of the economic and financial appraisal, aggregated at the EE Facility level, are presented in table 1.[23] The detailed analysis can be found in annex 7.

[21] Average size ESL subproject is defined as 42,500 points of light; average IEE is defined as the 'Project-Portfolio', which represents a typical set of interventions in the IEE space, assuming 10 different technology/process interventions (for example, heating, ventilation, and air conditioning (HVAC); energy-efficient motors; heat recovery; and variable-speed pumps). See annex 7 for more detail.

[22] For this analysis, the economic life of ESL subprojects is 13 years and that of IEE subprojects is 8 years.

[23] All returns shown are net of inflation.

Table 1. Economic and Financial Appraisal Summary - Aggregated EE Facility Portfolio

Sub-sector	Economic Analysis			Financial Analysis			
	Investment	Expected lifetime GHG reductions	EIRR (real)	Investment	Financial NPV	IRR (real)	Payback period
	US$ M	*$MtCO_2e$*	*%*	*US$ M*	*US$ M*	*%*	*years*
ESL	479.8	3.9	39%	767.3	148.9	12%	6.1
IEE	295.5	8.6	37%	328.3	112.2	17%	1.5
Total	775.3	12.5		1,095.6	261.1		

(b) Financial Analysis of the GF

59. **A preliminary financial analysis was prepared to assess the viability of the GF.** This analysis assumes the GF will be capitalized at the outset with the GCF and CTF grants. The base case assumes average annual sub-loan default rates of 10 percent and capital reserve requirements of 15 percent of the total annual value at risk (estimated requirement to achieve BBB credit rating[24]). When necessary, CEF will draw down on the callable capital of the IPF contingent loan and channel these funds to the GF to ensure that guarantees to commercial lenders are paid out and reserve requirements are maintained. The analysis estimates (a) the minimum annual guarantee fee required to ensure the GF is sustainable, (b) the value of GCF, CTF, and IPF contingent loan funds utilized over the GF's lifetime, and (c) the impact of the IPF contingent loan and grant funding from GCF and CTF on the viability of the GF.

60. **In the base case scenario, payouts are estimated at US$36 million over 15 years, with full utilization of the US$5 million of the GCF grant and US$16 million of CTF funds and disbursement of approximately US$12 million of the IPF contingent loan to meet capital reserve requirements.** Of the contingent recovery grant, US$4 million would be reimbursed to the CTF at the end of the Project. The minimum sustainable guarantee fee under this scenario is approximately 0.8 percent. The detailed analysis is provided in annex 7.

61. **Sensitivity analysis shows the IPF contingent loan, GCF grant, and CTF grant significantly reduce the cost of the operation of the GF.** Having the IPF contingent loan as callable capital will enable the GF to achieve a higher de facto credit rating (up to AAA) without bearing the financial cost of holding reserves as cash in the GF. If the reserves for the AAA rating need to be held as cash in the GF, the minimum fee would increase up to 1.1 percent in the base case scenario (increase of 40 percent). Without the CTF and GCF grants, the GF would have to borrow from the IPF contingent loan to replace these cash reserves, and the minimum guarantee fee in the base case scenario would increase to 1.7 percent (increase of 125 percent). These additional costs incurred without the GCF, CTF, and IBRD support would result in higher sub-loans cost, reducing the pipeline and compromising the scale and impact of the Project. Details on the sensitivity analysis are provided in annex 7.

[24] The analysis is based on international credit ratings for the underlying subproject credit analysis as well as for the targeted GF rating, due to the limited availability of information on Brazilian credit rating data.

B. Technical

62. **Technologies, technical parameters, estimated costs, and regulatory considerations have been analyzed for each component as part of the prior TA activities supporting the preparation of FinBRAZEEC.** This market research indicated a large untapped potential for EE subprojects in the ESL and IEE sectors, but this potential is not being realized due to the barriers described in Section B (and detailed in annex 1 and annex 6). The Project is designed to support CEF to provide innovative financial and technical solutions to help overcome these market barriers, including providing dedicated financing lines for off-balance-sheet financed EE subprojects, offering credit enhancement products to attract the private sector, and providing TA to support technical preparation of a robust pipeline of subprojects.

63. **CEF has the capacity necessary to coordinate and supervise the project activities.** CEF has technical teams with experience evaluating subprojects in the municipal street lighting and industrial sectors, and TA under Component 2 will allow CEF to further increase its capacity to evaluate EE investments in these sectors. Subproject identification, due diligence, contractual negotiation, and supervision will be conducted by CEF, supported, as necessary, by the World Bank. In many cases, subproject due diligence will be done alongside commercial lenders, thereby increasing the robustness of the process. The Project will support subprojects that meet predefined eligibility criteria, which will be established between CEF and the commercial lenders, with World Bank support and endorsement. Subprojects will be implemented in accordance with local laws and internationally accepted technical standards. CEF's wide-reaching network of satellite offices, relationships with cities, and relationships with large industrial companies will ensure it has the market knowledge required to build a strong pipeline, as well as the local man power to conduct subproject due diligence. No key technical challenges are foreseen; however, support from experts (from the World Bank and elsewhere) will be sought as needed, in particular for more complex subprojects in the industrial space.

64. **In terms of CEF's role as an FI, CEF is assessed to have the technical and financial capacity to lead the development of the new financial products under Component 1 of this Project.** CEF is a profitable, 100 percent government-owned bank with a leading role in specific segments of the Brazilian financial market (for example, leader in mortgage lending and saving deposits, the largest bank by total deposits and loan portfolio, the exclusive agent for managing social security benefit funds, and a major agent of federal government policies). CEF has substantial experience acting as an FI of public funds. Under this Project, CEF will move outside of its traditional model of on-lending public funds and will develop innovative business lines designed to partner and co-lend with the private sector, as well as develop a new model for guarantees for project finance transactions. This innovation will push CEF beyond its 'business-as-usual' approach. Any gaps in the existing skill set within CEF to design and implement these new products will be filled using the ongoing Bank-executed TA activities and the TA funds under Component 2 of this Project.

65. **CEF is carefully considering the optimal design for the new products under this Project in relation to new capital regulatory requirements under Basel III, in particular the implications of an on-balance-sheet versus off-balance-sheet design of the GF (Subcomponent 1.2).** As of September 2017, CEF's Capital Asset Ratio was 15.2 percent; Tier 1 Capital was 9.54 percent, above the minimum capital required, but stricter Tier 1 Capital requirements of 9.5 percent will be taking effect as of January 2019. CEF has been implementing several measures to improve its capital position, and the Tier I capital ratio increased to 11.22 percent as of December 2017. CEF's funding is stable and diversified, with high-quality

liquid assets, and credit risk exposures as well as losses have been limited. The detailed FI assessment is provided in annex 5. The World Bank will continue to support CEF to optimally implement the Project considering CEF's compliance with international banking regulations, and TA funds under Component 2 will also be used to support CEF to this end.

C. Financial Management

66. **The FM systems' capacity and performance, with the implementation of the proposed mitigating measures and agreed actions to strengthen the systems (which will be reflected in the Program Action Plan), are adequate to provide reasonable assurance that the Project funds will be used for the intended purposes,** with due attention to the principles of economy, efficiency, effectiveness, transparency, and accountability.

67. The key fiduciary challlenges are as follows: (a) the innovative project design with multiple financial instruments, creating a risk of implementation delays; (b) although CEF already implemented a number of World Bank-financed projects (National Biodiversity Mainstreaming and Institutional Consolidation Project - PROBIO [P094715], Brazil Solid Waste Picker Social Inclusion Initiative [P121881], and Integrated Solid Waste Management and Carbon Finance Project [P106702]), it is expected that additional training will be required; thus, there is a risk of delays in implementing the contracts bidding processes and disbursements under Component 2, particularly during the beginning of implementation. Additional training will be provided to CEF staff under Component 2.**The Project will provide capacity-building to strengthen CEF's capacity to implement the FM aspects of the Project, including** (a) CEF will identify experienced fiduciary staff that will provide support to implementation and ensure the proper use and documentation of funds; (b) CEF Corporate System will be adapted, including the creating of a Ledger Account to properly account and generate FM and disbursement reports; and (c) close support will be provided from the World Bank to assure CEF's understanding of World Bank's policies and procedures throughout the Project life.

D. Procurement

68. **For contracts financed in whole or in part by the IBRD Loan, procurement will be carried out in accordance with the World Bank's Procurement Regulations for IPF Borrowers dated July 2016, revised November 2017.** However, according to Section 2.2.b of the Procurement Regulations, the Procurement Regulations do not apply to the procurement of goods, works, non-consulting services, and consulting services financed by the World Bank through loans made by eligible FIs to private borrowers.

69. **The World Bank has carried out an assessment of CEF's ability to implement the procurement activities under Component 2 - the US$4 million TA component of the Project that is financed by a GCF grant, administered by the World Bank.** The assessment revealed CEF has adequate structure and staffing to carry out the procurement required for the Project, especially given CEF's experience with World Bank and other donor-funded procurement, and the fact that CEF's recent procurement regulations provide specifically for the application of donors' procurement rules, mitigating the usual conflicts in interpreting which rules takes precedence. As anticipated, CEF is not deeply familiar with the World Bank's new procedures for the selection of consultants; so, training is being proposed to the CEF's staff and supporting procurement experts.

70. **CEF prepared a detailed Project Procurement Strategy for Development (PPSD) for the procurement activities under the TA.** The PPSD identified how procurement activities will support the development objectives of the Project and deliver the best value for money under a risk-based approach. CEF is a robust organization, with clearly defined roles and responsibilities, solid experience in procurement, and robust governance and economic structures. Most of the contracts under the Project are of low value and low risk, and the market analysis has already identified the major players in the market. It shall also provide adequate justification for the selection methods in the Procurement Plan and for the prior-review thresholds.

71. **Procurement activities that require retroactive financing will be identified in the Procurement Plan and will be carried out in accordance with the Procurement Regulations.**

72. **Procurement supervision and post review by the World Bank.** The World Bank will carry out procurement post reviews on an annual basis with an initial sampling rate commensurate with the risk rating of the Project. This rate will be adjusted periodically during implementation based on CEF's performance. The World Bank will also carry out procurement supervision missions on a semiannual basis. CEF shall upload all procurement and contract information in the Systematic Tracking of Exchanges in Procurement (STEP), which will be used to provide the World Bank with a consolidated list of all contracts for goods, works, and consultants' services awarded under the Project. The post review contract sample will be selected from STEP.

E. Environment and Social (including Safeguards)

73. **Based on the findings of the Safeguards Diagnostic Report, CEF's institutional and management capacity is broadly considered as adequate given the environmental and social risks to be managed under this operation.** An ESMF was prepared by CEF following World Bank guidelines. The draft ESMF was cleared and disclosed on the World Bank website on January 26, 2018 and by CEF on March 5, 2018. Due to low response rates to this publication, the document was republished[25] and an additional round of public consultations was conducted on May 18, 2018, and comments were incorporated into the final ESMF as appropriate. This process was led by CEF and supervised by the World Bank. The final ESMF was cleared and disclosed by CEF and the World Bank on May 24, 2018.

74. **CEF's environmental and social responsibility policy (*Política de Responsibilidade Socioambiental* [PRSA]) and risk management system show full equivalence with the requirements of the World Bank safeguard policies.** CEF's PRSA requires its clients to comply with the relevant and robust Brazilian social and environmental legislation (including licensing process). When analyzing project finance applications with investments of US$10 million or more and in corporate loans that are linked to projects worth US$100 million or more, CEF takes the Equator Principles[26] into account, which reflect IFC's Performance Standards on Environmental and Social Sustainability and associated Environmental, Health,

[25] http://www.caixa.gov.br/sustentabilidade/responsabilidade-social/compromissos/Paginas/default.aspx
[26] The Equator Principles is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in project finance. It was formally launched in Washington DC on 4 June 2003, and based on existing environmental and social policy frameworks established by the International Finance Corporation.

and Safety General Guidelines. In addition, the Brazilian labor, environmental, and social rules for the sector are also equivalent to the World Bank Group's Environmental, Health, and Safety Guidelines.

75. **The potential impacts during the implementation phase of subprojects involve:** (a) excavation, noise, dust, and disposal of domestic waste and waste water typical to installation/construction activities; (b) disposal of old parts of inefficient equipment, which may contain hazardous waste; and (c) safety issue during the construction/installation of new equipment and facilities. The subprojects implementation related impacts are likely to be localized and can be managed and mitigated to acceptable levels by applying good standards and practices. The possible impacts during the operation phase of new equipment and facilities may include safety issues, air emission, solid waste, wastewater, and disposal of hazardous substances from industries.

76. **Citizen engagement.** As part of CEF´s financing arrangements, it requires a structured and continuous Social Communication Program to be created to receive complaints, suggestions, or queries and to monitor grievance resolution. An indicator has been included in the Results Framework to measure the level of satisfaction of final beneficiaries to the process by which they were engaged in the identification and preparation of the EE subprojects in compliance with the citizen engagement corporate requirements.

77. **Gender Analysis.** A Gender Action Plan was prepared to identify potential opportunities to integrate gender issues within the FinBRAZEEC (see annex 8). In Brazil, gender advances in the legal and political spheres have been accompanied by significant improvements in education and health. Nevertheless, gender progress is still lagging behind in other dimensions, including in women's violence prevention, and Brazil is ranked fifth gloabally in Violence Against Women (VAW) rates. In particular, victimization in public spaces is a major concern. A 2017 national survey showed that 70 percent of women under 24 years old have suffered aggression in public spaces; 25 percent of interviewed women suffered aggression within the past year, of which 39 percent took place on public streets. In addition, 40 percent of women declared having suffered from harassment, 78 percent of which took place on public streets.

78. **Gender-sensitive interventions.** Safety audits conducted globally have concluded that street lighting is a key tool to improve women's sense of insecurity and prevent violence against females in public spaces. Given that at least 50 percent of the investments under Component 1.1 will be targeted at ESL subprojects that provide better quality street lighting, it is expected that the Project will have a positive impact on women's safetyperception. To this end, the Project will seek to target interventions in areas with high women's victimization and high perception of insecurity. A study developed in parallel to the Project will be conducted in pilot areas in selected sub-projects prior to implementation, and an evaluation will be conducted after installation of the improved lighting technology to investigate the impacts of improved public street lighting on women's perception of insecurity.

79. **Climate and disaster risks.** The FinBRAZEEC Project has been screened for climate and disaster risks using the World Bank's in-depth energy screening tool. Exposure of the subprojects to climate (that is, flooding, extreme precipitation, droughts, strong winds, and so on) and geophysical hazards (earthquake, tsunami, volcanic eruption, and landslides) has been rated Moderate, while the current and future impacts of identified climate and geophysical hazards have been rated Low. Moreover, the level of risk to energy delivery related to the Project is considered Moderate. The Project will encourage CEF, PFIs,

municipalities, ESL concessionaires, and IEE aggregators to further evaluate the risks during design and construction and incorporate appropriate measures where applicable.

F. Other Safeguard Policies (if applicable)

80. None.

G. World Bank Grievance Redress

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

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework

Project Development Objective(s)

The Project Development Objective is to unlock private financing for urban energy efficiency projects in Brazil by reducing the credit risk and enhancing the technical quality of Efficient Street Lighting subprojects and Industrial Energy Efficiency subprojects.

PDO Indicators by Objectives / Outcomes	DLI	CRI	Unit of Measure	Baseline	End Target
Acheive energy savings and reduce GHG emissions					
Projected Lifetime Energy Savings (electricity and fuel)			Mega Joules (MJ)	0.00	169,194,000,000.00
Projected energy savings from ESL			Mega Joules (MJ)	0.00	31,869,000,000.00
Projected lifetime energy savings for IEE			Mega Joules (MJ)	0.00	137,325,000,000.00
Acheive energy savings and reduce GHG emissions					
Net GHG emissions savings			Tones/year	0.00	960,000.00
Net GHG emissions savings in ESL			Tones/year	0.00	300,000.00
Net GHG emissions saving in IEE			Tones/year	0.00	660,000.00

PDO Indicators by Objectives / Outcomes	DLI	CRI	Unit of Measure	Baseline	End Target
Capital mobilized for EE financing					
Capital mobilized (debt)			Amount(USD)	0.00	580,000,000.00
Commercial capital mobilized (debt)			Amount(USD)	0.00	400,000,000.00
CEF funds mobilized (debt)			Amount(USD)	0.00	180,000,000.00

Intermediate Results Indicators by Components	DLI	CRI	Unit of Measure	Baseline	End Target
Component 1.2 - Credit Enhancement Products					
Guarantees subscribed			Amount(USD)	0.00	200,000,000.00
Component 2 - Technical Assistance					
Number of street lighting PPPs advised			Amount(USD)	0.00	6.00
Number of Technical Studies completed			Number	0.00	5.00
Number of CEF employees trained			Number	0.00	20.00
Number of female CEF employees trained			Percentage	0.00	50.00

Grievances registered related to delivery of project benefits that are actually addressed			Percentage	0.00	95.00
Number of gender awareness campaigns conducted			Amount(USD)	0.00	3.00
Perception of insecurity in public spaces among women in pilot areas			Percentage	70.00	77.00

Monitoring & Evaluation Plan: PDO Indicators	
Indicator Name	Projected Lifetime Energy Savings (electricity and fuel)
Definition/Description	This indicator projects lifetime energy savings (electricity and fuel) directly attributable to the Project, converted to MJ. The baseline value is expected to be zero. All projected lifetime savings will be accounted at the time when the EE technologies are installed and operating under the subprojects.
Frequency	Bi-annual
Data Source	CEF progress report
Methodology for Data Collection	CEF will collect data from sub-projects, which will be based on metered and/or deemed savings comparing energy use in the baseline scenario versus project scenario. The precise methodology to calculate energy savings for each technology will be specified in the Operations Manual. The lifetime savings will be fully accounted at the time that the EE technology is installed as part of the sub-project implementation. CEF will ensure a harmonized approach and report to the World Bank on the results bi-annually.
Responsibility for Data Collection	CEF, which will pass on responsibility to beneficiaries of the sub-loans and/or guarantees to provide the required data.

Indicator Name	Projected energy savings from ESL
Definition/Description	This indicator projects lifetime electricity savings from ESL directly attributable to the Project, converted to MJ. The baseline value is expected to be zero. All projected lifetime savings will be counted at the time when the EE technologies have been installed and are operating under the sub-projects.
Frequency	Bi-annual
Data Source	CEF progress report
Methodology for Data Collection	CEF will collect data from sub-projects, which will be based on metered and/or deemed savings comparing energy use in the baseline scenario versus project scenario. The methodology to calculate energy savings from ESL will be specified in the Operations Manual. The lifetime savings will be fully accounted at the time that the ESL technology is installed and operating as part of the sub-project implementation. CEF will ensure a harmonized approach and report to the World Bank on the results bi-annually.
Responsibility for Data Collection	CEF, which will pass on responsibility to beneficiaries of the sub-loans and/or guarantees to provide the required data.

Indicator Name	Projected lifetime energy savings for IEE
Definition/Description	This indicator projects lifetime electricity and fuel savings from IEE directly attributable to the Project, converted to MJ. The baseline value is expected to be zero. All projected lifetime savings will be counted at the time when the EE technologies have been installed and are operating under the sub-projects.
Frequency	Bi-annual
Data Source	CEF progress reports
Methodology for Data Collection	CEF will collect data from sub-projects, which will be based on metered and/or deemed savings comparing energy use in the baseline scenario versus project scenario. The methodology to calculate energy savings for each IEE technology will be specified in the Operations Manual. The lifetime savings will be fully accounted at the time that the EE technology is installed as part of the sub-project implementation. CEF will ensure a harmonized approach and report to the World Bank on the results bi-annually.
Responsibility for Data Collection	CEF, which will pass on responsibility to beneficiaries of the sub-loans and/or guarantees to provide the required data.

Indicator Name	Net GHG emissions savings
Definition/Description	This indicator projects lifetime GHG savings directly attributable to the Project. The baseline value is expected to be zero. All projected lifetime savings will be accounted at the time when the EE technologies are installed and operating under the subprojects.
Frequency	Bi-annual
Data Source	CEF progress reports
Methodology for Data Collection	CEF will collect metered and/or deemed energy savings data on subprojects and convert this to GHG savings (tCO2e) using the appropriate methodology and grid emission factor, as specified in the Operations Manual. The lifetime savings will be fully accounted at the time that the EE technology is installed and operating as part of the sub-project implementation.
Responsibility for Data Collection	CEF, based on energy savings data collected from subprojects.

Indicator Name	Net GHG emissions savings in ESL
Definition/Description	This indicator projects lifetime GHG savings directly attributable to the Project from ESL projects. The baseline value is expected to be zero. All projected lifetime savings will be accounted at the time when the ESL technologies are installed and operating under the subprojects.
Frequency	Bi-annual
Data Source	CEF progress reports
Methodology for Data Collection	CEF will collect metered and/or deemed energy savings data on ESL subprojects and convert this to GHG savings (tCO2e) using the appropriate methodology and grid emission factor, as specified in the Operations Manual. The lifetime savings will be fully accounted at the time that the ESL technology is installed and operating as part of the sub-project implementation.
Responsibility for Data Collection	CEF, based on energy savings data collected from ESL subprojects.

Indicator Name	Net GHG emissions saving in IEE
Definition/Description	This indicator projects lifetime GHG savings directly attributable to the Project from IEE subprojects. The baseline value is expected to be zero. All projected lifetime savings will be accounted at the time when the IEE technologies are installed and operating under the subprojects.
Frequency	Bi-annual
Data Source	CEF progress reports
Methodology for Data Collection	CEF will collect metered and/or deemed energy savings data on IEE subprojects and convert this to GHG savings (tCO2e) using the appropriate methodology and grid emission factor, as specified in the Operations Manual. The lifetime savings will be fully accounted at the time that the IEE technologies are installed and operating as part of the sub-project implementation.
Responsibility for Data Collection	CEF, based on energy savings data collected from IEE subprojects.

Indicator Name	Capital mobilized (debt)
Definition/Description	This indicator reports on the amount of debt capital mobilized to finance ESL and IEE projects under Subcomponent 1.1 of the Project. It includes the aggregation of capital from CEF and commercial lenders.
Frequency	Bi-annual
Data Source	CEF progress report
Methodology for Data Collection	CEF will track the amount of debt financing provided by CEF and commercial lenders to the sub-projects receiving debt financing under Subcomponent 1.1 of the project.
Responsibility for Data Collection	CEF

Indicator Name	Commercial capital mobilized (debt)
Definition/Description	This indicator reports on the amount of debt provided by commercial lenders to finance ESL and IEE projects under Subcomponent 1.1 of the Project.
Frequency	Bi-annual
Data Source	CEF progress report
Methodology for Data Collection	CEF will track the amount of debt financing provided by commercial lenders to the sub-projects receiving debt financing under Subcomponent 1.1 of the Project.
Responsibility for Data Collection	CEF

Indicator Name	CEF funds mobilized (debt)
Definition/Description	This indicator reports on the amount of debt provided by CEF to finance ESL and IEE projects under Subcomponent 1.1 of the Project.
Frequency	Bi-annual
Data Source	CEF progress reports
Methodology for Data Collection	CEF will track the amount of debt financing it provides to the sub-projects receiving debt financing under Subcomponent 1.1 of the project, excluding the on-lending of GCF funds.
Responsibility for Data Collection	CEF

Monitoring & Evaluation Plan: Intermediate Results Indicators	
Indicator Name	Guarantees subscribed
Definition/Description	This indicator reports on the cumulative value of guarantees purchased by commercial lenders from the Guarantee Facility under Subcomponent 1.2 of the Project.
Frequency	Bi-annual
Data Source	CEF progress report
Methodology for Data Collection	CEF will track the cumulative value of guarantees sold by the Guarantee Facility to commercial lenders under Subcomponent 1.2 of the Project.
Responsibility for Data Collection	CEF, which will require reporting from the Guarantee Facility to ensure all necessary data is available.
Indicator Name	Number of street lighting PPPs advised
Definition/Description	
Frequency	
Data Source	
Methodology for Data Collection	
Responsibility for Data Collection	

Indicator Name	Number of Technical Studies completed
Definition/Description	This indicator is measures the cumulative number of technical studies completed under Component 2 of the Project.
Frequency	Bi-annual
Data Source	CEF progress report
Methodology for Data Collection	CEF will track the number of technical studies completed under Component 2 of the Project.
Responsibility for Data Collection	CEF

Indicator Name	Number of CEF employees trained
Definition/Description	This indicator is measures the cumulative number of CEF personnel trained under Component 2 of the Project.
Frequency	Bi-annual
Data Source	CEF
Methodology for Data Collection	CEF will track the number of personnel participating in trainings conducted under Component 2 of the Project.
Responsibility for Data Collection	CEF

Indicator Name	Number of female CEF employees trained
Definition/Description	This indicator is measures the cumulative number of female employees trained under Component 2 of the Project.
Frequency	Bi-annual
Data Source	CEF
Methodology for Data Collection	CEF will track the cumulative number of female employees trained under Component 2 of the Project.
Responsibility for Data Collection	CEF

Indicator Name	Grievances registered related to delivery of project benefits that are actually addressed
Definition/Description	This indicator is defined as the number of grievances registered related to delivery of project benefits that are addressed by the Project
Frequency	Bi-annual
Data Source	CEF
Methodology for Data Collection	CEF will track the number of grievances received related to the delivery of the Project, and the number that are addressed.
Responsibility for Data Collection	CEF

Indicator Name	Number of gender awareness campaigns conducted
Definition/Description	This indicator measures the number of gender awareness campaigns conducted under Component 2 of the Project. These campaigns can take place with CEF, subproject sponsors, municipalities, and industrial companies.
Frequency	Bi-annual
Data Source	CEF
Methodology for Data Collection	CEF will track the cumulative gender awareness campaigns conducted under Component 2 of the Project.
Responsibility for Data Collection	CEF

Indicator Name	Perception of insecurity in public spaces among women in pilot areas
Definition/Description	This indicator is measures the decrease in perception of insecurity in public spaces of women in pilot areas for ESL subprojects that will be identified during project implementation.
Frequency	Bi-annual
Data Source	CEF
Methodology for Data Collection	Under Component 2, CEF will conduct field surveys with World Bank support to identify the baseline and project (after ESL implementation complete) levels of female perception of insecurity in public spaces, in selected, pilot areas, to be defined during project implementation.
Responsibility for Data Collection	CEF, with World Bank support.

ANNEX 1: DETAILED PROJECT DESCRIPTION

COUNTRY: Brazil
Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC

SECTORAL AND STRATEGIC BACKGROUND

1. **Brazil is an upper-middle-income country and the fifth largest country of the world, covering an area of 8.5 million square kilometers.** It has a population of approximately 200 million people, most of them living in coastal areas. The country is generously endowed with natural resources and is a leading producer and exporter of agricultural produce, iron ore, bauxite, and limestone. Brazil's economy is the seventh largest in the world, with a GDP of US$2.2 trillion (2013), and it is reasonably diversified: the service sector represents 59 percent of the GDP, followed by industry (21 percent) and agriculture (15 percent)[27].

2. **Brazil is a presidential republic with a federal government structure comprising 26 states and one federal district.** Articles 22 and 23 of the Brazilian Federal Constitution of 1988, as amended in 2005, reserve the exclusive right of the federal government to legislate on matters of energy, international trade, and transportation. This has created an important and central policy role for the federal government in these areas.

3. **Brazil's economic and social progress between 2003 and 2015 lifted 25.4 million people out of poverty, and inequality dropped significantly.** The income level of the poorest 40 percent of the population rose, on average, 7.1 percent in real terms between 2003 and 2014, compared to a 4.4 percent income growth for the population as a whole. After this decade of social progress, Brazil's economy first stumbled and then fell into deep recession. Growth declined from an average of 4.5 percent per year in 2006–10 to 2.4 percent in 2011–14, followed by contractions of 3.8 percent and 3.6 percent in 2015 and 2016, respectively[28]. While external factors triggered the slowdown, an expansionary policy response led to rapidly rising fiscal disequilibria and, together with rising domestic policy uncertainty, to a loss of confidence and a sharp drop in investment. The *Lava-Jato* investigation and the divisive impeachment process drove confidence to record low levels in early 2016[29].

4. **A large structural fiscal imbalance lies at the heart of Brazil's present economic difficulties.** While revenues are cyclical and have declined during the recession, spending is rigid and driven by constitutionally guaranteed social commitments, in particular on generous pension benefits. The large fiscal deficits have translated into rapidly rising public debt. General government gross debt rose from 56.3 percent of GDP at the end of 2014 to 69.5 percent by end 2016[30]. The fiscal crisis extends to

[27] *http://www.worldbank.org/en/country/brazil/overview*
[28] *http://documents.worldbank.org/curated/en/901571499386266016/text/MEC-PforR-PID-Concept-Stage.txt*
[29] Lava Jato: Brazil's Corruption Fallout. The *Lava-Jato* investigation and the divisive impeachment process drove confidence to record low levels in early 2016. https://www.cfr.org/backgrounder/brazils-corruption-fallout
[30] http://documents.worldbank.org/curated/en/148141498229092629/pdf/20170619-Brazil-CPF-draft-for-Board-with-CLR-Acknowledgement-Box-06202017.pdf

subnational governments, which have received a large share of lending by the World Bank and other international financial institutions in recent years.

5. **The recession and tight monetary policy have brought inflation down rapidly in recent months.** In 2015, the adjustment of energy, fuel, and public transport prices, combined with a food price shock and the sharp exchange rate depreciation, pushed inflation to 10.7 percent at year-end, well above the Central Bank's 4.5 ± 2 percent target[31]. However, in 2016, rising unemployment and a rebound of the exchange rate put downward pressure on prices, with inflation dropping to 6.3 percent by end-2016 and 3.6 percent by May 2017. The recession is also reflected in a sharp swing in the credit cycle. Real credit fell by 3.6 percent in 2015 and by 9.2 percent in 2016.

6. **Brazil returned to low but broad-based growth in the first half of 2017.** Private consumption has stabilized in recent quarters, and exports have benefited from increased production of both agricultural and extractive commodities. Yet, uncertainty remains high, reflected in falling investment, which has further decreased to 15.5 percent of GDP over the past year (from 18.1 percent in 2015) [32].

7. **A slow recovery materialized in 2017 with a 1 percent growth and is expected to strengthen moderately in 2018 reaching 1.8 percent[33].** The reduction in inflation and interest rates along with marginal improvements in the labor market should allow for a modest rebound in household consumption, while fiscal constraints will hold back government spending even in an election year. Private investment is expected to remain weak given low capacity utilization and high uncertainty in a complex election year. The recovery is expected to strengthen further in 2019, if the presidential election outcome enables reform efforts to proceed. Brazil's structural, fiscal problems remain unresolved, risking a return to economic and financial instability. On the upside, progress on structural reforms, removing protections and distortive subsidies in product and factor markets, could boost the economy's growth potential.

8. **Brazil remains below countries of similar income in the stock of physical infrastructure.[34]** Despite access to infrastructure has increased over the past decade mostly due to privatization programs of the 1990s and the adoption of the public programs to extend coverage in remote areas, road and infrastructure stocks have barely grown since 1990s. While Brazil has boosted its telecommunications infrastructure over the last 20 years, it is still somewhat behind countries like the Russia Federation, South Africa, and Argentina. Access to water sanitation facility have improved too, but the current figures are lower than in many other comparator countries.

9. **As public funding declined, the Brazilian authorities at both federal and state levels have increasingly resorted to the private sector to help close the gap.** According to the World Bank Private

[31] *https://www.imf.org/external/pubs/ft/scr/2016/cr16348.pdf*. **2016 article iv consultation—press release; staff report; and statement by the executive director for Brazil.**
[32] World Bank Data Base for Brazil. https://data.worldbank.org/country/brazil
[33] Gobal Economic Outlook: https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/WESP2018_Full_Web-1.pdf
[34] According a recent report from the World Bank "How to Close Brazilian Infrastructure Gap in times of austerity" (Martin Raiser J 2017). The report used two comparator groups: (a) the medians across different world regions; namely, Latin America and the Caribbean, East Asia and Pacific, Europe and Central Asia, and industrialized countries and (b) six peer countries with broadly similar characteristics: Russia, China, South Africa, Mexico, and Argentina.

Participation in Infrastructure Database,[35] Brazil has been one of largest markets for PPPs in the world over the past two decades, with around US$517 billion invested between 1990 and 2015. However, several regulatory and capacity barriers limited the efficiency of the implementation and scale-up of the PPP programs. An attempt has been made recently to address these issues through the creation of the PPI in 2016, which reports directly to the President of the Republic and has the authority to coordinate various government agencies. The PPI has tightened appraisal standards and is working in cooperation with the state banks, such as CEF, Banco do Brasil, and the Brazilian National Development Bank (BNDES), as well as with multilateral institutions, such as IBRD, IFC, and Inter-American Development Bank.

10. **In general, infrastructure investments are perceived as risky in Brazil.** Contractual uncertainty is one of the principal reasons why market project finance[36] does not exist and the bulk of infrastructure finance continues to come from public sources. Project finance allows for public and private sectors to share the risks of the projects in an optimal manner; however, it requires predictability of project cash flows. However, in Brazil, there is also a debate among stakeholders about who will absorb the risks: the granting authority versus private sector. Law No. 8.987/95 on concession contracts pushes the risks related to the concessions toward the private sector[37]. Nevertheless, in accordance with international recommendations, the Government has been making different contractual arrangements to take on some of the risks involved in infrastructure investment projects and attract more investments. The long maturity of infrastructure contracts involves a reasonable possibility of financial imbalances occurrences caused by Material Adverse Effect Uses in Government Action. In such a context, a government authority that acts against the borrower or any of its subsidiaries can reasonably be expected to cause material adverse effect.

11. **In the absence of project financing structures, the Brazilian state-owned development banks, in particular BNDES and CEF, have been the most important financiers of infrastructure and industrial projects in the country in recent decades.** They have been providing funding indexed to the TJLP,[38] a proxy for long-term interest rate, which is far lower than regular rates from commercial banks. BNDES's disbursements in infrastructure increased significantly after 2003, going from US$938 millionto US$11.2 billion in 2014. The BNDES and CEF together accounted for 62 percent of the total investments in infrastructure in Brazil in 2014. In 2016, as part of the financing, the progressive displacement of public banks—BNDES and CEF—and loans guaranteed by the National Treasury accounted for 83 percent of the debt taken by the infrastructure sector to finance its investments (Source: CNI). Until 2009, the Workers' Support Fund had been the most relevant source of funding to the BNDES. In 2009, the funding situation changed as the National Treasury assumed the role of the BNDES's main creditor.

[35] https://ppi.worldbank.org/snapshots/country /Brazil. The definition of PPPs excludes pure concession, without any public sector commitment, which are regulated under the 1995 Concessions Law. PPPs as defined under the 2004 PPP Law always include explicit public sector funding. The World Bank database on PPPs combines both, and this Project Appraisal Document (PAD) refers to both accordingly.

[36] Project finance is the practice of financing based on the cash flow of a project, where the collateral is the assets and receivables of the same project.

[37] Brazil Law No. 8.987/95. https://books.google.com/books?id=V4RuM_1kPhAC&pg=RA2-PA7&lpg=RA2-PA7&dq=Brazil:+Law+No.+8.987/95&source=bl&ots=C8JaJZxlxO&sig=5gsjZ6yrDD3VFiB--fPwaq6D2K4&hl=es&sa=X&ved=0ahUKEwit_rP31sHbAhVPrlkKHa6lDloQ6AEIOzAC#v=onepage&q&f=false

[38] The TJLP depends on historical inflation, expected inflation, and country risk premium. The methodology is updated every year by BNDES. For details, see (in Portuguese): http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/produtos/download/tjlp.pdf.

12. **However, with the onset of the macro-fiscal crisis in 2014, the National Treasury was no longer able to provide low-cost funding source to the public banks,** and this former financing model has come to an end and the amount of disbursement of these banks has fallen drastically, particularly for BNDES. Under BNDES's new operational procedures, access to long-term financing at subsidized rates (TJLP) is restricted to some sectors and only up to a share of financing. Sponsors are required to mobilize the capital market as part of the long-term financing package. Lending at TJLP will be gradually phased out, and rates for BNDES long-term lending will converge toward the market rate on inflation-linked government bonds.

13. **Attracting private investors has, therefore, become critical to fulfill infrastructure and industry investments needs.** Brazil has extensive domestic capital markets that could be mobilized for long-term infrastructure financing avoiding the need to mobilize foreign investment, with the associated FX risks. Domestic pension funds have a total of around BRL 740 billion (around US$235 billion) under management, and private banks and insurance companies have another BRL 1.5 billion. The challenge is to propose investment opportunities that can be sufficiently attractive when compared to government bonds. Banks and pension funds invest massively in Brazilian government bonds and have negligible participation in financing long-term assets or infrastructure.

14. **Recently, falling interest rates on government bonds are pushing fund managers and private banks to find new alternatives, including long-term infrastructure assets.** While there has been an increase in infrastructure debentures, most of them are indexed to the short-term floating rate (Certificado de Depósito Interbancário, CDI), which makes the financing of long-term assets difficult. Therefore, there is no market reference for long-run interest rates with a duration compatible with projects-based investment. The Brazilian interest rate curve is characterized by a high level of short-term rates and upward sloping format—long-term rates do not have sufficient liquidity and short-term rates are very high. As a consequence, the share of resources that commercial banks and institutional investors have been allocating to project financing, either in loans or bonds, has remained very limited and mainly concentrated on refinancing projects that are already operational, thus with a lower risk profile.

15. **Efforts to mobilize capital markets for long-term infrastructure investments need to confront some challenges such as the fact that institutional investors are unwilling to take construction or ramp-up risk.** Regarding commercial banks, the implementation of the Basel III regulations is expected to reduce even more their ability to invest in high-risk assets. Another issue is the market's ability to accept long-term bonds. Despite the need for adequate financing of investments with long maturation period, debentures issued since 2000 have maturities under six years on average. After the 2008 economic crisis, the average maturity fell even more, from six to four years.

16. **The Government of Brazil (GoB) has committed to addressing these issues and has engaged in a severe macro-fiscal adjustment, which includes reforms able to decrease and stabilize the growth of the public debt to eventually reduce short-term interest rates.** Regarding project financing, the majority of solutions proposed till now involve the use of state-owned banks to provide guarantees during construction. The Government has also created the *Agência Brasileira de Garantias Economicas Financeiras*, where project sponsors and financiers can obtain liquidity support, but most of its initiatives have remained unfunded. In parallel, the authorities are working on standard documentation to reduce regulatory risks and accelerate project approvals including financial close.

17. **There is a need to derisk project-based investment, create a robust project pipeline, and initially blend private resources with concessional funds to reduce the financing costs.** In this scenario where the reforms initiated by the Government will still require time before delivering the expected results, attracting private resources while still maintaining sustainable financial terms for investment projects requires (a) derisking projects and create new asset classes, by having public development banks assuming a new role of guarantors, as proposed by the FinBRAZEEC Project; (b) supporting the preparation of a robust pipeline of subprojects to reduce or eliminate technical risks; (c) blending private resources with concessional funds to offer competitive terms to subproject sponsors; the level of concessionality of the latter must be sufficient to compensate for the cost of hedging the foreign currency risk and allow for enough project returns; and (d) mobilizing, as much as possible, climate funds available in the international market to green initiatives, such as EE.

18. **The FinBRAZEEC Project aims to unlock financing for infrastructure investment starting with two key sectors favored by the GoB regulation and with high impact potential from the GHG emissions point of view.** On the public street lighting side, there is both an encouraging regulatory environment that makes establishing SPVs to provide street lighting a tax-efficient and effective mechanism for modernizing street lighting, while the limited fiscal space on municipal balance sheets makes such investments financially attractive to cities that cannot provide the large capital infusions required. Similarly, on the IEE front, the FinBRAZEEC facility can provide financing that would have previously been provided through a federal credit program.

Sectoral Background

Energy Resources and Balances

19. **Brazil is endowed with abundant and diverse energy resources.** The country is currently the 10th largest oil producer of the world at approximately 2.7 million barrels per day. Brazil is also not presently a large player in natural gas, either as a producer or consumer, with the recent discovery of large offshore pre-salt oil significantly boosting reserves. Brazil is the world's second largest biofuels producer (mostly ethanol). Due in part to strong internal demand for the transport sector, Brazil exports less than 10 percent of the ethanol it produces. Bioelectricity from cogeneration of heat and power from sugarcane bagasse has also significantly increased over the last decade, from 1.1 GW to 9.6 GW of installed capacity.

20. **Renewable energy resources in Brazil are significant.** Brazil has the largest hydro resources in South America with an estimated economic potential of about 818 TWh per year, from which half has already been exploited. Wind power has grown significantly in the last years but still represents only a small percentage of the electricity produced in Brazil. Solar photovoltaic energy currently accounts for only 0.02 percent of the total installed energy capacity in Brazil (27 MW), but it is poised to grow significantly with the installation of the recently tendered solar power capacity.

21. **Brazil's Total Final Energy Consumption (TFEC) was 6.1 million barrels of oil equivalent per day (Mboe/d) in 2013, an increase of 53.3 percent over the average from 1999 to 2002 and 25 percent over 2005–2008.** In 2013, the country imported 1.5 Mboe/d of primary and secondary energy, most of it hydrocarbons, and exported 0.5 Mboe/d. The industrial and transport sectors consume 40 percent, 31 percent, and 12 percent, respectively, of TFEC. Petroleum, oil products, and natural gas made up 51

percent of Primary Energy Supply (PES),[39] followed by sugar cane and renewable fuel products at 29.8 percent and hydraulic power at 12.1 percent.

22. **Brazil has a sophisticated and well-defined institutional framework in the energy sector, with policy-setting government authorities, regulatory agencies, state-owned enterprises, and private sector companies all operating in a dynamic market.** Brazil's energy sector is controlled by the Ministry of Mines and Energy (*Ministério de Minas e Energia*, MME). Most of the existing energy laws and policies were put in place recently, following larger economic reforms introduced by the federal government in the 1990s and 2000s (see figure 1.1).

23. **In the electricity sector, the National Electric Power Agency (*Agência Nacional de Energia Elétrica*, ANEEL) oversees the production, transmission, distribution, and commercialization of electricity.** It handles the promotion of auctions for the purchase of electricity through long-term contracts within the national interconnected system and sets tariffs for consumers where applicable. It also oversees and runs the concessions, bids, and inspections of utility services. It supervises competition for electricity system expansion to resolve conflicts among agents, designs and implements new regulations, and establishes power accessibility targets for each distribution utility. The agency also oversees EE and research and development programs established by the law, wherein concessionaries have to invest a minimum percentage of their net operating incomes (0.5 percent) into each of those segments.

Electricity Sector

24. **With total electricity demand of approximately 616 TWh per year (94 percent of which is supplied by domestic production), Brazil is the largest power market in Latin America and the Caribbean and the eighth largest electricity generator in the world with an installed capacity of 156.34 GW.** The country has achieved significant gains in energy access in the last two decades—access rate climbed from 93 percent in 1997 to 99.7 percent in 2017[40]. Roughly 41 percent of demand is driven by the 40 million residential customers, 30 percent by industrial users, and 28 percent by commercial consumers.

25. **Brazil has a relatively 'clean' electricity matrix but is highly dependent on hydrology.** Brazil has the third largest hydroelectricity generation installed capacity in the world. At the end of 2016, hydroelectricity represented 68 percent of the electricity supply, followed by natural gas (9.1 percent) and biomass (8.3 percent). However, the country is facing a growing challenge to expand hydropower and meet stringent environmental rules. Out of 20,000 MW planned to enter in operation between 2013 and 2018, only 1 percent (200 MW) has significant storage capacity. Overall hydro storage capacity fell from 6.3 months to 4.7 months in the last 10 years and might further fall to 3.8 months. This has increased the vulnerability of the of the hydro-dominated Brazilian power system to climate variations. Therefore, Brazil has become dependent on thermal generation to meet peak demand, contributing significantly to Brazil's national energy-based emissions that increased more than 130 percent for 1990–2012.

26. **To diversify the electricity matrix and reduce the vulnerability to climate change, Brazil has implemented a number of innovative electricity sector policies, including successful renewable energy**

[39] PES is the combination of domestic supply and imported primary energy and includes both sources oil based energy and renewable energy.
[40] World Bank Open Data: https://data.worldbank.org/

auctions. PDEE 2023 anticipates renewables (including large hydro) to represent 86.1 percent of the electricity generation matrix by 2023 up from 79.3 percent in 2013, with wind power accounting for 8.1 percent and expanding 20 GW.

Energy Intensity and EE Trends

27. **Brazil is one of the most successful examples of reducing GHG emission during a period of economic growth.** During 2005–2014, the country reduced emissions by more than 60 percent, while its economy grew by 25 percent. Yet, in 2015, Brazil was the third highest emitter in Agriculture, Forestry, and Land Use Emissions after China and India, and energy sector emissions increased over that period.

28. **Brazil is one of the few countries in Latin America and the Caribbean with a positive growth rate of energy intensity.** Brazil's energy intensity increased through 1995–2014, ending at 4 MJ per dollar of GDP in 2014. The commitments that Brazil made at the Conference of the Parties, United Nations Framework Convention on Climate Change (COP-21) as part of its NDCs include a reduction in national GHG emissions by 37 percent below 2005 levels in 2025 (with intention to reduce its emissions to 43 percent below 2005 levels in 2030). The NDC states a goal of achieving 10 percent efficiency gains in the energy sector by 2030 (approximately 105 TWh saved by 2030). Brazil has high urbanization rates (~85 percent), and thus, energy emission sources are predominately concentrated in urban areas.[41]

29. **A quick development of energy conservation will be needed to contain the growth of emissions of the energy sector to levels consistent with the NDC, while still ensuring the supply-demand balance.** Supply-side reforms are not sufficient to reduce volatility in Brazil's complex energy matrix, nor would they be cost-effective on their own. Demand-side management interventions must play a larger role. However, initiatives in this area have been limited to date.

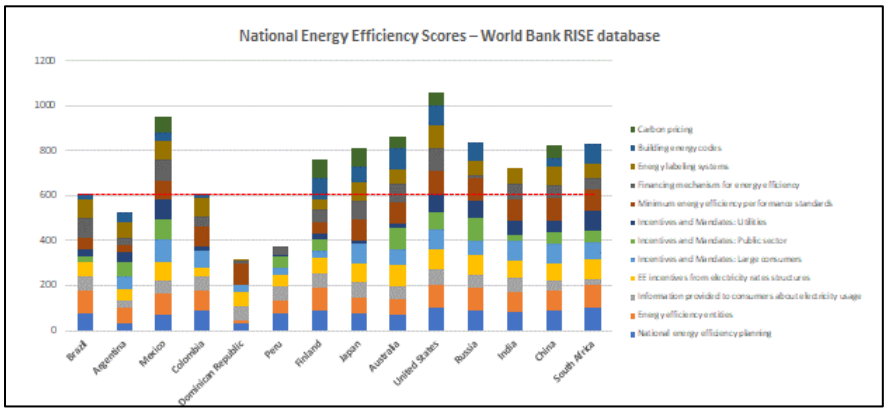
30. **Brazil has two primary public financing lines for EE projects—PROCEL and PEE.** In 2011, the Government implemented its first Energy Efficiency Plan, which established a specific tariff to finance utility-driven EE investments under PEE. These EE programs have achieved some results in a few target areas, but the overall cost-effectiveness is still a point of concern. Historically, resources have been prioritized for lower income groups at the exclusion of other large and low-hanging fruits (for example, commercial and IEE). The electricity sector regulator, ANEEL, has been working to make the efficient use of PEE resources by introducing a competitive process for EE projects. Despite the successful previous experience with EE measures to respond to the 2001 energy crisis, no demand-side actions were implemented during the more recent 2013–2014 power crisis, resulting in the continuous dispatch of thermal generation. Regarding the demand of fuels in the industry, the only program implemented so far is the limited National Program for the Rationalization of the Use of Petroleum Products and Gas (CONPET), created in July 1991 by a presidential decree. CONPET depends on resources allocated and mainly executed by Petrobras, amounting only around US$3 million per year on average and focusing mostly on soft measures, like labeling and educational programs in schools.

31. **In terms of energy policies for EE, Brazil exhibits similar scores when compared to other countries in Latin America and the Caribbean,** but falls short of the depth and breadth of EE policies in

[41] This is in line with global trends: cities are among the world's biggest consumers of electric energy, accountable for two-thirds of total electricity consumption and for over 70 percent of global GHG emissions.

developing countries and even in the Brazil, Russia, India, China, and South Africa tier, as shown in figure 1.1.

Figure 1.1. Comparison of National EE Policies



Source: Adapted from World Bank RISE database.

32. **Therefore, Brazil has significant opportunities to reap economic efficiencies through EE, particularly given its high energy intensity and energy supply/price volatility due to heavy reliance on hydrology.** Moreover, with the high rates of urbanization, improving urban EE in the urban areas will be particularly important. However, the barriers to invest in urban EE are often even higher than typical EE projects, such as higher transaction costs or municipal credit risk, among others.

33. **In a first attempt to identify concrete opportunities to reduce energy consumption and GHG emissions in the urban context in Brazil, the World Bank embarked on a strong engagement with Brazilian cities under the cross-sectoral US$1.3 million BRAZEEC, a non-lending technical support program funded by ESMAP.** BRAZEEC has examined several EE and GHG reduction opportunities, including ESL, IEE, public buildings, and transport. The ESL and IEE sectors were identified as having high potential impact and scalability of investments in the near-term.

Public Street Lighting

34. **The World Bank estimates that Brazil has more than 18.5 million points of light, with a service penetration of approximately 95.5 percent of residential areas.** Public street lighting represents about 3–4 percent of total electricity consumption in Brazil and close to 5 percent of peak consumption. The installed public lighting footprint predominantly comprises high-pressure sodium (HPS) and mercury vapor lamps. The technology penetration of light-emitting diodes (LEDs) is quite modest, although many cities have pilot projects in the pipeline to implement this technology. By replacing mercury and sodium lamps with LEDs, cities can achieve electricity savings ranging from 50 percent to 80 percent and O&M savings of about 40 percent.

35. **A number of factors have come together to make street lighting EE investments economically viable in Brazil, including** (a) the quality and costs of LEDs have reached a threshold where the economics of projects in Brazil are viable; (b) new regulatory changes require all electricity distribution companies to transfer public street lighting assets to municipalities, creating opportunity for investments in EE through PPPs through administrative concessions granted by municipalities; (c) tariff increases, which have started in 2015 and continued thus far; and (d) existing legal framework for creating tax-efficient, special-purpose

entities by cities to invest and recover street lighting costs. The World Bank's 'Lighting Brazilian Cities'[42] report provides an in-depth analysis of this sector.

36. **Despite the favorable conditions described in the previous paragraphs, investments in EE public street lighting have been slow to take off.** Only a few of PPPs have been signed or are at advanced stages for having concessions granted (from which, only one is a large city, Belo Horizonte). As of March 2018, there were 21 projects with concessions already granted or being tendered—see table 1.1:

Table 1.1. Status of PPP Development for ESL in Brazil, March 2018

Phase	No.	Examples
Commercial close	12	Caraguatatuba (SP), Açailândia (MA), Belo Horizonte (MG), Cuiabá (MT), Goianésia do Pará (PA), Guaratuba (PR), Marabá (PA), Mauá (SP), São Paulo (SP), São João de Meriti (RJ), São José de Ribamar (MA), and Urânia (SP)
Tender awarded	3	Araguaína (TO), Caxias (MA), Feira de Santana (BA)
Tender in progress	6	Bagé (RS), Cachoeirinha (RS), Dom Eliseu (PA), Ouro Preto (MG), Salvador (BA), and Venâncio Aires (RS)
Public hearings	18	Diadema (SP), Vitória (ES), Maceió (AL), Itajubá (MG), and others
Feasibility studies being prepared by the private initiative or already delivered to the public authority	81	Porto Seguro (BA), Boa Vista (RR), Brasília (DF), Campos do Jordão (SP), and others
Feasibility studies being prepared by the public authority, with or without external advisers	10	Rio de Janeiro (RJ), Macapá (AP), Teresina (PI), and others
Public intention disclosed	16	Florianópolis (SC), Campo Grande (MS), and others
Suspended or canceled	33	Contagem (MG), Niterói (RJ), Porto Velho (RO), and others

Source: Radar PPP.

37. **Market research indicates the following barriers to investment in municipal street lighting projects:** (a) constrained municipal balance sheets, including the Fiscal Responsibility Law on municipal indebtedness, which imposes strict borrowing limits on cities; (b) municipal credit risk, as demonstrated by the case of the Sao Paulo PPP for EE street lighting, in which all major international firms pulled out from the tender process due to lack of acceptable guarantee mechanisms for repayment by the municipality[43]; (c) the challenging macroeconomic and fiscal situation in Brazil leading to reduced availability of credit; and (d) high project preparation/transaction costs involving a new technology and low municipal capacity to structure PPPs.

Industrial Energy Efficiency

38. **The potential for efficiency in the industrial sector is enormous.** A study from ACEEE analyzed the performance of the 16 largest economies. Brazil was ranked 16 (last) on industrial energy efficiency. Brazilian industrial associations (CNI and ABRACE) have carried out several studies demonstrating the high potential for IEE and GHG emissions reduction and in fossil fuel-based thermal processes (potential

[42] http://ppp.worldbank.org/ppp/library/lighting-brazilian-cities-business-models-for-energy-efficient-street-lighting.
[43] For example: http://antp.org.br/noticias/clippings/consorcio-desiste-de-disputar-ppp-da-luz.html

savings range from 8 percent to 40 percent of current consumption depending on the sector). The World Bank also published two reports, which detail the potential for mitigation options related to energy generation and use, with specific results on the potential related to EE in the industry.

39. **While a large share of Brazilian industrial companies is in urban industrial districts, cities often leave industrial districts out of their citywide plans for emission reductions, largely because they are outside of their direct purview, in contrast to areas like public buildings, waste, street lighting, and so on.** An example is the Campo Grande industrial district in the metropolitan area of Rio de Janeiro, the fourth largest in the country and accounting for 33 percent of Rio's urban emissions.

40. **More than 150 projects with high return and short payback periods have been identified among large industrial energy users.** Projects encompass a variety of sizes and technologies, such as automation in furnaces, regenerative burners, heat recovery, efficient motors, frequency controls in pumping, and so on. Some investments in EE projects present very low paybacks of 1–3 years, and IRRs ranging from 30 percent to 90 percent. More capital-intensive projects, such as co-generation, may present larger paybacks of 7 years and IRRs of about 20 percent. Potential for EE should also be significant in medium and small industries and commercial establishments.

41. **However, there are several barriers for IEE investments.** An assessment conducted by CNI and ABRACE members revealed that the current high level of indebtedness and lack of room in balance sheets prevents industrial companies from investing in anything outside of their 'core' business (such as EE), even when these companies having sufficient net operating incomes that could be used to pay for efficient equipment and EE upgrades over time. Investments are also constrained by the lack of specific government programs targeting IEE. Moreover, private sector financiers in Brazil (direct financing or through the ESCO market) typically shy away from providing up-front financing for large industrial projects because they are capital intensive and perceived as risky, and banks are not sufficiently familiar with the technologies and do not feel comfortable with the uncertainties of EE cash flow streams.

42. **A few functions or roles have been identified to catalyze the market for EE initiatives including** (a) creating an aggregation vehicle to reduce transaction costs and attract capital from commercial lenders and other investors; the aggregation vehicle will also offer diversification into a portfolio of projects (and off-takers), thereby reducing risks and exposure to investors; (b) offering a suite of credit enhancement products to attract commercial financing; the type of products would depend on the structure of the aggregation vehicle but could be a combination of funded and contingent financing; and (c) liquidity facilities are another potential option that could help mitigate construction risks, which is typically the highest risk component of small-scale initiatives.

43. **To overcome these barriers, off-balance-sheet solutions leveraging private sector capital are required.** FinBRAZEEC seeks to catalyze investments providing a ready source of funds to projects. FinBRAZEEC will be implemented in parallel and in close coordination with the broader, ongoing dialogue between the GoB and the World Bank on energy sector reform, including on measures to promote EE. Therefore, FinBRAZEEC will serve as a financial instrument to finance the investments required to respond to the new incentive framework being implemented by the Government with the World Bank's support.

DETAILED PROJECT DESCRIPTION

44. **FinBRAZEEC offers an innovative financial structure designed to overcome some of the major barriers to financing energy infrastructure in Brazil, in particular in EE interventions in the urban industrial and street lighting sectors.** The Project entails the setup of an Energy Efficiency Facility (EE Facility) to leverage public funds (own resources, World Bank, GCF, and CTF) to attract private sector investment in EE subprojects in the public street lighting and industrial sectors. The Project will be implemented by CEF (the Borrower), a state-owned development bank as an FI. As such, CEF will have the main function of catalyzing private investment in EE and supporting private companies and municipalities in addressing some of the key market failures that prevent long-term financing to EE. The beneficiaries of the FinBRAZEEC Project will be private sector entities that borrow from the facility to invest in public street lighting (through PPPs) and IEE subprojects.

CEF as Financial Intermediary

45. **CEF is the second largest state-owned financial institution in Latin America (after Banco do Brasil), the fourth largest bank in Brazil by assets and one of the largest in Latin America.** Nowadays, CEF is present in thousands of Brazilian towns. With more than 72 offices countrywide and more than 85 million accounts, CEF is ranked the third largest financial institution in Brazil in number of branches. Together with government pension funds and other governmental resources, CEF controls more than BRL 1.80 trillion (about US$630 billion). CEF is also a government tool for public investment and expansion of access to financial services to the Brazilian public.

46. **CEF has the mission to "Promote the sustainable development of Brazil, creating value for its clients and the society as public financial institution and State policy agent."** This mission is aligned with the development objective of the FinBRAZEEC Project. Moreover, CEF has the mandate from the GoB to help municipalities develop infrastructure projects. CEF has a unique and comparative advantage to work in the urban EE space, given that it traditionally works with municipalities and has an impressive network of local offices with technical experts to interact directly with its municipal clients. In fact, nearly half of Brazilian cities are currently active clients. CEF also has solid relationships with commercial banks and businesses. Moreover, CEF's recently updated its Strategic Plan, which was approved by its Board in December 2017. The plan is based on 10 major principles, one of them being a focus on financing infrastructure using innovative mechanisms and leveraging private sector participation. Among CEF's new objectives under 'Client and Markets', CEF must "…become the enabler for the expansion and modernization of the infrastructure in the country."

47. **CEF as an institution has significant implementing experience executing World Bank-financed projects.** CEF has implemented three projects as an FI for the World Bank in the past: (a) the National Biodiversity Mainstreaming and Institutional Consolidation Project - PROBIO (P094715), (b) the Brazil Solid Waste Picker Social Inclusion Initiative (P121881), and (c) Integrated Solid Waste Management and Carbon Finance Project (P106702).

48. **CEF is well positioned to lead Project implementation given its knowledge of the World Bank lending process.** It has an extensive network and outreach (which allows it to work across the country with municipal governments and small industries), familiarity with many of the facility's potential clients, and decentralized technical skills to identify and appraise subprojects that can benefit from the EE

Facility's resources. Additional training will be provided to close any capacity gaps related to the innovative financial design of this Project.

Project Structure

49. **The Project has two components:** Component 1: An EE Facility[44] for Efficient Public Street Lighting (ESL) subprojects and urban Industrial Energy Efficiency (IEE) subprojects, comprising Subcomponent 1.1 – private financing for ESL and IEE subprojects, in the form of a loan syndication among CEF and commercial lenders and Subcomponent 1.2 – credit enhancement products, in the form of a GF established by CEF, and Component 2: Technical assistance to help increase CEF's internal capacity to implement the Project, support the startup costs of the EE Facility, and help develop a pipeline of high-quality subprojects, reducing the technical risk of the transactions.

50. **Component 1: EE Facility for ESL and IEE subprojects is structured into two subcomponents, as follows.** The schematic structure of the EE facility is provided in figure 1.2.

51. **Subcomponent 1.1: Private financing for ESL and IEE subprojects, in the form of a loan syndication, led by CEF, to provide sub-loans to private companies for ESL and IEE subprojects on a limited recourse basis.** CEF will blend US$180 million of its funds with the US$186 million GCF concessional loan. It will lead a syndication[45] with domestic commercial lenders to leverage approximately US$400 million in private debt. CEF and the syndicated lenders will provide parallel loans to (a) SPVs established to implement ESL subprojects and (b) entities, such as dedicated funds, ESCOs, or other aggregators, for IEE investments on a limited-recourse basis. The sub-loans will be divided into two separate windows: Window 1 (sub-loan to ESL subprojects) and Window 2 (sub-loans to IEE subprojects). The total estimated value of the debt of the EE Facility is US$766 million.

52. **It is expected that the subprojects will be financed with a 70:30 debt to equity ratio, and thus, the US$766 million of debt will mobilize a total of US$328 million in sponsor equity, for a total value of subproject investment of US$1,096 million.** Additional investments from IFC (in the form of a syndicated loan or mezzanine capital) are possible. CEF will charge a fee for the management of the concessional funds (GCF and CTF) and for leading the syndication (including subproject identification and preparation of the loans).

53. **Syndication is the preferred mechanism to attract commercial lenders to invest.** Various market soundings have been conducted as part of the preparation of this Project. Commercial lenders confirmed they commonly use syndication to aggregate debt for infrastructure investments, and they feel comfortable with CEF acting as the syndication lead. Moreover, these banks indicated that they would prefer to enter into parallel but separate financial contracts with the subprojects for their share of provided debt and thus receive loan repayments directly from the subprojects. This mechanism gives

[44] The term 'EE Facility' is used in this document to refer to the set of financial arrangements for the lending by CEF and other domestic banks to the private sector sponsors of ESL and IEE subprojects (Subcomponent 1.1, Loan Syndication), as well as the associated credit enhancement products (Subcomponent 1.2, GF).

[45] The term 'syndication' is used broadly here to represent the parallel lending of CEF and commercial lenders, led by CEF; the precise legal arrangements and operational rules (for example, traditional syndication and club deal) will be determined in the OM. Market soundings have been conducted to compare syndication to other options, such as the creation of a fund. Banks confirmed that they prefer to use a syndication approach, and they feel comfortable with CEF acting as the syndication lead.

them full control of their credit due diligence (as opposed to delegating these decisions to a fund manager, on a portfolio-approach, for example) and avoids 'comingling risk' present if another entity is responsible for collecting and distributing the payments among the syndicated banks.

54. **A framework intercreditor agreement will establish the terms of the relationship between the syndicated lenders**, such as the responsibilities of CEF as the syndication lead, the indicative expected debt contribution by each financial institution (as a percentage of the total), the share of concessional funds to be provided by CEF, the terms of each lender depending on the evaluated credit risk, provisions in case of default, and arbitration mechanisms, among others.

55. **As the syndicate lead, CEF will charge a fee and be expected to identify and originate the subprojects in ESL and IEE, support subproject structuring, perform a preliminary credit risk assessment,[46] and monitor and evaluate subprojects performance on an ongoing basis.** A committee comprising all the syndicated lenders will be allowed to review and make a decision endorsing or rejecting that preliminary credit risk evaluation within a preestablished period. Commercial lenders will be allowed to decline their participation in specific sub-loans based on their own credit risk evaluation or any other justified causes. The commercial lenders that decide to enter in a syndication agreement for a specific subproject will be eligible to apply for credit enhancement products provided by a GF to be set up and managed by CEF (see Subcomponent 1.2). A transparent process will be put in place to allocate subprojects to potential lenders. The structure of the facility is shown in figure 1.2.

56. **Subcomponent 1.2: Credit enhancement products, in the form of a GF, which will offer products to derisk the loans under Subcomponent 1.1.** The GF may offer several credit enhancement products, including (a) first-loss coverage and (b) partial credit risk guarantees to cover up to 50 percent of sub-loan losses. Over time, the GF may also offer payment guarantees for subproject sponsors. The GF will charge guarantee fees, priced to cover the expected value of guarantee payouts and ensure the GF is sustainable beyond the life of this Project.

57. **To make the GF viable, grant funding and liquidity support are required to reduce funding costs and increase investor confidence.** The GF will benefit from the CTF contingent recovery grant (US$20 million) and GCF grant (US$5 million) to act as first-loss funds for initial GF payouts, thereby significantly reducing the cost of the GF operation. These savings will result in lower guarantee fees and, ultimately, lower sub-loan financing costs. CEF has never offered a credit enhancement mechanism of this type before, and market feedback indicates liquidity support from the World Bank will significantly increase market uptake. To this end, the GF will benefit from an IBRD contingent loan (US$200 million) with special financial features, which will act as a credit line on which CEF can draw down to support the GF's operation, in the event that the GF needs additional funds to meet its obligations to the guaranteed, syndicated lenders (for example, if sub-loan defaults are higher than expected).[47] The special financial

[46] CEF may delegate part of those roles to a third party selected competitively (that is, fund management and pipeline identification) where the third party has a competitive advantage.

[47] The IPF Loan offers a pro-active way to avert any potential default to the beneficiaries of CEF's partial credit guarantee, as CEF can disburse the IPF contingent loan if pre-defined funding requirements are reached. In contrast, a traditional IBRD guarantee would be deployed after a default is confirmed, and would carry the associated repercussions (e.g., possible rating implications, trigger of the federal government counter-guarantee, etc.). Moreover, this Project will finance many sub-loans, which would be difficult to manage in the traditional guarantee framework. Finally, market sounding with potential guarantee beneficiaries (i.e., domestic commercial lenders) revealed that they do not require an international AAA credit rating to invest

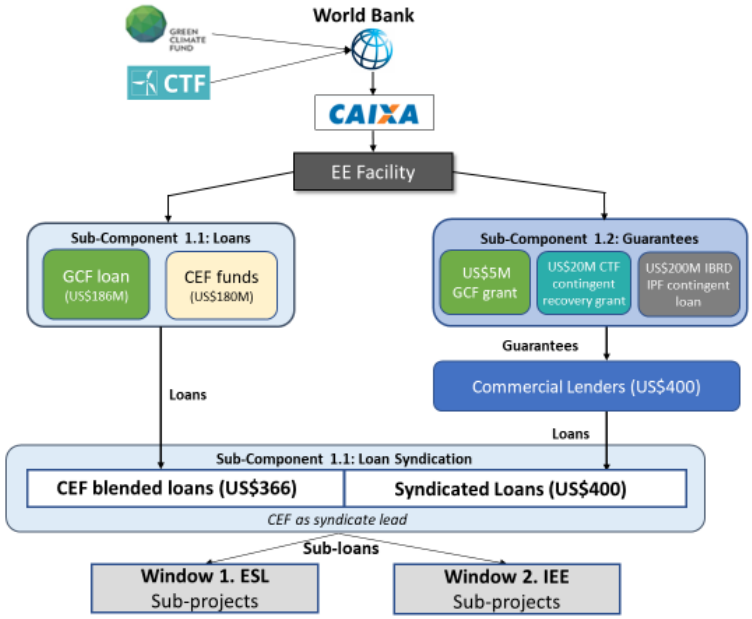
features include allowing CEF the flexibility to change the repayment schedule and pricing at the time of disbursement, with the objective to allow CEF to select repayment terms that are linked as closely as possible to the underlying liabilities that are being covered. This approach is similar to that used for DPF DDOs. Disbursements of the IBRD contingent loan will be tied to the GF funding needs. Because the GF will be designed to be sustainable (that is, guarantee fees charged should cover expected guarantee payouts), the need for disbursements from the IPF contingent loan are expected to be minimal.

58. **This GF may offer several credit enhancement products to commercial lenders and possibly subproject sponsors in the future:** (a) first-loss guarantees will cover up to 100 percent of first losses on sub-loans, expected to be up to a maximum of 5 percent of the sub-loan value. GCF and CTF grant funds will be used to support this product; (b) partial credit risk guarantees to cover up to 50 percent of the losses of commercial lenders in case of subproject default. In the event of subproject insolvency leading to contract termination, the GF will cover up to half of the value of the remaining loan amount; and (c) potentially, payment guarantees for sponsors of subprojects, to cover payment delays from municipalities to SPVs in the case of ESL, or from industries to financial aggregators in the case of IEE.

59. **CEF will manage directly a dedicated account or enter in an agreement with the GF.** CEF will capitalize the GF (as callable capital) using the World Bank US$200 million IPF contingent loan, the US$20 million CTF contingent recovery grant, and the US$5 million GCF grant. The relationship between CEF and the GF is yet to be detailed, depending on the final solution (either on- or off-balance) to be decided by CEF. In principle, the GF will receive an initial allocation of US$25 million corresponding to GCF and CTF grants. This initial amount will provide sufficient reserves to cover any calls on the guarantee products. If those resources are not sufficient, CEF may make use of the IBRD IPF contingent loan to replenish reserves. If an off-balance-sheet solution (for example, separate fund) is adopted, the IPF loan resources will be channeled to this entity, possibly through a lending arrangement with CEF. Disbursements from IBRD to the GF will be contingent to certain events (such as insufficient level of capitalization due to default, high demand for guarantees, or both).

(since they are capped at the BR sovereign rating), nor the irrevocability feature offered by a IBRD guarantee. These factors combined imply the coverage offered by a traditional IBRD guarantee would not result in sufficient benefits to the Project to justify the associated costs.

Figure 1.2. Indicative FinBRAZEEC EE Facility Structure



60. **Component 2: Technical Assistance (TA) consisting of GCF US$4 million recipient-executed grant and US$1 million Bank-executed grants provided by GIF and ESMAP.**[48] The TA component of this Project will support essential technical studies, capacity building for the departments of CEF involved, and early operational costs. In the case of IEE, these funds will be used to support technical studies and initial implementation efforts (for example, structuring of off-balance-sheet funds to support scale-up of IEE investment). In the case of ESL, the TA will support cities' preparation of high-quality PPP subprojects. A detailed Procurement Plan and procurement strategy for the recipient-executed TA funds (GCF) have been prepared.

61. **Table 1.2 provides an overview of the sources of Project funding by subcomponent:**

Table 1.2 FinBRAZEEC Sources of Funding by Component

Project components	Total	IBRD IPF loan	GCF Loan	GCF grant	CTF contingent grant	CEF funds	Commercial lenders	Equity	Bank executed TA
Component 1: EE Facilty	**1319**	**200**	**186**	**5**	**20**	**180**	**400**	**328**	**-**
*Sub-component 1.1: Loan syndication**	1094	-	186	-	-	180	400	328	-
Sub-component 1.2: GF	225	200	-	5	20	-	-	-	-
Component 2: TA	**5**	**-**	**-**	**4**	**-**	**-**	**-**	**-**	**1**
Total Project Funding	**1324**	**200**	**186**	**9**	**20**	**180**	**400**	**328**	**1**

** This includes $766 of sub-loan debt from the EE facility, as well as $328 of sponsor equity expected to be part of the sub-project financing*

[48] US$0.2 million from ESMAP and US$0.5 million from GIFhave been provided in the form of Bank-executed trust funds. ESMAP funds are being used to inform the design/structure of the EE facility. The GIF resources, a project definition grant , are supporting EE Facility structuring and prefeasibility studies to identify candidate cities for ESL. Additional funds may be secured from GIF's PPSA window to support PPP structuring, in partnership with IFC (details still being defined).

62. **The sub-loans will be divided in two separate windows:** Window 1 (ESL) and Window 2 (IEE).

63. **The ESL window of the EE Facility will primarily lend to SPVs, established by the private sector, with a concession to modernize and operate the street lighting system on a PPP basis in a municipality.** Such SPVs will recover costs from the concession by a dedicated levy for street lighting from electricity consumers or from the municipal budget. Figure 1.3 illustrates the flow of funds from the EE Facility to the SPV. Detailed implementation arrangements for the ESL subprojects are provided in annex 2.

Figure 1.3. Fund Flow from EE Facility to SPV

64. **The IEE window will lend to EE investments in industries through on-balance-sheet or off-balance-sheet solutions.** In the case of an on-balance-sheet solution, the EE Facility will make loans directly to industrial companies with EE investments at a scale to justify the transaction costs of a retail lending approach. Figure 1.4 illustrates the flow of funds from the EE Facility to the Industrial company in an on-balance-sheet approach. While the option for on-balance-sheet approaches is within the scope of the Project, market analysis indicates that the potential to achieve scale through this approach will be limited, primarily due to the barriers associated with constrained balance sheets of industrial entities whose corporate investment priorities often do not include EE.

65. **In the case of an off-balance-sheet solution, there are multiple business models that could be deployed, and the Project will remain open to considering various approaches according to market conditions, including investments through ESCOs and other off-balance-sheet IEE aggregators.** The most probable off-balance-sheet model to be developed and implemented under this Project is known as the '*Fundo de Eficiência Energética'* (F2E) model. Under the F2E model, the off-balance-sheet financing vehicle would be a consortium or joint venture between a financial partner and a technical partner. CEF (and other commercial lenders) would lend directly to the off-balance-sheet vehicle, on a limited-recourse finance basis. There would be no restrictions to having several similar vehicles competing in the market or specializing in specific market segments (that is, industry sub-sector, specific technology, or process), and all such entities could access FinBRAZEEC financing. Figure 1.5 illustrates the flow of funds from the EE Facility to the F2E in an off-balance-sheet approach.

Figure 1.4. On-balance-sheet Investments in IEE

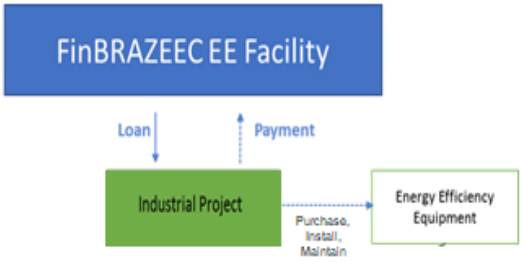
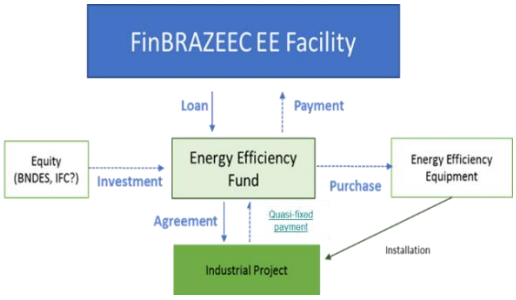


Figure 1.5. Off-balance-sheet Investments in IEE



66. **Detailed implementation arrangements for the IEE subprojects are provided in annex 2.**

67. **The GCF grant will be used to support the remaining work required to successfully implement the facility and ensure a strong pipeline of subprojects from both sectors.** This will include the costs associated with structuring and operationalizing the facility, confirming the portfolio of subprojects for the IEE window, structuring the off-balance-sheet vehicle for IEE investments, enhancing CEF understanding of the impact of IFRS 16 in subproject selection and contract arrangement, finalizing the toolkit for public street lighting PPPs, and conducting additional market studies.

68. **To date, US$0.2 million from ESMAP and US$0.5 million from GIF have been provided in the form of Bank-executed trust funds.** ESMAP funds are already being used to support technical work that is informing the design/structure of the facility. The GIF resources already secured are in the form of a project definition grant, with the objective of supporting the preparation of a strong pipeline of public street lighting PPP projects that could ultimately request financing from the FinBRAZEEC EE facility. More specifically, the GIF resources are being used to support work co-led by the World Bank and CEF to (a) conduct prefeasibility studies on a short list of cities interested in pursuing a PPP to modernize their public street lighting systems and (b) complete the first stage of preparing a toolkit for PPP street lighting in Brazil. Ultimately, this work will identify approximately 10 cities from the current long list that are strong candidates to move to the full feasibility/PPP structuring phase.

69. **The FinBRAZEEC Project provides not only the opportunity to realize specific mitigation activities in the energy sector, but also an entry point to expand the current dialogue with the GoB for a scaling-up approach of M&V activities**. In this regard, funding from TCAF program is being considered, and would be coordinated with other related activities funded by the World Bank, such as Brazil Partnership for Market Readiness project, which supports the government decision process regarding the introduction of carbon pricing instruments in Brazil, and the NDC Support Facility to support the Ministry of Environment to develop the Brazilian NDC Implementation Strategy.

70. **Management of credit risk.** The first line of defense in mitigating risk of the facility will be to ensure a strong pipeline of high-quality subprojects that will borrow from the facility, as well as strong capacity of CEF to conduct the due diligence of these subprojects. In addition, the EE Facility will require that certain risk mitigation structures be in place for the subprojects. In the case of public street lighting, the lending agreements will include requirements for the subproject borrowers to implement mechanisms to reduce the risk of payment defaults, for example, through the implementation of Debt

Service Reserve Accounts (DSRAs), Letters of Credit (LoCs), step-in rights to the concession, and recourse to the subproject equity. In the case of IEE, loans are more exposed to credit risk from industrial companies, since there is not a cash flow based on ex post energy savings that can be ring-fenced (the role played by COSIP in public street lighting). Lending agreements between CEF and industries (directly or through an intermediary fund) will include a very thorough due diligence and some traditional credit enhancement mechanisms at the subproject level such as LoCs and the ability to remove the equipment from the customer's premises.

71. **Management of FX risk.** The EE Facility will make loans denominated in Brazilian reais. The CEF and private lender loans will be denominated in Brazilian reais. However, the contingent IBRD loan and the GCF loan, as well as the contingent grants provided by GIF and CTF, are denominated in U.S. dollars. To limit the FX risk associated with the IBRD and GCF loans, CEF has the option to request the World Bank to perform a currency swap on its behalf upon disbursement of these loans. If requested by CEF, the IBRD will execute a swap transaction with a financial market counterparty. The Brazilian real swap market is liquid at shorter- and medium-term maturities (up to 10 years); beyond 10 years, a conversion can be performed on a case-by-case basis. In case a full-maturity conversion is not possible or is too expensive, a partial maturity conversion can be performed.

72. **The General Conditions for IBRD Investment Project Financing allow for interest rate and currency conversions of IBRD loans.**[49] Currency conversions are available both in major hard currencies and selected local currencies with more liquid swap markets (currently approved for 14 local currencies including Brazilian real). At the time of disbursement from the contingent IBRD loan, CEF can submit a request for conversion form, and IBRD loan amounts will be converted from U.S. dollars to Brazilian reais at prevailing market rates (IBRD executes the swap with a market counterpart and passes resources on to CEF). Given that these conversion options are stipulated in the General Conditions and the Loan Agreement, no additional legal documentation is necessary.[50]

73. **To further mitigate FX risk, hedging non-IBRD resources (GCF, CTF, and GIF funds) is also available through a non-IBRD hedge.** The cross-currency swap will be documented outside of the loan agreement and, therefore, is subject to signing of a Master Derivatives Agreement (MDA). Signing a subnational MDA requires a counterguarantee from the central government. Like an IBRD conversion, IBRD will execute the swap with a market counterpart and pass on the resources to CEF, stating the new Brazilian real interest rate. Conversion of IBRD resources has no implication for the country exposure limit, while a non-IBRD hedge does, equivalent to the higher of 10 percent of notional or the actual mark-to-market.[51]

[49] http://treasury.worldbank.org/bdm/htm/documents/GeneralConditionsIBRDIPF2017.pdf.
[50] Conversion guidelines, fees, and forms. Transaction fee of 0.06%.
http://treasury.worldbank.org/bdm/htm/Loan_Conversion_Options.html.
[51] Hedging guidelines, fees, and forms. Transaction fee of 0.02%.
http://treasury.worldbank.org/bdm/htm/hedging_products.html

74. **Market sounding.** In close coordination with CEF, the World Bank has conducted a series of market sounding activities to confirm the relevance and adjust the design of the financing structure and the derisking mechanism as well as to validate and adjust the business models proposed for ESL and IEE.[52]

75. **Regarding the financial structure, the market sounding confirmed the market preference for a syndication of banks led by CEF over the lending through a fund.** Regarding the derisking mechanism, the market response and the analysis of CEF capital position confirmed the need for CEF to establish a 'bankruptcy remote' GF, which will offer a guarantee product to commercial lenders to cover both insolvency of subproject (confirming the need for a coverage around 50 percent) and liquidity risk. All commercial lenders consulted expressed their interest in participating and further working with World Bank and CEF to precise the terms and impact on competitiveness of sub-loans.

76. **With regard to the PPP-based business model for LED-based street lighting modernization**, **the consultation of multiple stakeholders confirmed its technical and economic feasibility and helped define the legal and contractual arrangements required to optimize the distribution of risks and thus the bankability of projects.** These consultations are now moving to city-specific prefeasibility studies conducted together with CEF with GIF financial support.

77. **Regarding the off-balance-sheet business model for aggregating IEE subprojects, the market sounding confirmed the interest of industries for off-balance-sheet solutions like F2E to overcome the debt capacity issue that prevents these projects from materializing.** Industries confirmed the existence of hundreds of already identified subprojects. Several banks and potential operators also confirmed their interest in financing and investing in such off-balance-sheet vehicles, and different structures were discussed to comply with the new accountancy regulation (IFRS 16), optimizing the allocation of risks and ensuring the bankability of the IEE subprojects aggregator. The consulted stakeholders highlighted the need for further refining the legal, regulatory, and fiscal features of the proposed mechanism and for obtaining endorsement of reputed auditors in view of the new IFRS 16 norm on operational leasing to be adopted by large industries in the coming years.

[52] The audience consulted included commercial lenders (Santander, CEF, Bradesco, Itau-Unibanco, and BTG-Pactual); investors (BNDESPAR and Vinci Partners); public development financial institutions (BNDES, CEF, Banco do Brasil, and Desenvolve-SP); rating agencies (Moody's); fiscal and legal advisers (Tozzini Freire and Machado Meyer), LED manufacturers, and potential street lighting concessionaires (Philips, GE, and several distribution companies); municipalities and associations of municipalities (Frente Nacional de Prefeitos [FNP] and 15+ municipalities); ESCOs and EE experts (ABESCO, MGM, Brasilip, LIGHT Esco, CPFL Energia, BH Efficientia, CEPEL, and so on); industries and class representatives (ABRACE, CNI, CSN, and Vallourec); and central government entities (Private Public Investment Secretary, MME, EPE, ANEEL, Ministry of Finance, Ministry of Planning, Ministry of Industry and Commerce, and National Designated Authority for the GCF). The World Bank also coordinated regularly with the local IFC team.

ANNEX 2: IMPLEMENTATION ARRANGEMENTS

COUNTRY: Brazil
Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC

Project Institutional and Implementation Arrangements

1. **The implementation of FinBRAZEEC involves several stakeholders and design processes to govern the close coordination among themselves.** Detailed implementation arrangements will be provided in the Project's OM. IBRD, as lender of an IPF contingent loan, will enter into a Loan Agreement with CTF. IBRD, as implementing entity of CTF, will enter into a Grant Agreement with CEF. IBRD, as agent of GCF, will enter into Grant and Loan Agreements with CEF. All agreements will include references to the other key agreements and documents, including the OM and Guarantee Facility Manual.

Entities Involved in the FinBRAZEEC Project

2. **CEF, as an FI, has the main function of implementing the EE Facility and TA activities under the Project.** The Project will be implemented over 15 years. The first 5 years of the Project will be focused on financing and implementation of the sub-loan investments under Subcomponent 1.1, sale of associated partial credit guarantees under Subcomponent 1.2, and implementation of the TA activities under Component 2. The last sub-loan is envisioned to be committed in Year 5 with an estimated implementation period (equipment installation) of two years. After Year 7, the Project will involve monitoring of the implemented subprojects as the debt financing is repaid and monitoring the operation of the GF.

3. **Throughout the Project life, CEF will supervise/monitor all EE Facility operations to ensure that they are in compliance with Brazilian and World Bank requirements.** CEF will provide periodic reports, including fiduciary, technical, and safeguards reports to the Ministry of Finance and the World Bank. Independent auditors will be selected to conduct annual technical and financial project audits on the performance of CEF; this will be financed from the TA component. CEF will form a PIU with dedicated teams supported by technical, financial, environmental, social, and procurement experts. The PIU will lead implementation of the Project and will act as CEF focal point to interact with the World Bank and other stakeholders as needed. CEF may delegate part of its roles to a third party selected competitively, where the third party has a competitive advantage.

4. **CEF is a financial institution constituted by Decree-Law 759/1969, in the form of a public company and linked to the Ministry of Finance.** As part of the national financial system, it assists in the execution of the federal government's credit policy and is subject to rules and decisions of the federal government competent bodies. CEF implements its main banking activities through the collection and application of resources in commercial, FX, real estate, and rural operations, in the provision of banking services, including the administration of investment funds, guarantee funds, and portfolios, as well as to implement social public programs. In addition to the intermediation of securities, CEF implements debit and credit cards, insurance, private pension, capitalization, and administration of consortia through equity interests in CEF Seguridade and CEF Participações S/A.

5. **Under Subcomponent 1.1, CEF will have two roles:** (a) the leader of the loan syndication with PFIs and (b) a lender to subprojects using GCF and its own funds. In its role as the syndication lead, CEF will identify and select subprojects and beneficiaries based on predefined eligibility criteria and conduct detailed due diligence on technical, economic, environmental, financial feasibility, and other subproject-related assessments. CEF will then present candidate subprojects to the syndicated banks for their own due diligence and, ultimately, decision on whether to co-invest. A transparent decision-making process should be put in place to allocate funding (and, if applicable, guarantees) to participating banks. CEF will be responsible for leading the preparation of an intercreditor agreement that will establish the rules and procedures for the loan syndication with commercial financial institutions. In its role as a lender, CEF will have the responsibility to appraise and invest in the pipeline of EE subprojects and make investment decisions. For both activities, CEF will have full responsibility to ensure all activities are implemented in accordance with the OM, as approved by CEF and the World Bank.

6. **Under Subcomponent 1.2, CEF will be responsible for developing the new credit enhancement product(s) that will be offered by the GF.** CEF will have full responsibility to ensure the GF is implemented in accordance with the agreed OM. CEF may opt to implement the GF through an off-balance-sheet solution, in which case, CEF may become a lender and investor in the GF. In this case, the GF will have its own governance structure, but CEF will continue to be responsible for ensuring the GF will operate according to the OM. Regardless of whether the GF is implemented through an on-balance-sheet or off-balance-sheet solution, CEF will assume the responsibility to draw down on the IBRD contingent loan to ensure the GF has sufficient reserves to meet its obligations promptly under guarantees sold to the commercial financial institutions.

7. **CEF will also be responsible for implementing the TA activities under Component 2**.

8. **Flow of funds for Subcomponent 1.1 (loan syndication).** GCF concessional loan funds of US$186 million will flow through the World Bank to CEF in the form of a GCF Loan Agreement. CEF will subsequently on-lend the GCF concessional loan to ESL and IEE subprojects, along with its own counterpart funds and other syndicated banks, in its role as a lender in the loan syndication. For Subcomponent 1.2 (GF), the flow of funds will involve the following: (a) US$5 million of GCF grant funds will flow through the World Bank to CEF in the form of a GCF Grant Agreement; (b) US$20 million of CTF contingent recovery grant will flow through the World Bank to CEF through a CTF Grant Agreement; and (c) US$200 million of IBRD contingent loan funds will provide additional, callable capital to the GF, if needed. At least three subaccounts will be created within the GF to receive, manage, and report on the use of the proceeds of these funds separately. Guarantee products will be sold by the GF to syndicated lenders. If required, a subsidiary agreement will be signed between CEF and the GF to establish the responsibilities of CEF as a shareholder in the GF and potentially as a management agent. In addition, the GF governance rules will be finalized and included in the OM before Project effectiveness.

9. **In addition to CEF, the Project will involve the following entities:**

   (a) **PFIs.** Commercial lenders and public lenders, under the regulatory purview of the Central Bank of Brazil, will be the financial institutions eligible to enter in syndication agreements with CEF for the Project. Only commercial lenders will be eligible to benefit from guarantees provided by the GF. Some of these entities may participate contributing with equity to the GF or to the subproject. To ensure a robust participation under the Project, PFIs will need to

fulfill appropriate criteria laid out by CEF. The following criteria, among others, will be assessed in determining PFI eligibility:

(i) Size and profitability
(ii) Experience from energy sector projects
(iii) Existence of adequate risk management systems
(iv) Availability of qualified personnel
(v) Involvement in any litigation or black-listing by a public sector entity

(b) **PPP concessionaires.** The winning concessionaires for ESL PPPs will form SPVs, comprising a consortium of companies (for example, an operator, lender, and manufacturer), which is responsible for raising the financing for the subproject, carry out the modernization, and operate the system throughout the life of the concession.

(c) **ESCOs.** ESCOs, or other forms of aggregating entity, may be the implementers of the EE subprojects for IEE if on an off-balance-sheet basis.

(d) **Host entities.** The host entities, represented by authorized representatives, are the entities on whose premises the EE subprojects will be implemented. The host entities will be municipalities for ESL and industries for IEE.

(e) **Project sponsors.** Sponsors are the owners of the companies that will carry on EE investments. Those will be the owners of the SPVs for ESL and the owners of the industry (if the subproject is financed on an on-balance-sheet basis) or aggregating entity for IEE (if the subproject is financed on an off-balance-sheet basis).

(f) **Monitoring and verification (M&V) agencies.** The independent M&V agency will be hired by CEF to conduct due diligence on the appraisal process followed by CEF and PFIs while extending loans to SPVs and ESCOs (or aggregating entities) for EE subprojects under the Project.

Implementation Arrangements

10. **It is critical that all the market participants under FinBRAZEEC possess a shared understanding of the processes and rules complied with in the Project.** Toward this objective, a detailed OM will be developed by CEF for operation of FinBRAZEEC before the Project effectiveness. The OM will set out the principles, operational policies and procedures, FM procedures, implementation of performance standards (Environmental and Social Management System), reporting, monitoring, and supervision of subprojects. The OM will define the detailed eligibility criteria for subprojects, for example, the minimum energy savings to be achieved, and exclusions linked to World Bank safeguards, such as exclusion of World Bank Category A subprojects and exclusion of subprojects with potential impact on international waterways. The OM will also focus on standardizing certain transaction documents in creating processing efficiencies and allow for speedier scale-up. The OM will have specific procedures for ESL and IEE subprojects to accommodate the timing.

11. **The OM will not be changed without IBRD consent.** The OM will be the guiding document for CEF to operate the FinBRAZEEC Project and will contain, but not be limited to, the following:

(a) The detailed description of Project implementation activities, their sequencing, and the prospective timetable and benchmarks in relation thereto
(b) The Project administrative, accounting, auditing, reporting, financial, flow of funds, reimbursement, and disbursement procedures, including all pertinent standard documents and model contracts
(c) A business and implementation plan for planning and implementing the Project
(d) A plan for capacity-building and training activities under the Project
(e) The plan for the M&E and supervision of the Project
(f) The eligibility criteria for subprojects, beneficiaries, and subproject sponsors (if any)
(g) The model forms of the Subproject Agreement, including framework of financial terms and conditions
(h) The methodologies for applying the concessionality under the GCF funding to the beneficiaries and to ensure that GCF reimbursable funds used for subprojects do not exceed 25 percent of the total volume of sub-loans on average over the implementation of the Project
(i) The indicative disbursement schedules for this agreement, the CTF Agreement, and the GCF funding
(j) The negative list, including, among others, Category A subprojects and subprojects in international waterways
(k) The safeguard documents
(l) The grievance mechanisms and the code of conduct
(m) The M&E framework
(n) The staffing plan for GECOA
(o) The GF's Legal Framework and set of the criteria for assigning guarantees to loans
(p) The methodology and process to ensure that the maximum cumulative value of the credit enhancement products to commercial lenders under the GF supported by the loan does not exceed the total loan amount

12. **The Project will also prepare a Guarantee Facility Manual,** which consists of different schedules setting forth, among others, governance rules, methods, guidelines, procedures, specific development plans, exchange rate issues, seniority of funds, rules for replenishment of concessional funds, limitation on the issuance of guarantees supported by the IBRD contingent loan, guidelines for the creation of segregated accounts for the various funding sources, restriction on the approved use of funds for each funding source, standard documents, and any other procedures necessary for the operation of the GF. It will also specify the detailed content and frequency of so-called 'Exposure Reports', which will be the basis for requesting disbursements of the IBRD contingent loan and will cap that value that can be disbursed in that given period (according to the value of the GF's cumulative outstanding guarantee payout liability). The GF Manual will not be changed without IBRD consent.

13. **All the stakeholders under FinBRAZEEC will operate and report according to the standardized documentation developed as discussed in the previous paragraphs.** This includes appraisal by CEF and PFIs; reporting to CEF from SPVs and municipalities; monitoring of subprojects with ESCOs, aggregators,

and beneficiaries; and loan repayment and guarantee fees payments. It is expected that with the use of standardized transaction documents, the probability of failure of EE subprojects will be reduced. To accommodate different levels of pipeline readiness, it is expected that the ESL and IEE subprojects may be implemented at a different pace.

Implementation Arrangements at Subproject Level for ESL

14. **The ESL window of the EE Facility will primarily lend to SPVs established by the private sector**, with a concession to modernize and operate the street lighting system on a PPP basis in a municipality. Such SPVs will recover costs from the concession by a dedicated levy for street lighting from electricity consumers or from the municipal budget. This kind of arrangement already exists for most municipalities in Brazil. It will be necessary to ringfence those funds to ascertain that they are used to make the contractual payments for the PPPs (*contra-prestação*). A typical arrangement for an SPV may follow a predictable path:

- A concessionaire is selected through a competitive bid to whom the municipality grants a concession with a wide range of responsibilities (installation and O&M) of the system over the PPP contract life.
- An SPV is formed by the winning concessionaire, as a consortium (for example, an operator, lender, and manufacturer), which is responsible for raising the financing for the subproject.
- The city remunerates the concessionaire through monthly payments using revenue raised from a dedicated levy on electricity consumers—known as 'COSIP' (or, if nonexistent or insufficient, municipal budget).
- COSIP is collected by the electricity utility directly on the electricity bills and flows to a municipal account or an escrow account.
- CEF and other co-lenders of the syndicate lend to the concessionaire, disbursing loans and receiving debt service payments on an agreed-upon schedule.

15. **Figure 2.1 illustrates the equivalent responsibilities within the concession,** and figure 2.2 shows the flow of responsibilities and funds from the EE Facility to the SPV.

Figure 2.1. Example Structure of ESL PPP Concession

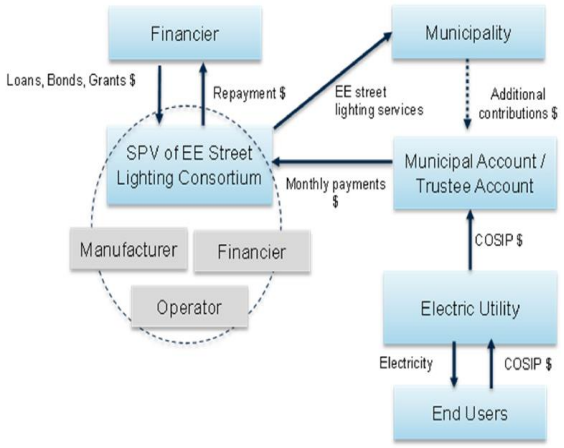
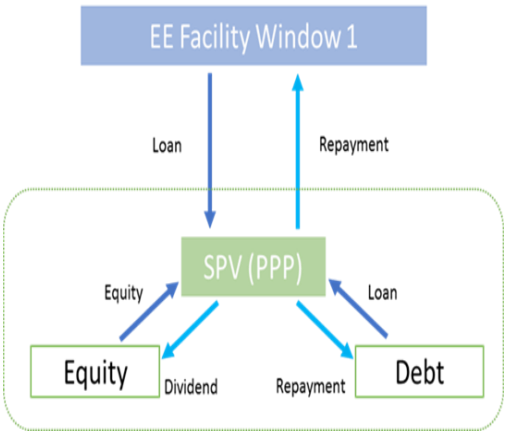


Figure 2.2. Fund Flow - EE Facility to SPV



16. **The ESL concessionaire will be fully responsible for the design, procurement, installation, and maintenance of the system.** The municipality will monitor quality and make a monthly payment based on metered or deemed savings and adjusted for the quality of service rendered and compliance with expansion plans. The granting authority will monitor performance periodically and will adjust the required revenue according to the terms and conditions set forth in the concession agreement. A tripartite operational contractual agreement involving the utility, the municipality, and the concessionaire should be signed, defining the responsibilities of each party regarding the terms of supply of electricity, use of shared assets, transfer of funds, payment for electricity used, and other matters. This operational agreement should also specify the expected quality of service delivered including technical specifications (for example, voltage fluctuation, transients) that may have an impact on the physical integrity of the equipment and the quality of lighting services provided by the concessionaire.

17. **The concessionaire will be competitively selected by the municipality as one of the eligibility criteria to receive financing from the FinBRAZEEC facility, in accordance with the applicable federal laws.** The concession contracts will set forth all terms and conditions that include the design, replacement, expansion, and maintenance of the street lighting systems. Construction (that is, replacement and expansion) will take place over a long period (for example, 3–5 years). The concessionaire may, at its own discretion, buy insurance to backstop equipment failures not covered by the manufacturers' guarantee. The concessionaire will be fully responsible for the design, procurement, installation, and maintenance of the system. The terms of the concession will spell out who is responsible for the payment of electricity and the incentives/penalties (if any) resulting from electricity savings at prespecified levels.

18. **The municipality will monitor quality of installation and make a monthly payment based on metered or deemed savings adjusted for the quality of service rendered.** Deemed savings should be used because consumption is typically not metered in public street lighting and is unlikely to be metered 100 percent any time soon; even if a PPP concessionaire installs its own meters, the utility (or the regulatory agency) may not accept it as credible for billing and invoicing. A key tripartite contractual agreement involving the power utility, the municipality, and the ESL concessionaire should be signed. The granting authority (municipality) will monitor performance periodically and will adjust the required revenue according to the terms and conditions set forth in the concession agreement.

Key Implementation Arrangements at Subproject Level for IEE

19. **The IEE window will lend to EE investments in industries through on-balance-sheet or off-balance-sheet solutions.** In the case of an on-balance-sheet solution, the EE Facility will make loans directly to industrial companies with EE investments at a scale to justify the transaction costs of a retail lending approach. While the option for on-balance-sheet approaches is within the scope of the Project, market analysis indicates that the potential to achieve scale through this approach will be limited, primarily due to the barriers associated with constrained balance sheets of industrial entities whose corporate investment priorities often do not include EE.

20. **In the case of an off-balance-sheet solution, there are multiple business models that could be deployed,** and the Project will remain open to considering various approaches according to market conditions, including investments through ESCOs and other off-balance-sheet IEE aggregators.

21. **The World Bank, in partnership with CEF, has undertaken in-depth market research as part of the TA activities under the BRAZEEC TA project and the preparation of the FinBRAZEEC Project.** This research has honed the primary off-balance-sheet model expected to be developed under this Project—referred to as the F2E. Under the F2E model, the off-balance-sheet financing vehicle will be a consortium or joint venture between a financial partner and a technical partner. CEF (and other commercial lenders) will lend directly to the off-balance-sheet vehicle, on a limited-recourse finance basis. There will be no restrictions to having several similar vehicles competing in the market or specializing in specific market segments (that is, industry sub-sector, specific technology, or process), and all such entities could access FinBRAZEEC financing.

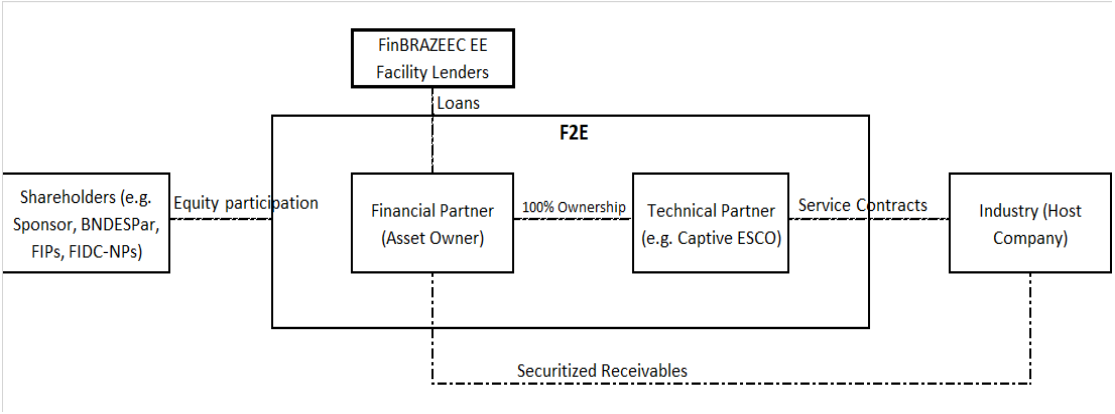
22. **The financial partner will be responsible for raising funds to finance investments in EE that will be executed in industrial facilities.** Resources will be sought from investors, donors, and commercial banks and, in the future, debentures, green bonds, and other financial instruments. It is expected that the most adequate structure for the off-balance-sheet vehicle would entail a combination of an existing ESCO, with technical reputation in the market, with a financial institution (referred as F2E). As the off-balance-sheet financing mechanism evolves and assets begin to perform, the structure can be complemented by financial instruments that are usually available on the Brazilian market such as FIPs,[53] FIDCs,[54] and—in the near future—new instruments that may be created (for example, Receivables Certificates in EE). The financial partner will be the owner of the assets and the holder of the securitization of the cash flows resulting from the payment for the service contract between the technical partner and the industrial company. It will use cash flows as collateral in lending operations with CEF and other syndicated banks.

23. **The technical partner (preferably a vehicle-owned and captive ESCO, or several ESCOs with separate contracts with the same financial arm)** will be responsible for identifying EE opportunities; estimating required investments and energy savings; auditing facilities and preparing investment-grade audits (or validating them if they already exist); and acquiring, installing, and maintaining the equipment in the industry (it may conduct maintenance directly, or enter into a contract with the industry or third parties). The technical arm will enter into one or more service contracts that can be characterized as off-balance-sheet operations according to IFRS 16, validating the concept with auditors and the legal department of the industrial company. The contract will include the provision of services in general, including availability of an installed capacity (heat exchangers, air compressors, and so on) consistent with the savings to be generated (and assumption of some risks). The technical arm will guarantee a minimum level of performance and efficiency gains. It will be responsible for the measurements and calculation of the generated savings (measured or estimated and adjusted to non-controllable factors), although this role could be outsourced to an independent third party.

24. **Figure 2.3 illustrates the relationship between the EE Facility and the proposed vehicle for industrial energy efficiency,** as well as among the other parties to the transaction.

[53] Fundos de Investimento em Participações.
[54] Fundos de Investimento em Direitos Creditórios.

Figure 2.3. Example Structure of Off-balance-sheet Business Model for IEE (F2E)



25. **The implementation of the new accounting standard IFRS 16, as of January 2019, will change the form of treatment of capital expenditures (CAPEX) and operating expenditure operations in the balance sheets of the companies.** Off-balance-sheet operations will continue to be possible, but through a careful analysis of the structure of the operation, the type of technology, and the contract to be carried out. Most of the targeted customers of the EE Facility are expected to implement the IFRS 16 rules. One of the fundamental factors for the analysis of the adequacy of IFRS 16 is in the 'economic essence' of the contract. In particular, certain risks will be transferred to the contractor, relating—for instance—to asset maintenance, performance assurance, and asset ownership costs (for example, insurance, losses due to obsolescence, and residual value risk). As a result, there will also be an appropriate transfer of margin between the industrial client and the technical partner. The contract will be designed to strike the right balance between cash flow predictability—and thus bankability—and risk transfer to ensure compliance with IFRS 16 standards.

26. **Market sounding conducted during Project preparation with banks, lawyers, ESCOs, accounting advisers, energy marketers, and industries has indicated the interest of several companies in testing the proposed business model.** There are other technically and financially sound ESCOs that have already expressed interest and have the required qualifications to implement the model. Discussions with the Brazilian ESCOs Association (ABESCO) also confirmed that several companies are interested in strengthening themselves technically and financially to operate under the proposed model. Discussions with the Brazilian energy marketers (traders) association suggested that many of those companies have interest in providing a complete 'package' of energy services to their clients, including trading and efficiency.

27. **This business model offers several advantages compared to other financing structures considered.** The primary advantage is a simple off-balance-sheet financing vehicle, therefore removing one of the main barriers for industrial customers to invest in EE: the lack of certainty in the stream of payments deriving from EE gains. Further, simplifying measurement and verification and largely delinking from payments will give more certainty to cash flows. The mechanism will enable the creation of a new asset class for investments in EE, thereby attracting a wider range of potential investors, including those interested in investing in green bonds.

28. **The IEE aggregators to be financed by the FinBRAZEEC facility will be responsible for the design of individual IEE subprojects.** The IEE aggregator and the host company should agree on who will be responsible for the installation and O&M of the system. Typically, the installation will be carried out (or at least monitored) by plant engineers, the operation of the equipment will be by the host company, and maintenance will likely be outsourced to a third party mutually agreed between the host company and the IEE aggregator. O&M contracts should be signed following the completion of the installation in the host company. Table 2.1 provides a comparison of typical energy savings arrangements provided by ESCOs (shared savings or performance guaranteed) and the off-balance-sheet financing model proposed in this Project. The solution proposed is a hybrid between the two typical ESCO arrangements. It operates as an off-balance-sheet vehicle (like a shared-savings ESCO), but the payment for services is—as much as possible—delinked for actual savings. In that sense, it resembles the contractual arrangement of a performance-guaranteed ESCO. Certainty about cash flows is an important condition to improve the bankability of the subprojects and to leverage larger amounts of debt—and therefore equity—resources to be invested in EE subprojects.

Table 2.1. Comparison of Off-balance-sheet Models

	Shared-Savings ESCO	Performance-Guaranteed ESCO	F2E
Is Performance-Guaranteed by the Energy Company?	YES	YES	YES
Does Energy Company Invest and Own EE Assets?	YES	NO	YES
Is it an off-balance transaction?	YES	NO	YES
IS Payment to the Energy Company Fixed?	NO, savings are shared between ESCO and host	YES, once performance within agreed range	YES, with some adjustments for risks as per IFRS 16's principles
Are cash flows certain and able to be securitized & leveraged?	NO	YES	YES

Key Contractual Agreements

29. The following contractual arrangements are expected to be required for the Project:

(a) **Funded Activity Agreement between GCF and IBRD.** Providing for US$186 million, the US$4 million nonreimbursable grant for the start-up costs for the EE Facility and TA activities, and the US$5 million nonreimbursable grant for the capitalization of the EE GF, all in accordance with the Accreditation Master Agreement between the World Bank and GCF. The GCF loan will be in the form of a trust agreement for the World Bank to provide the GCF proceeds in the form of loan and grant to the executing entity (CEF).

(b) **GCF Grant Agreements between IBRD and CEF.** Providing for the downstream transfer of the funds to CEF for the US$5 million nonreimbursable grant that will contribute to Subcomponent 1.2 and US$4 million nonreimbursable grant for Component 2 of the FinBRAZEEC Project. Two separate grant agreements may be signed for CEF to have access to the grant funds for Component 2 before effectiveness of the overall Project.

(c) **GCF Loan Agreement between IBRD and CEF.** Providing for the downstream transfer of the funds to CEF for the US$186 million loan that will contribute to Subcomponent 1.1 of the FinBRAZEEC Project.

(d) **CTF contingent Grant Agreement between IBRD and CEF in compliance with the CTF policies and legal requirements.** Providing for the downstream transfer of the funds to CEF for the US$20 million contingent grant that will contribute to Subcomponent 1.2 of the FinBRAZEEC Project. The agreement should specify the conditions for disbursement and return of unused funds and be compliant with the CTF policies and legal requirements.

(e) **IBRD IPF contingent loan (with deferred drawdown features) agreement between the World Bank and CEF.** Defines the terms and conditions of the IBRD loan offered, including covered risks, amount and terms, disbursement conditions, and payout procedures.

(f) **If required, a subsidiary agreement between CEF and the GF** to be created and managed by CEF to establish the responsibilities of CEF as shareholder and management agent. In addition, the fund governance rules should be determined and set before Project effectiveness.

(g) **Intercreditors agreement between CEF and other syndicated lenders financing the FinBRAZEEC facility.** This agreement, or a similar such agreement, will define the roles of the syndication leader and participants, common financial parameters, and operating conditions of the syndication of loans under Subcomponent 1.1 of the FinBRAZEEC facility.

(h) **Sub-loan agreements between CEF and EE Facility subproject (borrowers).** Defines the terms and conditions of the sub-loans in accordance with the intercreditors agreement, and the reporting conditions by the borrowers with respect to CEF (an acceptance of conditions agreement will be defined to ensure adequate reporting to CEF that ultimately will allow the World Bank to obtain information to monitor the Project indicators, including to report to the GCF and CTF).

Financial Management

30. **A Financial Management Assessment of CEF was performed in accordance with OP/BP 10.00 and the Financial Management Manual for World Bank-Financed Investment Operations (effective March 1, 2010 and Revised February 10, 2017).** The scope of the assessments included (a) an evaluation of the existing FM systems in place to be used for Project monitoring, accounting, and reporting; (b) a review of staffing requirements; (c) a review of the flow of funds arrangements and disbursement methodology; (d) a review of the internal control mechanisms in place; (e) format and content of Interim Financial Reports (IFRs); and (f) a review of internal and external audit arrangements.

31. **The conclusion is that CEF has sufficient capacity to fulfill its FM responsibilities and is adequately exposed to the World Bank's FM procedures having adequately implemented World Bank-funded operations.** At this stage, the FM risk is assessed as Substantial, mainly due to Project design involving multiple financing agencies; need for appropriately adjusting its accounting and management information system; maintenance of dedicated ledger accounts to provide details for the respective

operations and timely information to monitor the program and run agreed reports; and possible delays to implement the TA loan. Based on previous project lessons learned, to mitigate implementation delays, at least two dedicated qualified FM staff will be identified no later than the signing of the Loan Agreement, and will be responsible to support the multiple entities involved throughout project implementation. CEF's corporate system (*Sistema de Acompanhamento de Programas de Fomento*, SIAPF) should be adjusted to properly reflect and account for project transactions (sub-loans and guarantee operations) and generate reports.

32. **Implementation arrangements.** To implement the program, an EE Facility will be established by CEF to offer loans to EE subprojects. The EE Facility will consist of a syndication of lenders led by CEF and the GF to be established by CEF.

33. **CEF will implement the program with two main functions: (a) implement and supervise EE Facility investment lending and guarantees to commercial lenders, and (b) manage all TA activities being financed under the Project.** For day-to-day operations, a specific unit, to be identified under current CEF structure, will host dedicated staff (to work exclusively for the Project) that will be responsible for technical and fiduciary aspects, including at least two qualified FM professional staff, responsible to properly follow up on the World Bank's FM and disbursement arrangements for both components, including preparation and submission of FM reports, and also responsible for the whole program's consolidated annual financial statements and audit, as well as the respective activities that will be described in the OM that sets out principles and procedures particularly for the Project, which are complementary to CEF's own current procedures.

34. **Accounting.** CEF adopted the Brazilian Corporation Law No. 6.404/76, modified by Law No. 11.638/07 and the guidelines of the Brazilian Securities Commission (CVM/SNC/SEP) and the Central Bank of Brazil and specific regulations applicable to the finance institutions, under the National Monetary Council, which together with other rules, policies, and procedures issued by the National Treasury Secretariat (*Tesouro Nacional*), National Federal Accounting Council (*Conselho Federal de Contabilidade*), and Committee of Accounting Guidelines (*Comitê de Pronunciamentos Contábeis*) is aligned with international accounting standards and IFRS. CEF will maintain the accounting records of the transactions under the Project encompassing the related components and subcomponents activities. CEF will record all transactions in its corporate accounting management system and will reconcile these records with budget report figures monthly. SIAPF will be used by CEF as the Financial Management Information Systems. Transactions under the Project will be accounted for on a cash basis, for disbursements, reporting, and auditing purposes.

35. **GF.** In principle, the disbursement of the contingent loan to the GF will be triggered in the event of default of subprojects leading to low capital, with the exception of the first capitalization. In case of disbursement, control over such amounts will be made through the maintenance of specific Ledger Account, by source of funds, in its books of accounts and timely reporting in the prescribed format (Exposure Report). These accounts and the related supporting documents/records will be subject to both internal and external audit arrangements and will be detailed in the OM.

36. **Reporting.** CEF will maintain detailed Loans and Guarantee Registers/Records to track individual sub-loans, guarantees, defaults/payouts, claims and recoveries/write-offs for sub-loans, and other expenditures separated by source of funds. CEF will follow all relevant regulations and reporting

requirements particularly those relating to nonperforming assets. CEF will disclose the total of the balances in the EE Facility's account and its operations account under liabilities. This will be represented by CEF cash and cash equivalents under assets and should be subject to internal and external audit. In case the GF is established off CEF's balance sheet, disclosure of GF accounts and its operations will be subject to external audit.

37. **CEF through the PIU will ensure the timely production of semester financial monitoring reports (IFRs) for program expenditures, prepared in Brazilian reais and U.S. dollars, on a cash basis, for monitoring reasons.** These reports will be generated from the CEF management system and will be submitted to the World Bank, within 60 days after the end of each semester. A specific ledger account, by source of funds, will be created in the system to record all loan transactions and will be aligned with the structure of the project cost table to record transactions by category and component/activity. Accordingly, the format and content of the IFRs will cover the following items:

(a) IFR 1A - Sources and Uses of Funds by Disbursement Category, with evidence of the World Bank's share in the financing of expenditures, cumulative (project-to-date, year-to-date, and for the period)

(b) IFR 1B - Uses of Funds by Project Component and Subcomponent, cumulative (project-to-date, year-to-date, and for the period) versus actual expenditures, including a variance analysis

(c) IFR 1C - List of guarantees issued, including details of lender, ESCO, and end user

(d) IFR 1D - Details on progress of underlying sub-loans including default and details on invocation of the GF

(e) IFR 1E - Designated Account bank reconciliation (as appropriate)

38. Any difference between the expenditures reported in the IFRs and those reported in the annual audit reports could be declared ineligible and refundable to the World Bank.

39. **Internal control/internal audit.** All Project budgeting and accounting transactions will run through the CEF management system. All payments will follow acquisition, verification of invoices (*provisão*), and payment (*pagamento*) routine and any other specific procedure stated by the regulators. All transaction processing (recording annual budgets, budget commitments, and payables; authorizing payments; and internal control reviews) will be carried out by CEF that will execute payments and control the segregated Project bank account. These functions will be carried out by the Accounting and Finance Departments of CEF. Other internal control mechanisms will include review and reconciliation of payments, proper access to systems, segregation of functions, and observation of internal administrative codes and procedures. Dedicated bank accounts underlying detailed sub-loans and Guarantee Registers/Records to track individual sub-loans, guarantees, defaults/payouts, and claims and amount would be deposited recoveries/write-offs separately for own loans and loans by CEF, and they will be subject to both internal and external audit. Internal controls procedures will be detailed in the OM and, if necessary, routines will be established during Project implementation.

40. **In accordance with the World Bank's Anticorruption guidelines for IPF operations, the borrower needs to ensure that "any person or entity debarred or suspended by the World Bank is not awarded a contract under or otherwise allowed to participate in the Program during the period of such debarment or suspension."** Reporting of fraud and corruptions practices has increased during the last years and is mainly done through phone calls to the federal police and/or directly to the institution ombudsman. To raise awareness about existing program mechanisms to handle any allegations of fraud and corruption, CEF should agree on adequate measures including the insertion of a link with its websites. CEF will immediately report to the World Bank, through exchange of letter, any allegation of fraud and corruption and every semester (joint with the IFRs) provide a report containing all alleged cases with an updated status of respective actions taken.

41. **External audit.** CEF is subject to the Federal Government internal and external control oversight bodies, General Controller of the Union (CGU) and Supreme Audit Institution policies and procedures. Its internal audit department, AUDIT, follows international standard practices issued by the Institute of Internal Auditors (IIA). The consolidated financial statements are under the responsibility of its Board of Directors and have been prepared in accordance with IFRS, issued by the International Accounting Standards Board. Ernst & Young Auditores Independentes issued an unmodified opinion over the latest available (FY2016) consolidated financial statements; however, due to ongoing investigation by the federal public authorities of possible noncompliance with laws and regulations by CEF employees and administrators, it is not possible to predict their effects on the consolidated financial statements.

42. **For the Project, the external audit will be conducted by CGU due to its mandate to audit externally financed projects at the federal level.** The CGU will follow agreed terms of reference acceptable to the World Bank and will conduct the audit in accordance with International Standards on Auditing (issued by the International Auditing and Assurance Standards Board of the International Federation of Accountants or national auditing standards if, as determined by the World Bank, these do not significantly depart from international standards). The auditors will be required to issue an opinion on the Project annual financial statements (that is, fiscal years' last semester IFR) prepared by CEF in accordance with accounting standards acceptable to the World Bank and produce a management letter, where any internal control weaknesses will be identified, contributing to the strengthening of the control environment. The auditor's report will be submitted to the World Bank no later than six months after the end of the fiscal year. The World Bank will review the audit report and will periodically determine whether the audit recommendations are satisfactorily implemented. The World Bank also requires that CEF disclose the audited Project financial statements in a manner acceptable to the World Bank and following the World Bank's formal receipt of these statements from CEF. The World Bank will also make them available to the public in accordance with the World Bank Policy on Access to Information.

Disbursements

43. **The following disbursement methods will be available.** Advance, Reimbursement, and Direct Payment as defined in the respective Disbursement and Financial Information Letters. Disbursements will follow specific arrangements based on the purpose of each financing operation ensuring the adequate flow of funds agreed with CEF as summarized in table 2.2.

Table 2.2. Summary of Disbursement Arrangements

Project Components	GCF Concessional Loan	GCF Grant	CTF Contingent Recovery Grant	IBRD Contingent Loan
Component 1: EE Facility	**$ 186**	**$ 5**	**$ 20**	**$ 200**
Subcomponent 1.1 Loan Syndication	$ 186			
*Disbursement arrangements	**Method:** Advance to Segregated DA in BRL **Documentation required:** Customized SOEs			
Subcomponent 1.2 Credit Enhancement Products	0	$ 5	$ 20	$ 200
*Disbursement arrangements		**Method:** Advances into the GF segregated designated account held by CEF **Documentation required:** Advances: Evidence of Disb. Conditions fullfilment as specified in the Agreements. For the IBRD contingent loan this requirement applies only to the first disbursement. For subsequent disbursements, submission of "Exposure Report" approved by the World Bank indicating the withdrawn amount.		
Component 2: Technical Assistance	**0**	**$ 4**	**0**	**0**
*Disbursement arrangements		**Method:** Advance to Segregated DA in BRL. Reimbursement and Dir.Payment also available **Documentation required:** SOEs		
Total	**$ 186**	**$ 9**	**$ 20**	**$ 200**

DA = Designated Acccount; SOEs = Statement of Expenses;

44. **The GCF concessional loan will finance 100 percent (inclusive of taxes) of respective eligible expenditures.** Eligible expenditures will be defined in the Legal Agreement as eligible sub-loans from EE Facility for ESL and IEE subprojects under Subcomponent 1.1. The funds will be disbursed into a segregated Designated Account opened in Brazilian real managed by CEF and report on the use of Advances requests through Customized Statement of Expenditures.

45. The GCF grants will finance US$5 million under Subcomponent 1.2 GF and US$4 million under Component 2, Technical Assistance (see disbursement arrangements in paragraphs 128-129).

46. The CTF contingent grant will finance US$20 million under Subcomponent 1.2 GF (see disbursement arrangements in paragraph 128).

47. The IBRD contingent loan will finance US$200 million under Subcomponent 1.2 GF (see disbursement arrangements in paragraph 128).

48. **The GF disbursement arrangements will be the same for all the financiers.** CEF will capitalize the GF using the US$5 million GCF grant; the US$20 million CTF grant; and, as needed, the IBRD contingent US$200 million loan. Upon fulfillment of detailed disbursement conditions agreed and defined in the legal documents, the GF capitalization will be authorized for GCF and CTF grants. In addition, the initial capitalization under the IBRD contingent loan may be requested. For subsequent disbursements under the IBRD contingent loan, an Exposure Report indicating the amount to be withdrawn, in form and substance satisfactory to the World Bank, will be submitted by CEF. The Exposure Report will also indicate the maximum disbursement that can be requested for the given period, based on the value of the Guarantee Facility's cumulative guarantee payout liability. The GF will mainly offer credit risk enhancement products to private lenders. Disbursements will be contingent on certain events and conditions (such as insufficient level of capitalization due to default, high guarantee demand, or both) established in the Guarantee Facility Manual approved by the World Bank. The funds will be disbursed through advances to the GF segregated Designated Account opened in CEF for capitalization. The advances for capitalization will be considered documented by the World Bank upon receipt of the CEF's confirmation, within the following 30 days, that an equivalent amount was accounted for by CEF, in accordance with the GF procedures defined in the Guarantee Facility Manual.

49. **The TA disbursement arrangements will follow the standard disbursement procedures.** The GCF and GIF grants will finance 100 percent (inclusive of taxes) of respective eligible expenditures. Eligible expenditures will be defined in the Legal Agreement as goods, consultants, non-consulting services, training and operating costs. The funds will be disbursed to a pooled Designated Account opened in Brazilian real and CEF managed by CEF. Reimbursement and Direct Payment methods will be also available. CEF will report on the use of Advances and Reimbursement requests through regular Statement of Expenditures (SOEs). Direct Payments will be documented by Records (copy of the invoices).

50. **Retroactive financing.** Retroactive financing will be allowed only for payments under the TA component, financed by the GCF grant, up to US$ 800,000.00 made before the signing date, but not exceeding 12 months from such date.

Procurement

51. **For contracts financed in whole or in part by the IBRD loan or IDA credit, procurement will be carried out in accordance with the World Bank's Procurement Regulations for IPF Borrowers dated July 2016, revised November 2017.** However, according to Section 2.2.b of the Procurement Regulations, the Procurement Regulations do not apply to the procurement of goods, works, non-consulting services, and consulting services financed by the World Bank through loans made by eligible FIs to private borrowers.

52. **The World Bank has carried out an assessment of CEF's ability to implement the procurement activities under Component 2—the US$4 million TA component of the Project that is financed by a GCF grant, administered by the World Bank.** The assessment revealed that CEF has adequate structure and staffing to carry out the procurement required for the Project, especially given CEF's experience with World Bank and other donor-funded procurement and the fact that CEF's procurement regulations

provide specifically for the application of donors' procurement rules, mitigating the usual conflicts in interpreting which rules takes precedence.

53. **CEF prepared a detailed PPSD for the procurement activities under the TA.** The PPSD identified how procurement activities will support the development objectives of the Project and deliver the best value for money under a risk-based approach. CEF has a robust organization, with clearly defined roles and responsibilities, solid experience in procurement, and robust governance and economic structures. Most of the contracts under the Project are of low value and low risk, and the market analysis has already identified the major players in the market. It shall also provide adequate justification for the selection methods in the Procurement Plan and for the prior-review thresholds.

54. **As anticipated, CEF is not deeply familiar with the World Bank's new procedures for the selection of consultants.** So, training is being proposed to CEF PIU staff and supporting procurement experts. The risk assessment rating is Low.

55. **Retroactive financing.** Procurement activities that require retroactive financing will be identified in the Procurement Plan and will be carried out in accordance with the Procurement Regulations.

56. **Procurement Plan.** A draft Procurement Plan for the first 18 months of implementation, acceptable to the World Bank, has been prepared by CEF through the World Bank's STEP system:

Table 2.3. FinBRAZEEC Procurement Plan, Component 2

Contract Type	Contract Description	Value (US$, thousands)	Risk	World Bank Oversight	Market Approach	Method	Evaluation Criteria
CS	Assessment of ESCOs and their ability to provide off-balance-sheet financing for IEE	100	2	Post	Open International	QCBS	n.a.
CS	Study on tax and accounting implications of different aggregation vehicles to support off-balance-sheet EE financing	400	3	Post	Open National	QCBS	n.a.
CS	Review of EE benchmarking studies for key industries (oil and gas, cement, manufacturing, and so on) and studies of key equipment (heating systems, cooling systems, and so on)	50	1	Post	Direct	DIR	n.a.

Contract Type	Contract Description	Value (US$, thousands)	Risk	World Bank Oversight	Market Approach	Method	Evaluation Criteria
CS	Technical and legal support to CEF to establish a syndication vehicle (risk allocation, cost sharing, responsibilities of lenders, legal documents, role of CEF, and so on) and the GF	1,000	2	Post	Open National	QCBS	n.a.
CS	Manual on social aspects (for example, safety) related to public lighting	75	1.5	Post	Open National	INDV	n.a.
CS	Audit of Category A projects - social and environmental risks	100	1.7	Post	Open National	QCBS	n.a.
CS	Training on risk modeling	6	1.5	Post	Open National	INDV	n.a.
CS	Training on financial feasibility analysis	6	1	Post	Open National	INDV	n.a.
CS	Investment-grade audits (involving all industrial technologies) with CEF's participation (as part of its capacity building)	250	2	Post	Open International	QCBS	n.a.

Note: CS = Consultants' Services; DIR = Direct Consulting; INDV = Selection of Individual Consultant; QCBS = Quality- and Cost-Based Selection.

57. **Procurement supervision and post review by the World Bank.** Contracts not subject to prior review will be subject to post review. The World Bank will carry out procurement post reviews on an annual basis with an initial sampling rate commensurate with the risk rating of the Project. This rate will be adjusted periodically during Project implementation based on CEF's performance. The World Bank will also carry out regular procurement supervision missions on a semiannual basis. CEF shall upload all procurement and contract information in STEP, which will be used to provide the World Bank with a consolidated list of all contracts for goods, works, and consultants' services awarded under the whole Project. The postreview contract sample will be selected from STEP.

Environmental and Social (including Safeguards)

58. **Following the World Bank's Operational Policy OP/BP 4.01 for Environmental Assessment of FI operations, a Safeguards Diagnostic Report was elaborated by the World Bank to assess CEF's environmental and social risks institutional and management capacity.** This annex summarizes the main findings of the Safeguards Diagnostic Report. CEF's environmental and social institutional and management framework is considered as adequate to manage the risks under this operation. Based on this diagnostic, an ESMF was prepared by CEF following World Bank guidelines. The Project's environmental and social risk is assessed as moderate. The draft ESMF was cleared and disclosed by the World Bank on January 26, 2018 and by CEF on March 5, 2018. Due to low response rates in the first round of public consultations, an additional round of public consultations was conducted on May 18, 2018, and

comments were incorporated into the final ESMF as appropriate. This process was led by CEF and supervised by the World Bank. The final ESMF was cleared and disclosed by CEF and the World Bank on May 24, 2018.

59. **In Financial Intermediary Operations (Category FI), the World Bank, the FIs, and the subprojects share responsibilities on Environmental and Social Risk Management.**[55] At the preparation stage of FI operations, the requirements related to environmental and social assessment and management and the proper framework and/or plan of management of environmental and social risks and impacts are defined. The World Bank evaluates these arrangements for management of environmental and social risks and impacts. The World Bank also verifies that disclosure and public consultations (with general stakeholders, NGOs, prospective subprojects, and potentially subproject`s affected people) have been properly held and decides to which subprojects (if any) World Bank's prior review of safeguard-related issues is required. The Project may include a component to strengthen the FIs' environmental and social management framework, plan, system and capacities. At the implementation stage of FI operations, the FIs implement the agreed ESMF system and ensure that all subprojects meet all the social and environmental safeguard-related requirements. The FIs (a) screen subprojects, (b) determine environmental and social requirements, (c) ensure these requirements are met before approving subprojects, and (d) monitor and report on compliance with these requirements during subprojects' implementation. Meanwhile, the World Bank applies 'due diligence' to fulfill fiduciary responsibilities, prior-reviewing subprojects as needed and supervising compliance with agreed environmental and social arrangements.

Potential Project Impacts and Mitigation Measures

60. **The Project is part of the World Bank's long-term engagement to support Brazil to increase energy savings and improve demand-side EE.** Overall, this Project brings benefits to public lighting, selected industries, and the environment by contributing to reduction of GHGs and pollutants, increases energy savings, and encourages the promotion of environmentally good industry practices. It is anticipated that the Project would only include Category B and C subprojects (World Bank's classification).[56]

[55] The FIs are responsible for (a) screening subprojects; (b) ensuring the subprojects carry out appropriate environmental assessments, including proper consultation of key stakeholders; and (c) verifying that the subprojects meet all national environmental requirements and are consistent with OP 4.01 and all other World Bank safeguard policies. The World Bank is responsible for (a) reviewing the adequacy of country environmental requirements and the proposed arrangements, mechanisms and responsibilities for screening, monitoring, and evaluating the management of environmental and social impacts of subprojects; (b) evaluating the capacity of each participating FI to fulfill its related responsibilities with the management of environmental and social risks; and (c) where necessary, ensuring the project includes components to strengthen the relevant environmental and social management regulatory framework, system, and capacity of the FIs.

[56] Category A: Projects that are likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. Environmental Assessment for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives, and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. Category B: When the projects' potential adverse environmental impacts on human populations or environmentally important areas are less adverse than those of Category A projects; site-specific; few if any of them are irreversible; and in most cases mitigating measures can be designed more readily than for Category A projects. Category C: Projects that are likely to have minimal or no adverse environmental impacts. Beyond screening, no further Environmental Assessment action is required for a Category C project.

61. **The potential impacts during the implementation phase of subprojects involve** (a) excavation, noise, dust, and disposal of domestic waste and waste water typical to the installation/construction of activities; (b) disposal of old parts of inefficient equipment that may contain hazardous waste; and (c) safety issue during the construction/installation of new equipment and facilities. The subprojects' implementation-related impacts are likely to be localized and can be managed and mitigated to acceptable levels by applying good standards and practices. The possible impacts during the operation phase of new equipment and facilities may include safety issues, air emission, solid waste and wastewater, and disposal of hazardous substances from industries.

62. **There are long-term impacts, for which the magnitude of toxicity and amount of pollutants generated from the new EE facilities are assessed to be lower than those from the older replaced technologies and equipment.** These impacts are site-specific, and measures for managing these impacts could be readily designed. The most significant envisioned impact of the Project relating to disposal of solid waste (bulb replacement of street lightning) is fully covered by the Brazilian legislation, policies, and procedures, which also involves well-developed reverse engineering practices.

63. **The TA component of this Project is not expected to have significant environmental and social consequences.**[57] Activities may be classified as Type 2 TA activities.[58] Considering the sector of investment of these PPPs, TA activities may have an indicative Environmental Assessment Category C. Therefore, they do not require the preparation of safeguards instruments before appraisal or during implementation.

64. **As the EE subprojects to be financed will be located within the existing premises of privately owned industrial facilities and public spaces of middle size and large Brazilian cities, they are not expected to have adverse impacts related to land acquisition and involuntary resettlement.** The Project is expected to have overall positive social benefits because it promotes energy efficiency and reduces GHG emissions and other pollutants into the atmosphere.

65. **The Project also has a potential to generate jobs in the lighting industry, which currently comprises 604 factories that generate more than 37,000 jobs.** These factories are mostly located in the southeast and south regions, and 65 percent of them are small manufacturers.[59]

CEF's PRSA

66. **CEF's analysis of environmental and social risks is based on its PRSA, on internal social and environmental risk assessment rules and the verification of requirements, in addition to the Equator Principles.** CEF works with two types of processes: (a) Project Analysis applies to large projects such as

[57] In the IEE sector, the Project will essentially support technical studies and early operational costs, for which no bank or private investor is willing to invest during the initial labor- and investment-intensive months of operation, before revenues are sufficient to support these functions. In the Street Lighting sector, TA activities supported by the Project will work directly with municipalities and private sector companies helping them to prepare the studies and build the capacities needed to (a) launch successful tenders for PPPs to provide energy-efficient street lighting services and (b) create a new asset class for EE that can attract the interest of a wide range of investors and bondholders. These activities usually do not have adverse environmental and social impacts and risk.

[58] World Bank Interim Guidelines on the Application of Safeguard Policies to Technical Assistance (TA) Activities in Bank-Financed Projects and Trust Funds Administered by the Bank.

[59] Data from the Brazilian Association of Lighting Industry, available at http://www.abilux.com.br/portal/conjuntura/1/diagnosticotico.

infrastructure works (hydroelectric plants, ports, airports, and so on) and corporate loans, which follows four stages: (i) classification, (ii) Equator Principles, (iii) independent social and environmental audit, and (iv) monitoring; and (b) Client Analysis applies to applications for credit from public or private companies in diverse sectors and follows four steps: (i) analysis of impediment, (ii) licensing and value, (iii) in-depth analysis, and (iv) emission of reports.

67. **In addition to the PRSA, since 2014, CEF has had its Credit, Capture, Asset and Liability Management and Pricing Policy, as well as internal standards that address management of social and environmental risks to be observed by the business areas.** The application of the social and environmental guidelines in risk management takes place by means of verification of social and environmental compliance, tracking of cases of environmental degradation and violation of human and labor rights, concession of credit for regularization, and adaptation to requirements of environmental bodies, among others.

68. **For loan operations involving activities with the potential to generate pollution or degradation or that consume natural resources, environmental licensing is required.** For larger-scale operations, a social and environmental analysis of the company is undertaken, involving verification of its registration and regularity with environmental agencies, the existence of fines, embargos or Terms of Conduct, adjustment related to social and environmental infractions, and the use of child or slave labor.

69. **Sector Good Practice Guides.** In 2016, CEF published its first Sector Good Practices Guides to provide its internal and external audiences with guidance on the social and environmental criteria employed in the analysis of corporate credit and structured finance operations. These publications address the main social and environmental impacts in each sector, best management practices for dealing with these, and a summary of the minimum requirements to ensure the social and environmental compliance of ventures in these industries. The first sector guides targeted the agriculture, livestock, planted forest, civil construction, and electrical energy industries.

70. **Institutional arrangement for social and environmental risk management.** Within CEF, social and environmental risk management is an institutional responsibility of National Department of Sustainability and Social Environmental Responsibility (GERSA). GERSA comprises five units: (a) Social and Environmental Impact Assessment; (b) Promotion of Sustainable Business; (c) Corporate Socioenvironmental Investments; (d) Portfolio Management ; and (e) Ecoefficiency, Citizen Engagement, Governance, and Communication. The Social and Environmental Impact Assessment—which is responsible for screening and supervising projects and clients—has a core team composed of biologists, environmental engineers, and civil engineers. This team relies on staff of 72 subsidiary branches distributed countrywide.

Gap Analysis

71. **CEF's PRSA shows full equivalence with the requirements of the World Bank safeguard policies.** CEF's PRSA requires its clients to comply with the relevant and robust Brazilian social and environmental legislation (including licensing process). When analyzing project finance applications with investments of US$10 million or more and in corporate loans that are linked to projects worth US$100 million or more, CEF takes the Equator Principles into account, which reflect IFC's Performance Standards on Environmental and Social Sustainability and associated Environmental, Health, and Safety General

Guidelines. In addition, the Brazilian labor, environmental, and social rules for the sector are also equivalent to the World Bank Group's Environmental, Health, and Safety Guidelines.

72. Above all, CEF has shown in previous operations with the World Bank—BR Caixa Solid Waste Management (P124663) and BR Integrated Solid Waste Management and Carbon Finance Project (P106702)—solid capacity to manage social and environmental issues with well-established policies and procedures that have been recently consolidated.

Monitoring and Evaluation

73. **During Project implementation, the M&E of the Project mainly involves (a) tracking performance indicators as included in annex 1, (b) periodic progress reports broken down by component and window, and (c) an MTR about two years after Project effectiveness.** The focus of such reviews is to ensure that the Project is progressing as originally designed but with the ability to respond to any issues early enough that it does not jeopardize the PDOs.

74. **CEF, as the primary financial counterpart and with the most direct access to the day-to-day functioning of the Project, will be responsible for the overall Project M&E, including collection of Project performance information and reporting on the results and impacts of the Project.** CEF will develop a comprehensive M&E plan during the first year of implementation, and staff will be assigned to collect and collate information in a suitable format to monitor the implementation performance of all the Project components. Such continuous evaluation will permit the Project to be more responsive to issues that arise during implementation and promote accountability and transparency about the allocation and use of resources.

75. **In addition to reporting against the metrics specified in annex 1, CEF will also routinely report financial statements such as a balance sheet, income statement, and cash flow statement in line with domestic law.** Such information can help assess the overall health of the institution and provide insight into any risks carried by the institution that affect the ability of the Project to meet its objectives.

76. **About two years after project effectiveness, CEF will carry out an MTR with the assistance of the World Bank -.** A key goal of the MTR will be to ensure that the underlying logic of the project design still holds and to provide feedback that will inform technical or design adjustments if needed to ensure the Project meets its development objectives.

ANNEX 3: IMPLEMENTATION SUPPORT PLAN

COUNTRY : Brazil
Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC

Strategy and Approach for Implementation Support

1. **The Implementation Support Plan (ISP) describes the support CEF requires to implement key mitigation measures identified in the PAD.** The ISP will seek to ensure that major risks are addressed and the Project can be implemented in a swift and expedient manner. The ISP will be implemented by the World Bank involved in the operation and taking into account country-level risks, legal framework, and local context. The ISP is indicative and flexible and will be revisited during Project implementation based on progress made on the ground.

Overall Project Implementation

2. **The World Bank strategy to support implementation will rely on continuous monitoring and constant interaction with and advice for CEF, municipalities, PFIs, and ESCOs.** Even though these institutions have proven, capable, and experienced staff, hands-on and constant collaboration and advice will be necessary to overcome any challenges associated with Project implementation.

3. **Satisfactory implementation from the start will require the preparation of critical tasks in the following areas:**

(a) Legal: The World Bank will work closely with CEF to help expedite:
- The effectiveness due diligence;
- The creation and structuring of the GF managed by CEF;
- The signature of the framework intercreditor agreements among CEF and the PFIs;
- The agreements between CEF, municipalities, and utilities; and
- Supervision of CEF support to municipalities.

(b) Procurement
- A Procurement Plan for the first 18 months and a procurement chapter for the OM have been prepared with full support of the World Bank.
- Provide capacity building to CEF as needed.
- Review procurement documents under Component 2 and deliver timely feedback to CEF.
- Monitor procurement progress against the Procurement Plan.

(c) FM
- Provide capacity building to CEF as needed.
- Closely supervise the Project's FM.
- Review any audits or FM reports on time.

(d) Safeguards
- Support the development of specific studies and terms of reference needed at sub-project level, under the framework approach.
- Provide capacity building to the environmental and social teams and to municipalities and other stakeholders (as needed).

- Closely supervise the implementation of safeguards documents, considering experiences and lessons learned from previous operations.

4. **Particular key issues to be addressed also include the following:**

(a) **Implementation capacity.** The lack of experience of CEF in the ESL and IEE sectors, together with the need to define the specific arrangements on a subproject/portfolio basis with commercial lenders, municipalities, and companies, may slow down the implementation of the operation. The World Bank will continue to organize workshops and interviews to convene, present, and discuss the operation with stakeholders and provide capacity building, as needed.

(b) **Implementation arrangements: insufficient involvement from commercial lenders.** PFIs could be reluctant to participate in the initial operations despite the risk mitigation mechanisms provided or offer terms that differ considerably from the assumptions considered in the financial models. Mitigation options include helping CEF to identify domestic PFIs or international banks potentially interested and supporting the appraisal of subprojects and the creation of guarantee instruments adequate to attract commercial lenders.

(c) **Stakeholder involvement: dissemination of information for relevant stakeholders.** Improved dissemination and incorporation of new stakeholders during implementation will be sought. The World Bank will make sure it can recollect and take into account their opinions, considering the varying conditions across each state. Municipalities may lack interest, capacity, or experience. The World Bank will support participating subnational entities. The World Bank will help address each entity's particularities by supporting the preparation of specific guidelines, toolkits, and manuals and ensuring that CEF works closely with them.

Implementation Support Plan and Resource Requirements

5. **The World Bank will undertake field visits on a regular basis and have discussions with CEF, commercial lenders, municipalities, industrial associations, and other stakeholders.** During Project implementation, it will also maintain a constant presence in the field with at least two supervision missions per year (and even more during the first year of implementation). The World Bank will also support the strengthening of the capacities of CEF and municipalities, in collaboration with IFC and FNP, and will develop capacity-building activities as needed.

6. **The World Bank will also undertake regular and comprehensive fiduciary reviews, including thorough reviews of FM reports and findings of procurement reviews and audits.** As needed, the World Bank will work together with CEF to maintain a viable delivery model, allocate adequate human resources—in quantity and quality—for and throughout the implementation period, and continuously provide valuable guidance through local staff.

7. Implementation support will be carried out at the following levels:

(a) **Technical.** Technical staff will be located in Washington, D.C. and in Brazil. Specialized technical experts will also be used as needed.

(b) **Fiduciary.** The World Bank staff will provide advice and support to CEF. As usual, staff will be readily available in Brasilia.

(c) **Governance and capacity building.** Support will be coordinated from Washington, D.C., with support from local staff based in Brasilia.

(d) **Safeguards.** The World Bank will support relevant stakeholders with senior staff based in Brasilia.

Table 3.1. ISP - Time, Focus, Skills Needed, and Resource Estimate (Annual)

Time	Focus	Skills Needed	Resource Estimate (Annual)	Partner Role
First 18 months	Legal	Legal counsel	8 staff weeks (SWs) per specialist	Negotiations, constitution GF, and intercreditor agreements
	Procurement	Procurement specialist	4 SWs per specialist	Procurement of consultancies and training services
	Safeguards	Social and environmental specialists	6 SWs per specialist	Consultations, local and environmental and social plans
	Implementation capacity and implementation arrangements	Task Team Leaders and team	18 SWs per specialist	Legal arrangements, reporting, and M&V
	Stakeholder engagement	Staff team and social specialist	3 SWs per specialist	Produce stakeholder engagement plan and initiate consultations.
18–60 months	Technical	TTLs, finance and EE specialists	6 SWs per specialist	Subproject appraisal, signature of loans and guarantees in compliance with OM
	Fiduciary	FM and procurement specialist	24 SWs per specialist	Blending of loans, operation and capitalization of GF, procurement in agreement with updated Procurement Plan and strategy
	Safeguards	Social and environmental specialists	12 SWs per specialist	Ensure compliance with ESMF and OM
60–180 months	Technical	TTLs, finance specialist (GF)	2 SWs per specialist	Operation of GF
	Fiduciary	FM specialist	4 SWs per specialist	Repayment of loans and nonreimbursable grants to World Bank
	Safeguards	Social and environmental specialists	3 SWs per specialist	Ensure compliance with ESMF and OM

Time	Focus	Skills Needed	Resource Estimate (Annual)	Partner Role
Years 15–20	n.a.	n.a.	n.a.	CEF to submit financial statements directly to GCF

Note: TTL = Task Team Leader.

Table 3.2. Skills Mix Required

Skills required	Number of SWs per Year (Average)	Number of Trips per Year (Average)	Comments
TTL	18	3	Based in Washington, D.C.
Power engineer/ EE specialist	3	2	Based in Washington, D.C.
Financial markets	2	0	Based in Brasilia
Legal	8	2	Based in Washington, D.C.
Procurement	6	0	Based in Brasilia
FM	6	0	Based in Brasilia
Social safeguards	6	0	Based in Brasilia
Environmental safeguards	6	0	Based in Brasilia

ANNEX 4: CTF ANNEX

COUNTRY: Brazil
Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC

Results Framework

Table 4.1. CTF Results Framework

Indicator		CTF/IBRD-funded Project	Scaled-up Phase
Total electricity savings (MWh)		16,732,000	50,197,000
Total natural gas savings (MMBTU)		95,190,000	285,569,000
Tons of GHG emissions reduced or avoided (tCO_2e) -Tons per year [tCO_2e/year] -Tons over lifetime of the Project [tCO_2e]		 989,000 12,491,089	 2,883,000 37,473,000
Financing leveraged through CTF funding [US$, millions]		1,323,000,000	3,511,000,000
(a) - Total co-financing mobilized (b + c + d + e + f)	1,323		
(b) - From private sector (Concessionaires - equity)	328		
(c) - From private sector (Investors - debt)	400		
(d) - From public sector (World Bank + GCF)	395		
(e) - From public sector (CEF)	180		
(f) - Requested CTF amount	20		
(g) - Expected leverage factor (g = a / f)	**66.2**		
CTF leverage ratio [1:X]		1:66.2	1:175
Cost-effectiveness CTF cost-effectiveness [US$$_{CTF}$/$tCO_2e$ avoided over lifetime of the Project] Total project cost-effectiveness [US$$_{Total\ Project}$/$tCO_2e$ avoided over lifetime of the Project]		 1.6 102.9	 0.5 87.6
Other co-benefits:		As described in the main document, this Project is expected to have significant social benefits linked to perception of security at night, particularly for women, as well as job creation in the public street lighting and industrial sectors.	

(a) Introduction

Country Context

1. **There are significant needs for long-term financing of infrastructure in Brazil.** Brazil remains below countries of similar income in the stock of physical infrastructure and performs badly in the perception of the quality of infrastructure services. Although access to infrastructure has increased over

the past decade mostly due to privatization programs of the 1990s and the adoption of the public programs to extend coverage in remote areas, road and infrastructure stocks have barely grown since 1990s and generation capacity growth has been very slow compared to countries of similar income per capita.

2. **Private sector financing for infrastructure in Brazil remains modest and public banks have been the most important financiers of infrastructure and industrial projects in the country in recent decades, offering subsidized funding, typically under a corporate finance approach.** These banks have been providing funding indexed to the TJLP,[60] which is far lower than regular rates from commercial banks. BNDES's disbursements in infrastructure increased significantly after 2003, going from US$938 million to US$11.2 billion in 2014. In 2014, BNDES and CEF together accounted for 62 percent of the total investments in infrastructure in Brazil.

3. **The role of the state banks needs to be reoriented, and the Government has recently embarked on significant reforms.** After the onset of the macro-fiscal crisis in 2014, the National Treasury is no longer able to provide the same levels of low-cost funding to the public banks, and their disbursements have fallen drastically. To adjust to these constraints, BNDES has implemented new procedures, restricting access to TJLP to specific sectors and requiring co-financing for its investments. Moreover, the Congress recently approved a reform of the TJLP, replacing it with the TLP,[61] which is linked to long-term market rates. As the TJLP is gradually phased out, BNDES's long-term lending rates will converge toward the market rate on inflation-linked government bonds.

4. **Attracting commercial financing is critical to fulfill Brazil's infrastructure investments needs.** Brazil has extensive domestic capital markets that could be mobilized for long-term infrastructure financing, which would reduce the burden on public coffers and avoid the need to mobilize foreign investment, with the associated FX risks. The recent fall of interest rates on government bonds is pushing fund managers and private banks to find new alternatives, including infrastructure assets; however, the scope of investments has remained very limited to date, concentrating predominately on refinancing projects. New and innovative approaches are needed to increase private sector investment through a project finance approach.

Sectoral and Institutional Context

5. **Brazil has also set ambitious goals for the energy sector under its NDCs made at COP-21.** Brazil has committed to a reduction in national GHG emissions by 37 percent below 2005 levels in 2025 (with an intention to reduce its emissions to 43 percent below 2005 levels in 2030). In the energy sector, it seeks to achieve 45 percent of renewable energy sources in energy mix by 2030 and 10 percent efficiency gains in the energy sector by 2030 (approximately 105 TWh saved by 2030). To meet its NDC targets for energy efficiency, **s**upply-side reforms are not sufficient, nor would they be cost-effective on their own; demand-side management interventions must play a larger role in managing the Brazilian energy system.

[60] The TJLP depends on historical inflation, expected inflation, and country risk premium. The methodology is updated every year by BNDES. For details, see (in Portuguese):
http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/produtos/download/tjlp.pdf.
[61] The TLP uses the Government's funding costs as the new index and will allow for a predictable real long-term interest rate for firms making investment decisions.

6. **However, demand-side EE initiatives in Brazil have been limited to date.** Brazil has two primary public financing lines for EE projects—PROCEL and PEE. These EE programs have achieved some results in a few target areas, but their budgets are limited and their overall cost-effectiveness is still a point of concern. Regarding the demand of fuels, the only program implemented to date is CONPET, which depends on approximately US$3 million in Petrobras resources and focuses on measures like labeling and educational programs in schools.

7. **Public street lighting and urban industry have been identified as key sectors for urban EE investments in Brazil,** given their high potential impact, scalability in the near term, and ability to attract private sector financing if risks can be mitigated**.**

8. **The public street lighting sector in Brazil represents a significant portion of energy consumption and can attract private sector investment through PPPs.** However, investment in this sector has been slow to take off. The potential for investments in IEE in Brazil is enormous, but largely untapped.

9. **FinBRAZEEC aims to unlock financing for these sectors by combining existing financial products in an innovative way to catalyze limited-recourse finance in Brazil.** Working with CEF as an FI, FinBRAZEEC will leverage public funds, including climate finance, to attract private sector financing to EE investments in these sectors. CEF will blend public and private funds to lend to private sector sponsors of EE investments and will also offer credit enhancement mechanisms to derisk the investments, thereby creating a new asset class for EE investments and attracting new private sector investors. This will enable a sustainable infrastructure financing model with sufficient levels of investment to enable Brazil to meet its clean energy goals set out under its NDC.

Project Description

10. **The Project has two Components:** Component 1: An EE Facility[62] for Efficient Public Street Lighting (ESL) and urban Industrial Energy Efficiency (IEE) subprojects, comprising Subcomponent 1.1 – Private financing for ESL and IEE subprojects, in the form of a loan syndication among CEF and commercial lenders and Subcomponent 1.2 – Credit enhancement products, in the form of a GF established by CEF and Component 2: Technical assistance to help increase CEF's internal capacity to implement the Project, support the startup costs of the EE Facility, and help develop a pipeline of high-quality subprojects, reducing the technical risk of the transactions.

11. **Component 1: EE Facility for ESL and IEE subprojects, is structured into two subcomponents, as follows.** The schematic structure of the EE facility is provided in figure 4.1, and details are provided in annex 1.

12. **Subcomponent 1.1: Private financing for ESL and IEE subprojects, in the form of a loan syndication, led by CEF, to provide sub-loans to private companies for ESL and IEE subprojects on a limited-recourse basis.** CEF will blend US$180 million of its funds with the US$186 million GCF

[62] The term 'EE Facility' is used in this document to refer to the set of financial arrangements for the lending by CEF and other domestic banks to the private sector sponsors of ESL and IEE subprojects (Component 1.1, Loan Syndication), as well as the associated credit enhancement products (Component 1.2, GF).

concessional loan. It will lead a syndication[63] with domestic commercial lenders to leverage approximately US$400 million in private debt. CEF and the syndicated lenders will provide parallel loans to (a) SPVs established to implement ESL subprojects and (b) entities, such as dedicated funds, ESCOs, or other aggregators, for IEE investments on a limited-recourse basis. The sub-loans will be divided into two separate windows: Window 1 (sub-loan to ESL subprojects) and Window 2 (sub-loans to IEE subprojects), described in more detail in annex 1.

13. **Subcomponent 1.2: Credit enhancement produts, in the form of a GF, which will offer credit risk enhancement products to derisk the loans under Subcomponent 1.1.** The GF may offer several credit enhancement products, including (a) first-loss coverage and (b) partial credit risk guarantees to cover up to 50 percent of sub-loan losses. Over time, the GF may also offer payment guarantees for subproject sponsors. See annex 1 for more details on the GF products. The GF will charge guarantee fees, priced to cover the expected value of guarantee payouts and ensure the GF is sustainable beyond the life of this Project.

14. **To make the GF viable, grant funding and liquidity support are required to reduce funding costs and increase investor confidence.** The GF will benefit from the CTF contingent recovery grant (US$20 million) and GCF grant (US$5 million) to provide liquidity to the GF and absorb initial payouts, thereby significantly reducing the cost of the GF operation. These savings will result in lower guarantee fees and, ultimately, lower sub-loan financing costs. CEF has never offered a credit enhancement mechanism of this type before, and market feedback indicates liquidity support from the World Bank will significantly increase market uptake. To this end, the GF will benefit from an IBRD contingent loan (US$200 million) with special financial features,[64] which will act as a credit line on which CEF can draw down to support the GF's operation, in the event that the GF needs additional funds to meet its obligations to the guaranteed, syndicated lenders (for example, if sub-loan defaults are higher than expected). Disbursements of the IBRD contingent loan will be tied to GF funding needs. Because the GF will be designed to be sustainable (that is, guarantee fees charged should cover expected guarantee payouts), the need for disbursements from the IPF contingent loan are expected to be minimal.

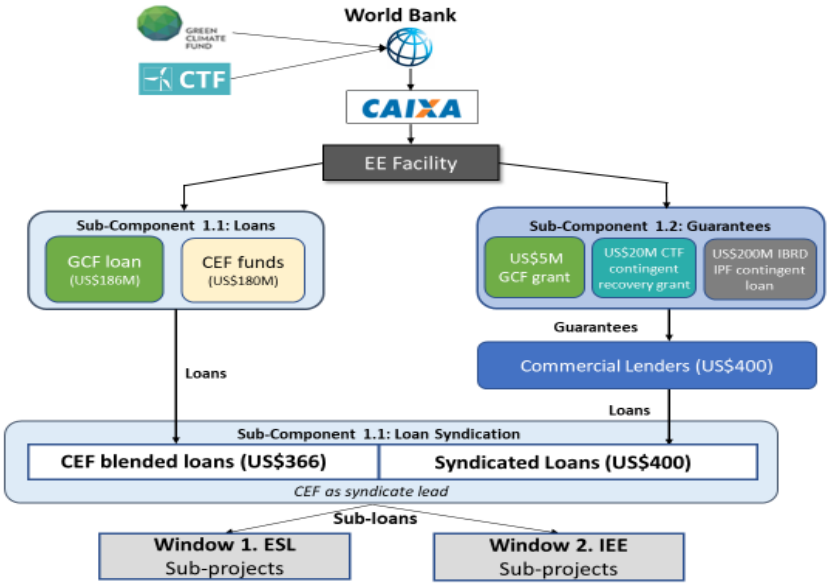
15. **The total estimated value of Subcomponent 1.1 (sub-loans of the EE Facility) is US$766 million**, including US$400 million in commercial loans, US$186 million GCF loan, and US$180 million in CEF's counterpart funds. It is expected that the subprojects will be financed with a 70:30 debt to equity ratio, and thus, the US$766 million of debt will mobilize a total of US$328 million in sponsor equity, for a total value of subproject investment of US$1,096 million. Additional investments from IFC (in the form of a syndicated loan or mezzanine capital) are possible. The value of Subcomponent 1.2 (GF) will depend on the value of guarantees sold. This component is supported by a US$200 million IBRD IPF contingent loan. The value of the IBRD loan is based on the assumption that CEF's partial guarantee—backstopped by the IBRD loan—will cover 50 percent of the US$400 million in commercial loans under Subcomponent 1.1.

[63] The term 'syndication' is used broadly here to represent the parallel lending of CEF and commercial lenders, led by CEF; the precise legal arrangements and operational rules (for example, traditional syndication and club deal) will be determined in the OM. Market soundings have been conducted to compare syndication to other options, such as the creation of a fund. Banks confirmed they prefer to use a syndication approach, and they feel comfortable with CEF acting as the syndication lead.
[64] The special financial features include allowing CEF the flexibility to change the repayment schedule and pricing at the time of disbursement, with the objective to allow CEF to select repayment terms that are linked as closely as possible to the underlying liabilities that are being covered. This approach is similar to that used for DPF DDOs.

This subcomponent will also benefit from the US$5 million GCF nonreimbursable grant and the US$20 million CTF contingent recovery grant.[65]

16. **The structure of the EE Facility, including the loan syndication and the GF, is shown in figure 4.1:**

Figure 4.1. Indicative FinBRAZEEC Structure: Component 1



17. **Component 2: Technical Assistance (TA) consisting of GCF US$4 million recipient-executed grant, and US$1 million Bank-executed grants provided by GIF and ESMAP.**[66] The TA component of this Project will support essential technical studies, capacity building for the departments of CEF involved, and early operational costs. In the case of IEE, these funds will be used to support technical studies and initial implementation efforts (for example, structuring of off-balance-sheet funds to support scale-up of IEE investment). In the case of ESL, the TA will support cities' preparation of high-quality PPP subprojects. A detailed Procurement Plan and procurement strategy for the recipient-executed TA funds (GCF) have been prepared.

18. **The EE Facility will require that certain risk mitigation structures be in place for the subprojects.** In the case of public street lighting, the lending agreements will include requirements for the subprojects to implement mechanisms to reduce the risk of payment defaults, for example, through the implementation of DSRAs, LoCs, step-in rights to the concession, and recourse to the subproject equity. In the case of IEE, loans are more exposed to credit risk from industrial companies, since there is no cash flow based on ex post energy savings that can be ring-fenced (the role played by COSIP in public street lighting). Lending agreements between CEF and industries (directly or through an intermediary fund) will

[65] In the future, the Project may seek financing from TCAF to support the GF as well.
[66] The World Bank has secured US$0.2 million from ESMAP and US$0.5 million from GIF in the form of Bank-executed trust funds. ESMAP funds are being used to inform the design/structure of the EE facility. The GIF resources, a project definition grant, are supporting EE Facility structuring and prefeasibility studies to identify candidate cities for ESL. Additional funds may be secured from GIF's PPSA window to support PPP structuring, in partnership with IFC (details still being defined).

include a thorough due diligence and some traditional credit enhancement mechanisms at the subproject level such as LoCs and the ability to remove the equipment from the customer's premises.

19. **Management of FX risk.** The EE Facility will make loans denominated in Brazilian reais. The CEF and commercial lender loans will be denominated in Brazilian reais. However, the IBRD contingent loan and the GCF loan, as well as the contingent grants provided by GIF and CTF, are denominated in U.S. dollars. To limit the FX risk associated with the IBRD and GCF loans, CEF has the option to request the World Bank to perform a currency swap on its behalf upon disbursement of these loans. If selected, the IBRD will execute a swap transaction with a financial market counterparty. The Brazilian real swap market is liquid at shorter- and medium-term maturities (typically up to 10 years); beyond 10 years, a conversion can be performed on a case-by-case basis. In case a full-maturity conversion is not possible or is too expensive, a partial maturity conversion can be performed.

(b) Assessment of Project with CTF Investment Criteria

(i) Potential for GHG Emissions Savings

20. **Combining the investments of the EE Facility in the two sectors (sub-programs), the Project is estimated to reduce 12.5 MtCO_2e over its lifetime.** This considers 8 years of emission reductions for IEE subprojects and 13 years of emission reductions for ESL subprojects. The assessment of potential emission reduction for each one of the sectors is described as follows.

21. **For this analysis, the social cost of carbon is US$30 per t$CO_2$e in 2015 terms, increasing up to US$80 per t$CO_2$e by 2050.**[67] The cost of carbon is included in the economic analysis but is not taken into account in the financial analysis for the time being, although the Project may eventually consider the monetization of emission reductions.

22. **A summary of the GHG calculations is provided in the following paragraphs.** More details can be found in annex 7.

(ii) Public Street Lighting

Identification of the Baseline Scenario

23. **The analysis assumes that, without this Project, municipalities would slowly replace burned-out lamps in the existing inventory with LEDs.** However, given the municipal constraints on financing (under the Fiscal Responsibility Law, described in detail in the Lighting Brazilian Cities report), cities would be limited to using only surplus revenues available from their street lighting budget, after paying for all electricity and O&M costs. For many cities, the source of revenue to fund public street lighting is known as COSIP, a tax levied on end users through their electricity bill.

[67] Based on the 2014 World Bank guidance note: http://globalpractices.worldbank.org/climate/_layouts/15/WopiFrame2.aspx?sourcedoc=/climate/Documents/carbon%20pricing%20guidance%20note%20-%207%2015%202015.docx&action=default.

Baseline Scenario

24. **For this analysis, electricity expenditures in the first year are estimated to be approximately BRL 16.5 million and O&M costs for lamp replacement are BRL 1.5 million, for a total expenditure of BRL 18 million.**

25. **The Baseline Scenario assumes that the city has a COSIP surplus of approximately 10 percent of its total expenditures, after paying electricity and O&M costs for street lighting.** In other words, COSIP collection will be BRL 20 million, BRL 18 million of which will be used to cover the current expenditures (including purchase of replacement lamps with conventional technologies such as HPS) with BRL 2 million in surplus. With this surplus, the city will fund its annual system expansion investments, as well as modernization of the system through the purchase of more efficient technologies such as LEDs. The baseline assumes the city will use 25 percent of its total surplus to fund the modernization with LEDs, equal to BRL 0.5 million, in Year 1.

26. **In practice, this means that under the Baseline Scenario, the city would eventually fully convert its inventory to LEDs.** However, due to its financing and budget constraints, the process will take place over a long period. By the end of 13 years, the Baseline Scenario assumes that 30 percent of the existing inventory will be replaced by LEDs.

Project Scenario

27. **The Project Scenario involves the establishment of a PPP that will finance the up-front cost of modernization of the entire inventory of public street lights with LEDs.** By bringing in private sector financing through the FinBRAZEEC facilities, the Project is able to overcome one of the key barriers for implementing an LED modernization project: up-front financing costs under constrained budget and balance sheet conditions of municipalities. The Project also overcomes other barriers, including improving municipal capacity and reducing the transaction costs involved in the preparation of subprojects through standardized approaches and identifying investors willing to invest in these subprojects through a derisked facility.

28. For the average city used in this analysis (42,500 points of light), this modernization is expected to take place over a two-year period.

GHG Savings

29. GHG savings are calculated based on the comparison of electricity used for public street lighting in the Baseline and Project Scenarios described in the previous paragraphs.

30. **The estimated annual electricity consumption in the Baseline Scenario over 13 years is 415 GWh.** In the Project Scenario, this number decreases to 222 GWh, a reduction of 46 percent. These savings are due to the efficiency differential between the LEDs and the inventory assumed in the baseline, as described in the assumptions section.

31. **The annual GWh per year is then multiplied by the assumed grid emission factor (GEF) of Brazil using the IFI Harmonized Database.** Based on a 50/50 combined margin, the GEF is 0.44 tCO_2e/MWh.

32. **Since public street lighting is partially peak coincident, and because demand in Brazil is increasingly being met with fossil fuels, the actual GEF for public street lighting could be higher based on a time-of-use calculation.**[68] The few studies available on the impact of climate change on hydropower due to changes in rainfall patterns demonstrate increased use of gas and fuel-oil-based thermal power plants to meet shortfalls. Thus, the annual GHG emissions of the sector in a dry year are four times higher than in years with favorable hydrology.[69]

33. The electricity savings are multiplied by the GEF to determine the estimated GHG emission reductions, resulting in approximately 85,000 tCO_2e reduced over the life of an average ESL subproject.

(iii) IEE

34. **For simplification, it was assumed that the implementation of a large IEE program will involve the scaling up of a series of notional 'Project Portfolios'.** Each Project Portfolio encompasses nine different technology/process interventions (for example, HVAC, energy-efficient motors, and heat recovery), based on audited subprojects among industrial clients. Each Project Portfolio represents a typical set of interventions in the IEE space, which may be 'scaled up' in modules depending on the availability of financial resources.

35. Table 4.2 presents a breakdown of emission reductions per technology/process intervention:

[68] Public street lighting hours are assumed to be from 6 p.m. to 5 a.m. The first four hours are assumed to be peak coincident during weekday operation.

[69] In 'dry years' such as 2014, GHG emissions increase up to 60 $MtCO_2e$, compared to only 15 $MtCO_2e$ on a wet year. (de Gouvello, et al. 2017. "Low Hydrology Scenario for the Brazilian Power Sector 2016-2030 – Impact of Climate on Greenhouse Gas Emissions." World Bank.)

Table 4.2. Project Portfolio Breakdown

Technologies within a "Project-Portfolio"	Expected Number of Occurrences	Combined emission factor (electricity) tCO2e / MWh	Emission Factor (natural gas) tCO2e / MMBTU	Total Emission Reduction
		0.440	**0.054**	
	#	*tCO2e / year*	*tCO2e / year*	*tCO2e / year*
1. Installation of Variable Frequency Drivers (VFDs) for large scale pumping systems	5	10,413	0	10,413
2. Installation of regenerative burners in natural gas furnaces	3	0	27,037	27,037
3. Heat recovery in large high-pressure steam boilers	3	-7,630	21,020	13,391
4. Installation of state-of-the-art burners in large furnaces	1	0	30,754	30,754
5. Energy optimization - software for energy real-time optimization (ERTO)	1	13,200	0	13,200
6. Variable Speed Drivers for Furnace Fans*	0	n/a	n/a	n/a
7. Optimization of compressed air systems	5	24,913	0	24,913
8. Conversion from electrical resistance to natural gas for ageing/homogenizing furnaces of aluminum profiles	3	6,510	2,722	9,232
9. Replacement of HVAC and motors of low efficiency	5	6,336	0	6,336
10. Improvements in cooling and refrigeration systems	5	1,267	0	1,267
TOTAL	**31**	**55,009**	**81,533**	**136,542**

(*) Technology # 6 was eliminated from the Project-Porffolio as originally defined. It will include in the future investments in water and sanitation efficiency motor and pumping systems. Project identification and studies being carried out.

EE Facility Level

36. **Aggregate at the EE Facility level, the analysis assumes approximately 50 'average' size ESL subprojects will receive investment.** Thus, the total GHG reductions by the EE Facility in the ESL sector is 3.9 $MtCO_2e$. For IEE, the analysis assumes 8.4 Project Portfolios, resulting in a total abatement potential of 8.6 $MtCO_2e$.

37. **Combining the investments of the EE Facility in the ESL and IEE sectors, it is estimated at 12.5 $MtCO_2e$ over the life of the facility.** The cost per tCO_2e of the total investment (US$1,323 million in debt + equity) is US$106.0.

Technology Development Status

38. **The technologies to be installed as part of this Project are already proven and mature, both for ESL and IEE.** In the case of ESL, the subproject will support the introduction of LEDs to replace existing mercury, sodium, and metal halide lamps. Introduction of LED in a large scale for public street lighting is occurring in several cities in the world, and the energy savings have exceeded expectations. Technology continues to evolve in the LED space, in terms of lighting efficiency (lumens per watt). However, existing lighting efficiency levels are already sufficient to achieve significant energy savings. The Project offers strong technical support (Component 2) to help municipalities identify EE and O&M savings opportunities and to structure PPP subprojects.

39. **In the case of IEE, the technologies used in the Project Portfolio are also well established.** Some of them require the acquisition of imported equipment. It is also necessary to develop investment-grade audit expertise in the country, to ascertain that most energy savings are captured. CNI has been collaborating with the U.S. Department of Energy to develop this technical capacity in Brazil.

(c) Cost-effectiveness

40. **The CTF investment in the FinBRAZEEC Project would be highly cost-effective, with an estimated cost per tCO_2e of US$1.6 per ton—see table 4.3.** This assumes an investment of US$20 million from the CTF, and total emission reductions of 12.5 $MtCO_2e$ over the Project life (see section (a) of this annex, as well as annex 7 for GHG emission reduction calculations).

Table 4.3. CTF Cost per tCO_2e

FinBRAZEEC Project	value	unit
Total Investment (ESL and IEE)	1,094	US$ million
Total electricity savings	16,732,447	MWh
Total natural gas savings	95,189,638	MMBTU
Total GHG reduced	12,491,089	tCO2e
Estimated cost per tCO_2e	88	US$/ton
Estimated CTF cost per tCO_2e	1.6	US$/ton
Estimated GCF cost per tCO_2e	15.6	US$/ton

41. **The FinBRAZEEC Project is also expected to have a material impact on technology costs, particularly the cost of LEDs for public street lighting.[70]**

42. **In the case of LEDs for public street lighting in Brazil, high up-front cost has been identified as an important barrier to scale up.** This is largely due to the high import taxes in Brazil—approximately 75 percent—and the high percentage of imported materials for LEDs used for public street lighting in Brazil—approximately 70 percent (taxes on domestic equipment are estimated to be 45 percent). The high percentage of imported materials is due to the lack of local manufacturing facilities in Brazil for some key components such as drivers, optics, and chips. However, market sounding indicated that international manufacturers are willing and interested to build local manufacturing facilities in Brazil for some LED components, once they have sufficient local business to justify such investment. Moreover, discussions with manufacturers have clearly indicated that the scale of investments envisioned for FinBRAZEEC fall within the volume of sales that these manufacturers are seeking to scale up local manufacturing.

43. **Taking into account technical limitations for national production,[71] national content could reach approximately 70 percent once sufficient scale is reached, meaning that imported equipment would decrease to only 30 percent of the total value of LEDs in Brazil.** Thus, the effective tax rate on LEDs could decrease from today's rate of 66 percent to 54 percent, a 20 percent decrease. Decreasing the CAPEX of street lighting investments in Brazil by 20 percent will have a substantial impact on the number of cities that can implement LED street lighting programs through municipal finance or PPPs. Considering the scale-

[70] Since the technologies associated with the IEE sector are already proven technologies, most have reached a cost plateau and thus have less room for decline going forward.
[71] For example, this analysis assumes that specialized components will continue to be imported, including chips and special luminaries.

up envisioned under this Project (as well as other market actors), this level of 'nationalization' could happen within five years.

(d) Demonstration Potential at Scale

Scope of avoided annual GHG emissions

44. **The Project has a significant potential for scaling up.** For analyzing the potential for scaling up, the following assumptions were made:

(a) In the case of ESL, investments could be scaled up to 135 cities, equivalent to a threefold increase from the expected Project scope. This is consistent with the World Bank market research presented in the Lighting Brazilian Cities report, which indicates that there are potentially 135 cities in Brazil with characteristics favorable for the deployment of PPPs in this sector (scale, fiscal health, legislation, and so on);

(b) In the case of IEE, investments would also be scaled up threefold. This is much less than the total market potential for IEE, but it was deemed to be an ambitious yet feasible level of scale-up.

45. **Based on these assumptions, total co-financing leveraged by the Project would increase to US$3.3 billion.** This would result in approximately 50 million MWh of electricity savings, 286 million MMBTU saved, and 37.5 $MtCO_2e$ avoided.

46. **Considering the US$20 million of CTF support to the Project, the leverage effect for CTF would increase up to 1:175.**

Transformation Potential

47. **In both ESL and IEE, the Project is building a solution that was missing in the energy sector to address a series of barriers that prevented economically viable EE subprojects to become bankable, which are described in section (B), paragraph 8.** While focusing only on ESL and IEE, the proposed financial structure can then be replicated to unlock other EE segments once corresponding business plans reach the same level of maturation achieved for street lighting and IEE under the preparation phase of FinBRAZEEC.[72]

48. **Moreover, the structure of the Project envisions the creation of new asset classes for EE in both ESL and IEE.** Once EE gains are derisked and EE subprojects in those two areas show a successful track record, the potential for replication, even in the absence of concessional funds or guarantees, is enormous. Market sounding has revealed that many banks are aligned with the idea of creating new asset classes and are willing to test new financial instruments such as *Creditos Recebiveis em Eficiencia Energetica* and FIDCs to attract a large number of investors to EE subprojects once they develop an initial understanding of the market risks and returns.

[72] Other EE segments for which similar business plans are already under development include distributed PV-based generation and EE/water conservation measures in public buildings.

49. **Once the approach is proven, similar financing mechanisms can be deployed to scale up clean infrastructure investment in other sectors, such as water and sanitation, distributed generation, and demand response, among others.** The ability to attract private sector investors to invest in new asset classes on a project finance basis (with credit enhancements when needed) can lead to a transformational impact on the market for infrastructure investments in Brazil.

(e) Development Impact

50. **In the case of public street lighting, the Project will offer a number of co-benefits.** In addition to the energy and GHG savings, the substitution of existing lamps by LED will result in an improvement in service quality for the population at large. Better lighting improves the quality of life and the perception of safety. This is expected to have a disproportionate impact on women, children, and the elderly. Economic activity in areas with better lighting is likely to improve. In addition, the replacement of mercury-laden lamps (here including not only high-pressure mercury but also sodium and metal halide) reduces contamination with harmful effects for the environment and human health. LED lamps do not contain those toxic metal substances.

51. **In the case of IEE, savings in this area have the potential to increase the sector competitiveness.** Brazil has been performing relatively poorly in energy intensity. Though Brazil's energy intensity fluctuated substantially in recent years, it has not shown a significant improvement. When compared to the Latin America and the Caribbean countries over 2003–2013, Brazil is the only country that has a positive growth rate of energy intensity. On the industrial sector in particular, and as far as EE is concerned, Brazil is ranked 16 when compared to the largest 16 economies in the world. In addition to contributing heavily to both the energy consumption and the GHG emissions of cities, the urban industrial districts are also responsible for most of the emissions of SO_2, particulates (PM_{10}), NO_2, and volatile organic compounds in the urban areas. SO_2 and PM_{10} emissions within the Rio city boundary represent, respectively, 31 percent and 25 percent of the total emissions in the whole state of Rio de Janeiro. The situation is similar in a number of industrial cities, and industry footprint is even stronger in medium industrial cities like Cubatão (São Paulo), Volta Redonda (Rio de Janeiro), Contagem (Minas Gerais), Camaçari (Bahia), and so on. By reducing the consumption and thus the burning of fossil fuels, IEE subprojects will also directly contribute to reducing the emissions of pollutants and thus improve public health.

52. **The commitments that Brazil made at COP-21 as part of its NDCs include a reduction in national GHG emissions by 37 percent below 2005 levels in 2025 (with an intention to reduce its emissions to 43 percent below 2005 levels in 2030).** Brazil has high urbanization rates (~85 percent), and thus, energy emission sources are predominately concentrated in urban areas.[73] Indeed, Brazil's NDC states a goal of achieving 10 percent efficiency gains in the energy sector by 2030 (approximately 105 TWh saved by 2030). Subprojects in ESL and IEE will help Brazil achieve those goals with significant economic benefits for the country.

[73] This is in line with global trends: cities are among the world's biggest consumers of electric energy, accountable for two-thirds of total electricity consumption and for over 70 percent of global GHG emissions.

(f) Implementation Potential

Country and Sector Strategies

53. **Brazil has two primary public financing lines for EE projects—PROCEL and PEE.** In 2011, the Government implemented its first Energy Efficiency Plan, which established a specific tariff to finance utility-driven EE investments under PEE. These EE programs have achieved some results in a few target areas, but the scale and scope is not sufficient to address the needs and potential for the ESL and IEE sectors.

54. **Despite the successful experience with EE measures to respond to the 2001 energy crisis, no demand-side actions were implemented during the more recent 2013–2014 power crisis, resulting in the continuous dispatch of thermal generation.** Regarding the demand of fuels in the industry, the only program implemented so far is the limited CONPET, created in July 1991 by a presidential decree.

55. **Therefore, Brazil has significant opportunities to reap economic efficiencies through EE, particularly given its high energy intensity and energy supply/price volatility due to heavy reliance on hydrology.** Moreover, with the high rates of urbanization, improving urban EE in the urban areas will be particularly important. However, the barriers to invest in urban EE are often even higher than typical EE projects, such as higher transaction costs or municipal credit risk, among others.

56. **The current administration has been working on four major policy directives, auctions for EE, labeling and standards, financing mechanisms, and taxation.** The implementation of policies in those areas may help scale up investment in the two business lines covered by this Project.

57. **Beyond the energy sector, the Project is well aligned with new policies being put in place in the Brazilian financial sector to attract additional private sector investment.** The financial sector in Brazil needs a transformation in its business model to be able to meet the long-term financing needs of the economy. Private sector financing for infrastructure in Brazil is modest, mainly offered by private company investors and limited private bank financing. Attracting private investors has become critical to fulfill infrastructure and industry investments needs. Brazil has extensive domestic capital markets that could be mobilized for long-term infrastructure financing avoiding the need to mobilize foreign investment, with the associated FX risks. The GoB has recently embarked on significant reforms and is rethinking on the role of public banks. Public banks can use their balance sheets to act as guarantors rather than direct investors, thereby increasing their leverage potential and attracting private sector capital to infrastructure investments.

58. **In summary, the FinBRAZEEC Project is well aligned with Brazil's energy and economic policies** to move toward more sustainable financial models for energy infrastructure that will help Brazil achieve its objectives for economic growth as well as climate change mitigation under its NDC.

Institutional Arrangements

59. **CEF will be the FI to play a key role in raising funds from several sources, originating and lending to subprojects, and managing the GF.** CEF is well equipped to carry on those functions. It has a strong technical and financial expertise, as well as a large granularity with local presence in most large and

medium-size cities in Brazil. CEF has a mandate from the current administration to leverage private funds to increase investments in efficiency and infrastructure. More details on the implementation arrangements can be found in annex 2.

60. **CEF has technical teams with experience evaluating projects in the ESL and IEE sectors.** CEF has the capacity necessary to coordinate and supervise the Project activities. Wide-reaching network of satellite offices, relationships with cities, and relationships with large industrial companies ensure that CEF has the market knowledge required to build a strong pipeline, as well as the local manpower to conduct project due diligence.

61. **Additional TA will be provided under this Project to increase CEF's capacity to evaluate EE investments in the ESL and IEE sectors.** Project identification, due diligence, contractual negotiation, and supervision will be conducted by CEF, supported, as necessary, by the World Bank. In many cases, Project due diligence will be done alongside commercial lenders, thereby increasing the robustness of the process.

Sustainability

62. **The FinBRAZEEC Project will use public funding (World Bank, GCF, and CTF) to crowd in private sector capital.** The use of public funds is needed to derisk investments and bring private investors into a new market. Based on a contribution of US$20 million of critical grant funding to the Project, CTF funds are expected to catalyze a total investment package of over US$1.3 million with a leverage ratio of 1:66.

63. **One objective of this Project is to develop a new market that can become sustainable without reliance on concessional and grant funds.** As the program reaches scale and confidence among financiers, operators, and manufacturers, one would expect the installation of manufacturing plants for luminaires, LEDs, lenses, and electronic parts and systems in Brazil, reducing the imported content and the overall price of the system. This will improve the risk perception and CAPEX of the EE investments in ESL and IEE subprojects, making investments in these sectors more attractive over time and allowing the mechanism to financially self-sustain eventually without concessional financing. Moreover, investors will better understand the risks and returns of investments in these sectors and new market will be well established (including a new and sustainable partial credit guarantee product), over time eliminating the needs for concessional funding to support transactions.

64. **In Brazil, one of the key concerns is the lack of long-term financing at competitive rates that can back EE investments.** To ensure the long-term stability and sustainability of the financing facility, the Project seeks to crowd-in private investors with a backstopping IPF contingent loan that will cover up to half of the value of the losses of syndicated banks. Similar liquidity mechanisms have been used elsewhere in the energy sector to provide necessary working capital through the use of formal guarantee instruments.

65. **Adequate portfolio risk management is needed to ensure the long-term viability of the EE Facility.** CEF, the implementation entity, is a national development bank with the technical, managerial, and financial resources needed to develop proper eligibility criteria for subprojects, conduct adequate subproject due diligence, and address residual risks through proper risk mitigation processes and products. TA (Component 2) will be essential to ensure the sustainability of the business model. By

providing capacity building, technical support, and standardized models, the Project will create the conditions for the continued preparation of high-quality subprojects that can be financed by a second round of the FinBRAZEEC facility and other market players. These benefits will long outlast the program itself.

(g) CTF Additionality

66. **Guarantee instruments are used to improve conditions for investment in, or lending to, projects by mitigating risks that lenders and investors would not be willing or able to accept as it is happening in the street lighting and industrial sectors.** CTF resources will be deployed as part of the GF to promote EE investments, which would otherwise fail to attract adequate capital. Funds from CTF will be used in tandem with GCF grant funds and the World Bank IPF contingent loan to provide liquidity to the GF, therefore acting as a backstop to debt payments to commercial lenders who are part of the syndicated arrangement.

67. **The CTF contingent recovery grant will be critical to make the EE Facility and GF viable.** CEF is taking more risk in this Project than it would do in any of its standard lending operations. In particular, it is working to establish a set of innovative financial products that will attract private capital. A critical element is the provision of a partial credit guarantee for syndicated lenders. CEF will also make a direct loan to the subprojects. Thus, CEF will take subproject risk from its own loan, as well as up to 50 percent of the subproject risk of the commercial, syndicated lenders. By absorbing the earliest risk together with the GCF grant,[74] the CTF contingent recovery grant is essential to mitigate the risk borne by CEF to a level that is acceptable to the CEF Board and the GoB, which is providing its sovereign guarantee for the GCF and the IBRD loans.

68. **For CEF to be able to offer a guarantee product that is affordable and results in viable lending rates to subprojects, CEF needs to benefit from the support of concessional loan and grant funding.** CTF contingent recovery grant funds play two critical roles: (a) allowing CEF to capitalize the fund at a lower cost and (b) providing critical first-loss funding.

69. **The CTF contingent recovery grant will be critical to allow CEF to capitalize the GF in the initial years when it may have limited revenues, as the demand for guarantees will increase only as the subproject lending increases, which may require some ramping time.** Moreover, the syndicated lenders may not be willing to enter into the transaction without funds already in the GF. The CTF contingent recovery grant funds will allow CEF to capitalize the GF at a low cost, thereby circumventing the 'chicken-and-egg' problem of needing capital to start up the GF but also needing the GF to be established before the private sector is willing to engage.

70. **Without CTF funding, the amount of first-loss available would not be sufficient for the market—in the range of 5 percent of the total investment.** Moreover, GCF indicated it would like to see a blending of GCF and CTF resources for the grant/first-loss funding for this Project in the structure of the fund. The

[74] The very first risk of insolvency will be absorbed first by subprojects DSRA accounts, then GCF grant, and then CTF contingent recovery grant. Only the insolvency and payment risks that do actually materialize will be borne by the CTF since unused CTF funds will be returned to CTF.

blending of GCF and CTF resources for this Project can serve as an excellent example of how combining various sources of climate finance can help achieve development outcomes.

71. **A preliminary financial analysis was prepared to assess the viability of the GF.** This analysis assumes the GF will be capitalized at the outset with the GCF and CTF grants. The base case assumes average annual sub-loan default rates of 10 percent and capital reserve requirements of 15 percent of the total annual value-at-risk (estimated requirement to achieve BBB credit rating[75]). When necessary, CEF will draw down on the callable capital of the IPF contingent loan and channel these funds to the GF to ensure that guarantees to commercial lenders are paid out and reserve requirements are maintained. The analysis estimates (a) the minimum annual guarantee fee required to ensure the GF is sustainable; (b) the value of GCF, CTF, and IPF contingent loan funds utilized over the GF's lifetime; and (c) the impact of the IPF contingent loan and grant funding from GCF and CTF on the viability of the GF.

72. **In the base case scenario, payouts are estimated at US$36 million over 15 years, with full utilization of the US$5 million of the GCF grant, US$16 million of CTF funds, and disbursement of approximately US$12 million of the IPF contingent loan to meet capital reserve requirements.** The contingent recovery grant of US$4 million will be reimbursed to the CTF at the end of the Project. The minimum sustainable guarantee fee under this scenario is approximately 0.8 percent. The detailed analysis is provided in annex 7.

73. **A sensitivity analysis demonstrates the significant value of the GCF and CTF funds to the GF and sub-loans by reducing the cost of funding of the minimum cash reserves required in the fund.** The analysis was conducted to estimate the financial benefit of the GCF grant and CTF contingent recovery grant, as shown in table 4.4. Without the GCF and CTF funds, US$25 million in minimum cash reserves would need to be generated by fees and offset by disbursements of the IPF contingent loan, bringing with it additional interest costs. In this case, the breakeven fee in the base case scenario would increase to 1.7 percent (102 percent increase). As discussed earlier, these additional costs would be passed on to the sub-loans, likely significantly reducing the pipeline and compromising the scale and impact of the Project.

Table 4.4. Sensitivity Analysis of GCF and CTF Funds

Indicator	BBB credit rating	
	Base case / Break-even	No GCF or CTF grants
Targeted credit rating	BBB	BBB
Sub-loan average annual default rate (%)	10.0%	10.0%
Annual Guarantee Fee (%)	0.8%	1.7%
Guarantee Payouts (US$ million)	39.0	27.8
Cumulative use of GCF, CTF, IPF funds		
GCF grant usage (US$ million)	5.0	-
CTF grant usage (US$ million)	15.8	-
IPF disbursed (US$ million)	12.1	30.5

[75] The analysis is based on international credit ratings for the underlying subproject credit analysis as well as for the targeted GF rating, due to the limited availability of information on Brazilian credit rating data.

(h) Implementation Readiness

74. **The development of FinBRAZEEC and the business models for the ESL and IEE sectors has involved in-depth market studies and market soundings, supported with funds from ESMAP and GIF, leading to a high level of implementation readiness for this Project.**

75. **For ESL, the initial prefeasibility assessments were carried out for the municipalities of Rio de Janeiro and Belo Horizonte.** The World Bank provided TA working hand in hand with the municipal secretariats involved in the provision of street lighting, agreeing on the assumption, and discussing the findings and recommendations. The work has subsequently expanded to other cities. In June 2016, the World Bank organized a two-day workshop in Sao Paulo when more than 200 stakeholders in the public street lighting sector were invited to discuss the issues, options, and challenges to modernize the ESL systems in Brazil. On this occasion, the World Bank launched a report entitled Lighting Brazilian Cities and the CityLED prefeasibility tool, which generated a lot of interest from multiple municipalities (both available on ESMAP's website). The World Bank and CEF continue to engage in market soundings as the financial structure of FinBRAZEEC becomes more detailed, to ensure there will be strong demand for the products offered by the Project.

76. **In the case of IEE, the World Bank was approached by ABRACE and CNI in 2015 to discuss alternatives for improving efficiency among large industrial users and share World Bank international experience.** The concept proposed by CNI and ABRACE was very innovative but required some fine-tuning. Significant work has been carried out together with CNI and ABRACE in the design of the IEE window organization, processes, systems, governance, and pricing criteria, and a detailed technical, economic, and financial feasibility analysis has been jointly carried out, taking real case EE opportunities among CNI and ABRACE industry members. Market sounding undertaken with a first series of industrial firms has confirmed both the existence of a large pipeline of EE subprojects already identified by these companies as economically viable and their interest in the proposed off-balance-sheet mechanism to turn these subprojects bankable. The interest of being an agent and financier for IEE has also been tested with local public and private financial institutions such as Banco do Brasil, CEF, BNDES, and SANTANDER.

77. **The financial and economic viability of investments in the subprojects has been analyzed in great detail under the BRAZEEC program (P150942) and early project preparation stages of the FinBRAZEEC Project.** Through market studies, the technical and economic feasibility of investments in these sectors has been proven (see annexes 6 and 7 for more details).

78. **CEF, the implementing agency, is familiar with the establishment and management of guarantees and syndication processes.** In addition, CEF has been mandated by the GoB to serve as the lead agency for municipal development and therefore has experience in managing municipality-specific risks over a wide portfolio of infrastructure investments in urban areas. To further strengthen CEF's technical capacity, the World Bank is providing additional TA support through Component 2 and has agreed to closely supervise the first few transactions made through the EE Facility.

ANNEX 5: FINANCIAL INTERMEDIARY ASSESSMENT

COUNTRY: Brazil
Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC

1. **An assessment of CEF took place based on the eligibility criteria in accordance with FI financing guidelines.**

(a) The bank must be duly licensed and at least two years in operation.
(b) The bank's owners and managers must be considered 'fit and proper'. It must have qualified and experienced management and adequate organization and institutional capacity for its specific risk profile.
(c) The bank must maintain capital adequacy.
(d) The bank must have adequate liquidity.
(e) The bank must have positive profitability and an acceptable risk profile. It must maintain the value of its capital.
(f) The bank must have well-defined policies and written procedures for management of all types of financial risks (liquidity, credit, currency, interest rate, and market risk, as well as risks associated with balance sheet and income statement structures) and operational risk.
(g) The bank must classify its assets and off-balance-sheet credit risk exposures (at least four times per year) and make adequate provisions. It must have adequate portfolio quality. The bank should not have more than 10 percent of criticized assets (that is, classified as doubtful and at a loss).
(h) The bank must have adequate internal audits and controls for its specific risk profile.
(i) The bank must have adequate MISs.

Table 5.1. Summary of CEF Appraisal

Criterion	Comments
1. License	Licensed and subject to the regulation and supervision of the Central Bank. Has been declared as a systemic bank, and as such, subject to more capital requirements and closer supervision.
2. Owners/managers 'fit and proper', governance quality	As a public-owned bank, it is subject to certain political influence and turnover. It has just approved a change in its statute to improve the requirements and process for appointing senior management and to reduce political interference (for example, including independent members of the Board). The Central Bank has been reinforcing the fit and proper requirement and has to approve the appointment of the Board members.
3. Capital adequacy	Complies with the minimum, plus the additional (conservation capital buffer and systemic bank capital surcharge) capital required. Due to the phase in the process of Basel III, faces challenges in complying Tier 1 Capital from January 2019.
4. Liquidity	Adequate, due to its stable and diversified funding.
5. Profitability	Moderate, as a consequence of the low margin due to its main business model (mortgages). Profitability has improved in the last year due to a reduction in the cost of funding, reversal of provisions, improvements in efficiency, and increase in fees and commissions.

Criterion	Comments
6. Policies and risk management functions	Adequate. An adequate structure for risk management is in place, with clear responsibilities. Policies and procedures for managing risks are in place.
7. Asset quality and provisions	Low NPL ratio (2.7%), explained by NPL ratios of housing (1.9%) and infrastructure (0.2%), while commercial loans´ NPL ratio is above (5.5%). High coverage ratio of provisions over NPLs. There are risks of an increase in the share of renegotiated loans or that some of the already renegotiated loans fall into NPL category (specially the long-term ones), which may result in a deterioration of the NPL ratio and require additional provisions.
8. Internal audit and controls	Adequate. Structured in 3 different 'lines of defense', starting with the specific department with direct involvement in the risk exposure (first line), the risk area (second lines), and the Internal Audit. The latter depends directly on the Management Board.
9. Management information systems	Several reports on performance and risk exposures are elaborated, with different frequency depending on the type of risk and topic.

Note: NPL = Nonperforming Loan.

2. **CEF is a government-owned bank with a leading role in specific segments of the Brazilian financial market.** Established in 1861 and controlled by the Brazilian National Treasury, CEF is (a) the leader in mortgage lending (BRL 428 billion) and saving deposits (BRL 268 billion), representing 68.7 percent and 38.5 percent of the market share, respectively; (b) the largest bank by total deposits (BRL 510 billion) and loan portfolio (BRL 712 billion), with about 23 percent market share in the loan portfolio; (c) the third bank ranked in term of assets (BRL 1,270 billion); (d) the exclusive agent for managing social security benefit funds and major agent of federal government policies; and (e) the bank with the highest number of clients (84.1 million) and regional coverage (presence in 5,500 municipalities, with 4,200 branches and 10,200 third-party sales outlets).

3. **The main challenge that CEF faces in the near future is related to the compliance of the Tier 1 regulatory capital requirement due to the phase-in process of the Basel III.** As of September 2017, the regulatory capital (BRL 84.7 billion) and Tier 1 Capital (BRL 53.1 billion) over Risk-weighted Assets (RWAs) (BRL 556.1 billion) were well above the minimum capital required (including the conservation capital buffer and capital surcharge for domestic systemic bank), although its Tier 1 Capital Ratio (9.54 percent) was the lowest among the large Brazilian banks.[76] The Basel III phase-in process includes, from January 2018, the full impact of the deductions to the regulatory capital and two increases (January 2018 and 2019) in the additional capital requirements (conversation capital buffer and Domestic Sistemically Important Banks [D-SIB] capital surcharge). Table 5.2 reflects the challenge CEF will face in complying with the Tier 1 regulatory capital requirements during 2018 and, especially, from January 2019:

Table 5.2. Regulatory Capital as a Share of RWAs (%)

Capital	December 2017	January 2018	January 2019
Common Equity Tier 1 (CET 1)	11.22	Not available	-----
Tier 1	**11.22**	Not available	----
CAR	17.65	Not available	-----

[76] Compared to Banco do Brasil (13.29 percent), Banco Bradesco (13.40 percent), and Itau Unibanco Holding (16.70 percent).

Capital	December 2017	January 2018	January 2019
Adjusted Tier 1, including full impact of deductions (from 2018)	**10.63**		
Minimum CET 1	4.50	4.50	4.50
Minimum Tier 1	6.00	6.00	6.00
Minimum CAR	9.25	8.63	8.00
Additional capital: Conservation capital buffer	1.25	1.88	2.50
Additional capital: Capital surcharge for being a D-SIB	0.25	0.50	1.00
Minimum CET 1, including additional capital	6.00	6.88	8.00
Minimum Tier 1, including additional capital required	**7.50**	**8.38**	**9.50**
Minimum CAR, including additional capital required	10.75	11.00	11.50

Source: Own elaboration based on CEF reports and Central Bank of Brazil (*Banco Central do Brasil [BCB]*).

4. **CEF has been implementing several measures to improve its capital position, although with limited impact.** The business strategy included a risk-adjusted return on capital (RAROC)[77] analysis for the incorporation of risk assets, which enabled a reduction in the base of capital requirement (RWA in terms of total assets reduced from 46.3 percent in September 2016 to 43.8 percent in September 2017). Profits (albeit limited due to its main business model of mortgages, which are subsidized) have increased in the first nine months of 2017. The distribution of dividends to the Government has been limited to 25 percent of profits, which is the minimum allowed by statute, in a context where there is no supervisory limitation to distribute. The Tier 1 capital showed, as of September 2017 (year on year), a slight increase (9.54 percent versus 9.43 percent in September 2016), while the CAR during the same period moved to 15.24 percent from 13.46 percent (due to the incorporation of subordinate debt considered as Tier II capital). At end-2017, there was an improvement in the capital position mostly based on the reduction of its RWAs. The Tier I capital ratio increased from 9.54 percent as of September 2017 to 11.22 percent as of December 2017,[78] and total CAR increased from 15.24 percent as of September 2017 to 17.65 percent as of December 2017.

5. **The alternative of injecting capital into CEF has several constraints.** The Treasury is under fiscal pressure and has publicly announced that it will not capitalize CEF. The recent approval of a law[79] enabling the investment of the Fundo de Garantia do Tempo e Serviço (FGTS) that manages deposits from workers in Tier I capital instruments of CEF (by exchanging part of their current loans and investments in subordinated debt into hybrid bonds with specific characteristics with a maximum amount of BRL 15 billion, 2.7 percent of RWAs) still needs the approval of the Federal Court of Accounts (*Tribunal de Contas da Uniao*), the FGTS's Board of trustees, CEF's Board, and the Central Bank. FGTS may be assuming high risks with the investment of this type of instruments (for example, perpetuity, coupon payment only if there are profits to be distributed, and noncumulative coupons). In January 2018, CEF's Management Council Meeting revised its capital plan and announced[80] that it would not be necessary to inject capital through the FGTS and that other alternatives would allow meeting the capital regulatory requirements without affecting housing financing.

[77] Defined as an adjustment to the return on an investment that accounts for the element of risk, providing the decision makers the ability to compare the returns on several different projects with varying risk (and capital requirement) levels.
[78] Total CAR moved from 15.24 percent as of September 2017 to 17.65 percent as of December 2017.
[79] Law 13.589, published in the Gazzete on January 4, 2018.
[80] http://www20.caixa.gov.br/Paginas/Noticias/Noticia/Default.aspx?newsID=5769.

6. **Some of the new potential measures to enhance CEF´s regulatory capital are the issuance of Tier 1 capital instruments and the sale/securitization of loans.** In addition to continuing with the initiatives adopted since the beginning of 2017 (reduction of expenses, usage of RAROC analysis, and increase of the marginal contribution from its products and services, among others), CEF has also announced its intention to continue limiting the dividend distributions and raise capital through the issuance of hybrid perpetual capital instruments in the international market (considered as Tier 1) and the sale or securitization of loans with no retention of risks[81] (for an effective reduction in the level of its RWAs). Other options, such as the potential Initial Public Offering of its insurance entity (*Caixa Seguros*) and the sale of rights to manage one of its lottery products, would require more time and better market conditions to be implemented.

7. **Following a strong growth of its total assets and loan portfolio until 2016, there has been a modest increase since then, reflecting the lack of demand due to the recession as well as its capital constraints.** During 2010–2014, CEF was aggressive, more than doubling its total assets (from BRL 405 billion to BRL 1,065 billion) and its loan portfolio (from BRL 217 billion to BRL 605 billion). The rationale of that performance was to satisfy the lower risk appetite from the private financial institutions, as well as to support the economic activity. Although 2015 still showed relevant growth rates in its loan portfolio (12 percent), there was a significant slowdown in 2016 (4.4 percent) and in the first nine months of 2017 (1.8 percent)

8. **The loan portfolio is concentrated in low-risk credits, with a recent trend to reduce its exposure to corporates and micro, small, and medium enterprises (MSMEs), in favor of housing, infrastructure, and payroll deductible.** CEF's main business model is focused on mortgage lending. As of September 2017, 60 percent of its loan portfolio consisted of mortgages, 6 percent to MSMEs, 4 percent to large corporates, 11 percent to infrastructure, and 9 percent of payroll deductible loans, with the remaining consisting of car, rural, and other loans. In the last year, the stock of housing, payroll deductible, and infrastructure loans showed a positive growth rate, while in the same period, loans to MSMEs and for cars and large corporates decreased (see table 5.3). This loan strategy is aligned with CEF´s objective of reducing risks as well as capital requirements. More than 60 percent of its portfolio has an average maturity between six and seven years, reflecting the high share of housing loans.

Table 5.3. Breakdown of Loan Portfolio

Loan Category	September 2017 (BRL billion)	Share (%)	September 2016 (BRL billion)	Variation 2017/2016 (%)
Payroll deductible	66	9.3%	63	4.2%
Car	7	1.0%	11	-35.1%
Other physical persons	24	3.4%	29	-18.1%
MSME	46	6.5%	51	-9.8%
Large Corporate	28	3.9%	38	-26.4%
Housing	429	60.3%	402	6.8%
Infrastructure	81	11.4%	78	4.5%
Rural	7	1.0%	7	6.1%
Other	24	3.4%	20	18.5%
Total Loans	**712**	**100%**	**699**	**1.8%**

Source: CEF

[81] In other words, all the credit risk is transferred to the acquirer; hence, no risk is retained by CEF.

9. **The strong increase in the housing portfolio was mainly explained by housing programs involving high subsidies from the Government (as well as from CEF).** The most popular program is *Minha casa Minha Vida* funded by FGTS funds. The interest rate of the mortgage loans for low-income debtors is 5 percent, while the funding cost for CEF is 2.5 percent (a spread of 2.5 percent). Loans to debtors with higher income are charged with a higher interest rate. The beneficiaries of these loans are assigned taking into account several factors, such as the social situation, region, first/only house, and so on. The maximum Loan to Value (LTV) is 80 percent and Debt to Income is 30 percent. In some cases, the debtor is helped with a subsidy to afford the down payment. Although the credit risk of these loans is low, the reduced spread as well as the high administrative cost affects CEF´s capacity to significantly improve its profits.

10. **CEF's funding is stable and diversified.** Savings represents 26 percent of total funding, while total deposits are slightly above 50 percent. Other sources include borrowing and on-lending (loans from FGTS play an important role) (25 percent), repos (12 percent), and mortgage-linked notes (9 percent). To reduce the cost of funding, in 2017, it implemented a policy of decreasing time deposits and local and international notes (experiencing a reduction of 9.1 percent and 9.6 percent during the first nine months of 2017, respectively), in favor of savings and demand deposits (that grew by 10.3 percent and 8.9 percent, respectively). Over the years, saving deposits have shown strong stability.

11. **The credit risk exposure and losses have been limited.** As of September 2017, the NPL ratio[82] was 2.7 percent (compared to 3.5 percent in September 2016 and to an average ratio of 3.8 percent for the entire banking sector, excluding CEF). Commercial loans (both for firms and individuals) have a higher NPL ratio (5.5 percent), while housing (1.9 percent) and infrastructure (0.2 percent) have low NPL ratios. Problems in some big corporates, which also affected through the production chain MSMEs, and CEF's decision to enter into new markets, such as SME lending, without significant expertise and thus weaker underwriting ability, explains the higher commercial NPL ratio. Provisioning seems adequate, with provisions covering about 186 percent of NPLs. The renegotiated loans accumulated during the first nine months of 2017 were BRL 23 billion (3.2 percent of the loan portfolio), of which housing represented 85 percent of the renegotiated portfolio (the remaining 15 percent were renegotiated commercial loans). However, an increase in the share of renegotiated loans, with potential 'hidden' bad debts, and the fact that they are long-term loans (which would take time to reflect the difficulties in the payment capacity) may require additional provisions, potentially further weakening CEF´s capital position. With the aim to reduce risk and taking into account the RAROC analysis, CEF decided to reduce its maximum credit risk exposure for a single debtor, without the intervention of the Board (from 15 percent to 5 percent of its capital). Additionally, with the objective of reducing its RWAs, the LTV on housing loans has to be below 80 percent.[83] In terms of concentration risk, the 10 highest credit risk exposures accounted for 5 percent of the total credit exposure, while the first 100 represented 14.5 percent.

12. **The amount of high-quality liquid assets (HQLAs) as well as its diversified and stable funding reduce CEF's liquidity risk.** CEF's main funding sources include saving deposits, borrowings (mainly from FGTS), time deposits, mortgage-linked notes, repo transaction with its own portfolio, and other deposits. CEF has developed models for the projection of cash flows from banking operations under normal and stressed scenarios, as well as the measurement of the HQLAs it has available. As of September 2017, the

[82] Defined as over 90 days' arrears.

[83] According to the Central Bank´s regulation on capital, housing loans with LTV below 80 percent are subject to a risk weight ratio of 35 percent, while the ones that are above are assigned a 75 percent ratio.

calculation of the Liquidity Coverage Ratio (a Basel III short-term liquidity ratio) was 271 percent, well above the minimum of 80 percent required by the BCB regulation. Additionally, preliminary calculations for the Net Stable Funding Ratio (a more structural Basel III liquidity ratio with a one-ear time horizon) suggest CEF would be above 100 percent. To deal with potential stress situations, a Liquidity Contingency Plan was established with the definition of alerts, the appropriate communication to senior management for the evaluation of the situation, and the actions that should be taken, including the responsibilities of the units and entities involved in its execution, the sources of resources, and procedures to be followed.

13. **Although CEF has structural weak profitability due to its subsidized lending for mortgages, pressure to assume riskier exposures (such as MSMEs and corporates), and its heavy administrative structure, the performance has been positive in the last year.** During the first nine months of 2017, total profits were BRL 6.24 billion (versus BRL 3.38 billion in the same period in 2016), representing an annualized Return on Equity of 10.69 percent (against 6.35 percent as of September 2016). Although the ROE and Return on Assets are still below the levels seen in 2014 and 2015, they are 66 percent above 2016 and were achieved in a context of a low growth rate of assets. The improvement on efficiency observed (measured in the positive record levels achieved on the coverage ratios of administrative and personnel expenses) should encourage CEF to keep working in this area. Other factors that helped improve the results were the reduction in the funding costs due to the lower interest rates in the market, CEF´s strategy to reduce the most expensive funding sources, a reduction in the loan loss provisioning, and an increase in the incomes from commissions and charges (other than the ones related to credits) both from the public and the private sectors.

14. **CEF has an adequate structure for its risk and capital management.** It is carried out by a dedicated structure that covers systems, routines, procedures, and models and is responsible for identifying, measuring, evaluating, monitoring, controlling, mitigating, and communicating to senior management to support their decision-making process. Linked to the Board of Directors, there is the Risk and Capital Delegated Committee, which deliberates on the management and control of the risks and capital of CEF financial conglomerate.

15. **The Vice Presidency of Risk (VICOR) is responsible for the management of the corporate risk of CEF, including capital management, internal control, and risks of renegotiated operations.** The Executive Directorate of Risk is in charge of the implementation of the risk strategies, supported by three superintendencies: Corporate Risk responsible for the management of corporate risk and capital of CEF; Credit Risk responsible for managing credit risk, including risk modeling for corporate and retail loans, definition of credit limits for each risk classification, and providing third-party credit risk analysis services; and Control and Risk Integration, in charge of modeling, implementation, and monitoring of the lines of defense, managing the operational risk and guarantees, and the management and execution of the second line of defense. Other units depending directly on VICOR are the Superintendency of Institutional Control of the Conglomerate, responsible for monitoring the models used for risk assessment, compliance, and control of CEF; two units in charge of restructuring loans; and another one responsible for the relationship with regulators.

16. **The policy for risk management covers the relevant risks and is approved and revised, at least annually, by senior management.** It unifies and aligns risk management on the following risks: credit, operational, liquidity, market, interest rate (on transactions not classified in the trading book), counterparty, concentration, strategy, reputation, actuarial, and socio-environmental. It establishes,

among others, exposure and loss limits for each risk category to preserve CEF's solvency, liquidity, profitability, and capital structure, observing the regulatory rules and good market practices. The statement of the risk appetite is prepared by risk area and approved by the senior management.

17. **The credit risk management covers the different stages of the credit process, with segregated responsibilities.** There is a specialized unit in the modeling and risk assessment of new and old borrowers, as well as a unit responsible for managing credit portfolio risk, monitoring portfolio risk indicators, and monitoring compliance with exposure limits. The approval authorization involves a higher level in line with the amount of the loan. Additionally, there is a unit for credit collection and recovery. An independent unit validates and monitors the models used in credit risk management, to avoid conflicts of interest and to safeguard the impartiality of the work performed. Finally, the credit risk limits cover concentration risk per client, type of credit, guarantee, product, and segment.

18. **CEF has specific policies and procedures, as well as a dedicated unit for managing operational risk.** The operational risk tends to be relevant, especially in an institution of the size and coverage as is the case of CEF. CEF has developed methodologies to identify, map, control, and measure operational risks, as well as initiatives to mitigate and report it (including operating losses). The operational risk management also integrates crisis management, information security, and business continuity, with the latter acting in a possible interruption in services and activities. The calculation of the regulatory capital requirement for operational risk is performed using the Alternative Standardized Approach, accounting for 11 percent of total RWAs (the second contributor after credit risk).

19. **The internal control is performed through three levels of 'lines of defense'.** The first one is the unit/department directly involved in the generation of the specific risk and has to follow the process and procedures established for its appropriate management. The second line of defense is located at VICOR and is the one responsible for monitoring indicators and verifying compliance with limits and policies both off-site and in the field (2,500 employees are assigned to VICOR). Finally, the third line of defense is the Internal Audit, which directly responds to the Management Committee and advises the Audit Committee. The Internal Audit is split into four departments, each one in charge of specific topics (government, information technology, risks, and branches/channels), and has a staff of 470 people located both in headquarters and regional offices. The audit plan is approved by the Audit Committee, the Management Committee, and the Federal General Comptroller.

20. **The government structure of CEF includes a combination of collegiate bodies and senior management.** The Management Board is the highest-level body composed of the President of CEF and four representatives from the Ministry of Finance, one member from the Ministry of Planning, and another one representing the employees. It is responsible for the definition of guidelines and business objectives and for the monitoring and evaluation of CEF´s result. The Executive Board is chaired by the President and composed of 10 of the 12 Vice Presidents (VPs) and is responsible for the implementation of CEF's strategy. Each of the 2 VPs, not members of the Executive Board (VP of third-party asset management and VP in charge of managing government funds and lotteries), are members (including the President of CEF and two other VPs) of specific committees in charge of their topics. Other committees and commissions are Audit, Remuneration, Purchase/Contracts, Anti-Money Laundering, Ethics, Business and Renegotiation Evaluation, and Risk and Capital, among others.

21. **The bylaws of CEF were revised in 2017 with the aim to align with the new legal framework applicable to public-owned companies, improve the 'fit and proper' requirements of its management, and limit the interference from the Government.** Some of the changes include the power of the Management Committee to appoint the VP (previously the President of Brazil was in charge of it), improve the fit and proper requirements for the high-level positions (including, for the VPs, the hire of a specialized consultancy firm), and incorporate a requirement that 25 percent of the members of the Management Committee have to be independent. CEF announced that it has started to implement the new statute and is in the process of hiring a specialized consultancy firm for the revision of its organizational structure.

22. **Other actors monitoring CEF include the Central Bank, Federal Court of Accounts (*Tribunal de Contas da Uniao*), Federal General Comptroller, external auditors, and credit rating agencies.** The Central Bank has defined CEF as a systemic bank, and as such, it is subject to a capital surcharge and a closer supervision. CEF´s external auditor (PwC since April 2017, previously E&Y) has no major objections on its financial statements. CEF is rated by the three main credit rating agencies (S&P, Fitch, and Moody's), with ratings of BB(neg) and Ba2(neg), aligned with the sovereign risk.

Table 5.4. Key Financial Indicators

	2014	2015	2016	Sept 2016	Sept 2017
Assets (BRL billion)	1,065	1,203	1,265	1,231	1,270
yoy	*24.1%*	*13.0%*	*5.2%*	*6.5%*	*3.2%*
Loans (BRL billion)	605	680	709	700	712
yoy	*16.3%*	*12.3%*	*4.4%*	*5.0%*	*1.8%*
Capital Adequacy					
CAR	16.1%	14.4%	13.5%	13.5%	15.2%
Tier 1	12.0%	10.2%	9.4%	9.5%	9.5%
Asset Quality					
NPL (over 90 days arrears)	2.6%	3.5%	3.5%	2.9%	2.7%
Coverage (Provisions over NPLs)	1.7x	1.4x	1.7x	1.5x	1.9x
Profitability and efficiency					
Return On Assets (ROA)	0.7%	0.6%	0.3%	0.3%	0.6%
Return On Equity (ROE)	15.2%	11.4%	6.5%	6.4%	10.7%
Coverage ratio of administrative expense	64%	66%	68%	67%	72%
Coverage ratio of personnel expense	103%	105%	107%	105%	112%

ANNEX 6: TECHNICAL ANALYSIS

COUNTRY: Brazil
Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC

Public Street Lighting Technical Analysis

1. **The World Bank has published an in-depth report on the market for ESL investments in Brazil—"Lighting Brazilian Cities: Business Models for Energy Efficient Public Street Lighting" (Meyer et al. 2018).** This report is available online[84] and provides more detail on the technology, barriers to investment, market analysis, and investment needs. The remainder of this annex focuses on the financial and economic analysis of these investments.

2. **Technical analysis of ESL subprojects has been incorporated into the World Bank's CityLED tool,** an Excel-based financial and economic analysis tool developed as part of the BRAZEEC TA (P150942) project that preceded the preparation of the FinBRAZEEC Project. The tool can be found online at *http://esmap.org/node/cityled_tool*.

Industrial Energy Efficiency Technical Analysis

3. **The potential for efficiency in the industrial sector in Brazil is enormous but still untapped.** ABRACE and CNI surveyed their members to understand the barriers for IEE. The conclusion was that projects require the acquisition of new equipment and systems, which are capital-intensive. Such acquisitions are typically treated as assets (CAPEX) in the company's balance sheet. According to CNI, a large part of industries in Brazil (53 percent) has exceeded prudent levels of indebtedness; therefore, they would have limited space for new CAPEX, which could negatively affect the company's credit ratings. In light of the constrained balance sheets of these companies, these EE investments must compete for the use of capital with core business activities.

4. **Industrial companies have mobilized capital for EE projects on a case-by-case basis, with different levels of success.** Most solutions have worked under specific circumstances but are difficult to be replicated for the industrial sector. One of the modalities sometimes used is the contracting of ESCOs. The ESCO model is built on the assumption that the cash flow stream resulting from energy savings could be collateralized, enhancing the ESCO's ability to raise new funds. This assumption does not always hold, as financial institutions are seldom willing to collateralize uncertain EE cash flows derived from savings, which they perceive as less tangible, difficult to measure, and subject to dispute. Thus, the typical ESCO model is not expected to have a great impact on scaling up investments in IEE in Brazil.

5. **The World Bank started working on a proposal to explore the possibility of offering off-balance-sheet financing tailored to the needs of IEE companies to overcome their investment barriers under the BRAZEEC TA project (P150942).** Vehicles to provide this off-balance-sheet financing are not yet mainstreamed in Brazil, but there are successful cases in the industrial sector in Colombia and in the commercial sector for other Latin America and the Caribbean countries. Therefore, an SPV (or fund) would

[84] http://documents.worldbank.org/curated/en/679281521548635917/Lighting-Brazilian-cities-business-models-for-energy-efficient-public-street-lighting

have to be created to provide those services to industrial clients. The SPV would be a highly leveraged vehicle, borrowing in the market or even issuing green bonds in the future to make investments in energy efficiency. It will also raise equity among investors interested in playing a more active role in the climate space.

Market Analysis and Investment Needs

6. **A good understanding of the market is critical to tailor energy projects and services to each company as well as to understand the characteristics of corporations that have interest in making EE investments.** A study was carried out to understand industrial clients' needs, requirements, and plans in terms of capturing IEE opportunities. A sample of about 120 national and multinational companies with operations in Brazil was carefully selected from the ranking *Maiores empresas do Brasil em 2013* (Brazil's Largest Companies in 2013) elaborated by *Exame* magazine, which ranks the companies according to their net sales.

7. **The objective of the analysis was to better understand how national and multinational companies with operations in Brazil manage their energy consumption, trying to identify some questions such as** (a) who invests in EE? (b) which service and project model are best suited for each company? (c) which companies are interested in reducing GHG emissions and energy consumption? and (d) what makes an organization want to invest in Energy Efficiency?

8. **After careful examination of each one of the companies' annual reports, sustainability report, corporate website, and field interviews with industrial professionals, it was possible to tabulate the answers and build a database.** Preference was given to information regarding the Brazilian market but, as some of the organizations do not disclose the Brazilian financial results and sustainability initiatives separated from the global information, it was necessary to refer to the policies set forth at a global level. The selected companies represented a reasonable cross-sample in terms of industrial sector activities, as shown in table 6.1:

Table 6.1. Energy Programs for Large National and Multinational Companies with Operations in Brazil

Sectors	Companies	%
Pulp and Paper	4	3,28%
Mining	5	4,10%
Pharmaceutical	5	4,10%
Transportation	5	4,10%
Oil & Gas	5	4,10%
Ethanol & Sugar Cane	5	4,10%
Beverages	5	4,10%
Steel	5	4,10%
Cement	5	4,10%
Agricultural Production	6	4,92%
Electronics and Appliances	6	4,92%
Capital Goods and Manufacture	7	5,74%
Food Processing	8	6,56%
Non Ferrous and Metallurgy	8	6,56%
Automotive Parts	9	7,38%
Automotive Manufacturers	11	9,02%
Consumer Goods and Retail	11	9,02%
Chemical and Petrochemical	12	9,84%
Total	122	100%

Source: Ecoeficiência.

9. **This preliminary analysis revealed that even though 78 percent of those companies have some energy initiatives, only 27 percent have well-developed energy programs.** Most organizations lack effective methods to control and manage their reduction of energy consumption and GHG emissions. Of the companies, 84 percent expressed interest in investing in renewable energy and EE projects; however, only 54 percent have a cogeneration unit. These initial findings confirm the hypothesis that there is enormous potential for IEE and that companies have interest in better aligning their strategies with clean energy, renewables, EE, and GHG monitoring.

10. **As a next step of the analysis, the sample of 120 companies was grouped into three major clusters:** (a) The first cluster consisted of sectors in which the organizations, in general, already have an energy program implemented and operational; (b) The second cluster represented companies in transition, as they have a few EE initiatives and are implementing their programs; (c) The last cluster consists of companies in which there are no energy programs although a few ad hoc initiatives may exist to reduce energy consumption. Table 6.2 shows the final scores for all industrial sectors and illustrates the profile of some companies from each group.

Table 6.2. Grouping of Industrial Sectors

Sectors	Stage of EE Program (1-5)	GRI Sustainability Report (1-3)	Energy Reduction Target (1-3)	Energy Reduction History (1-3)	Examples of Initiatives (1-2)	Interest in Reducing GHG Emissions (1-3)	GHG Emissions Target (1-3)	Reduction of GHG Emissions History (1-3)	Cogeneration (1-2)	Investment in Renewable Energies (1-2)	International or Brazilian Information (1-2)
Chemical and Petrochemical	4,17	2,92	2,25	2,67	2,00	2,67	2,33	2,42	1,75	2,00	1,33
Automotive Manufacturers	4,09	2,91	2,27	2,55	1,91	2,73	2,27	2,55	1,55	1,91	1,45
Non Ferrous and Metallurgy	4,00	[illegible]	[illegible]	2,25	1,88	2,50	2,00	2,13	1,88	2,00	1,50
Capital Goods and Manufacture	4,00	2,14	2,29	2,00	1,86	2,43	1,57	2,00	1,43	1,71	1,29
Electronics and Appliances	4,00	2,33	2,33	2,33	1,67	2,67	1,67	2,33	1,33	1,50	1,33
Steel	3,80	2,00	1,80	1,60	1,80	2,40	1,40	1,60	2,00	1,80	1,80
Automotive Parts	3,78	2,33	1,89	2,22	1,89	2,67	2,67	2,33	1,78	2,00	1,00
Beverages	3,60	[illegible]	[illegible]	2,40	2,00	3,00	1,60	2,40	1,60	2,00	1,80
Consumer Goods and Retail	3,55	2,64	[illegible]	2,27	1,91	2,82	2,09	2,36	1,55	2,00	1,55
Pulp and Paper	3,50	2,75	2,00	2,00	1,50	2,75	2,00	2,50	2,00	2,00	2,00
Ethanol & Sugar Cane	3,40	2,80	1,60	2,20	1,80	2,60	1,40	2,20	2,00	2,00	2,00
Oil & Gas	3,20	1,60	1,60	2,00	1,80	2,40	1,80	2,00	1,80	1,80	1,40
Pharmaceutical	3,00	2,00	1,40	1,80	1,80	2,60	2,00	2,00	1,20	1,80	1,40
Transportation	3,00	[illegible]	[illegible]	1,80	1,80	3,00	1,80	1,80	1,00	1,60	2,00
Cement	2,40	2,20	[illegible]	1,60	1,60	2,60	2,20	1,80	1,40	1,80	1,80
Mining	2,40	2,00	1,40	1,60	1,60	2,20	1,40	2,20	1,20	1,60	2,00
Food Processing	2,25	2,25	1,75	1,50	1,13	1,88	1,50	1,38	1,25	1,50	1,88
Agricultural Production	2,17	2,17	1,67	1,50	1,33	2,00	1,83	1,67	1,67	1,83	1,67
Total	3,45	2,41	1,90	2,09	1,76	2,56	1,93	2,13	1,58	1,84	1,57

Group 1

Group 2

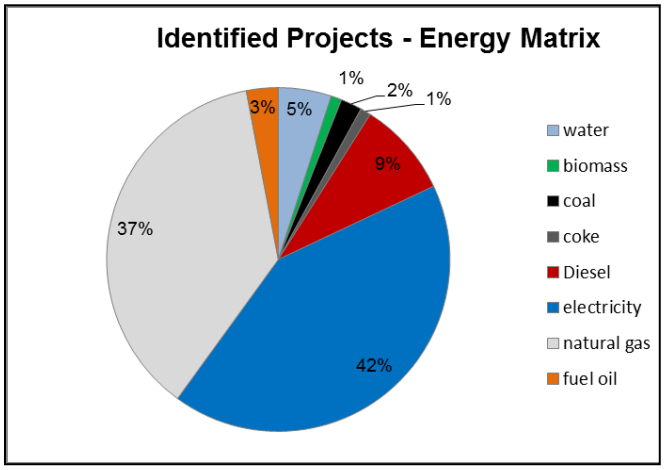
Group 3

Source: ABRACE and *Ecoeficiência*

11. **Potential list of projects and clients.** As a next step, the level of readiness of EE subprojects was identified. The information about these projects was collected from the ABRACE associates (on a confidential basis) and has been used as a reference on the opportunities that large companies might offer. Sensitive information was protected. There were about 150 ideas, opportunities, and projects in different stages of maturity. The sources that generated the initiatives came from different kinds of studies, such as very well-structured fieldworks with application of reference methodologies, use of experts and specialists in industrial systems, theoretical studies, and energy diagnosis with field measurements. Among these projects, reduction in electricity and natural gas represents the largest share of the opportunities—about 80 percent of the total. The remaining share is mostly concentrated on fuel

oil, diesel, coal, and coke. The ratio between thermal projects and electricity projects is approximately 60/40. Figure 6.1 shows the energy mix of the identified subprojects:

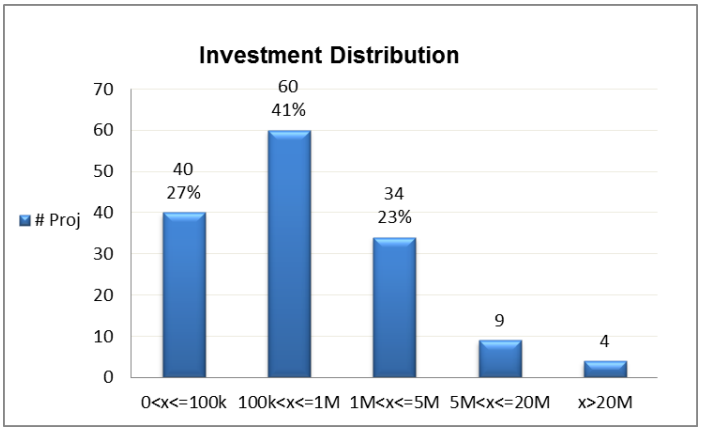
Figure 6.1. Energy Mix of IEE subprojects



Source: ABRACE and *Ecoeficiência*

12. **The current list of subprojects identified by the ABRACE members corresponds to about BRL 300 million (about US$90 million)** in terms of investment requirements, ranging from small projects of about BRL 20,000 (approximately US$6,000) to very large subprojects such as an investment in a new co-generation facility through industrial gases recovery, which may demand about BRL 45 million (approximately US$14 million). Figure 6.2 shows the distribution of the subprojects by investment size.

Figure 6.2. Distribution of Size of Investment (CAPEX) for IEE subprojects



Source: ABRACE and *Ecoeficiência*

13. **The potential for efficiency in the industrial sector is indeed substantial, and new business and financial models are to unveil this potential.** Only including ABRACE companies, the pent-up demand may be close to US$350 million once more energy audits are carried out. Projects encompass a variety of sizes and technologies, such as automation in furnaces, regenerative burners, heat recovery, efficient motors, frequency controls in pumping, and so on. Some investments in IEE subprojects present very low

paybacks of 1–3 years and IRRs ranging from 30 percent to 90 percent. More capital-intensive subprojects such as co-generation may present larger paybacks of 7 years and IRRs of about 20 percent. Potential for EE should also be significant in medium and small industries and commercial establishments.

Technologies

14. **Multiple EE technologies were identified and audited among ABRACE members.** For simplification, it was assumed that the implementation a large IEE program—for example, the one to be supported by FinBRAZEEC—would involve the combination of several of those technologies with the potential for being scaled up. A set of about 10 technologies was selected to constitute what will be herein called a 'Project Portfolio'. Each Project Portfolio encompasses several different technology/process interventions (for example, HVAC, energy-efficient motors, heat recovery, and variable speed pumps). The potential savings and required investments for each one of those technologies were based on audited subprojects among industrial clients. The Project Portfolio and the underlying EE interventions can be scaled up or down depending on the availability of financial resources. Very high capital-intensive subprojects, such as co-generation facilities, were not included in the Project Portfolio. The idea was to start with faster payback subprojects, able to generate sufficient returns to both the off-balance-sheet vehicle and to the host client, and still generate cash that can be used to reinvest in new subprojects. This list of technologies needs to be fine-tuned based on the new IFRS 16 accounting requirements for off-balance-sheet transactions. A summary of the expected energy savings and impact on energy intensity of the 10 technologies assumed in the Project-Portfolio is provided in Table A6-3.

Table A6-3: Project Portfolio: Expected Change in Annual Energy Use and Energy Intensity

	PRODUCT/SEGMENT	PLANT ANNUAL PRODUCTION (TON) (1)	ENERGY INTENSITY PERFORMANCE (2)		TOTAL ANNUAL ENERGY CONSUMPTION		ANNUAL SAVINGS				IMPACT ON ENERGY INTENSITY "ENERGY/TON"		% IMPROVEMENT IN ENERGY INTENSITY	IMPACT ON ENERGY INTENSITY "ENERGY/TON"	
TECH 1	REFINING (Al2O3)	6,200,000	11.400	GJ/TON	70,680,000	GJ	4,733	MWh	17,039	GJ	0.003	GJ/TON	0.024%	0.003	GJ/TON
TECH 2	METAL DIE CASTING	600,000	2.500	MBTU/TON	1,500,000	MBTU	167,265	MBTU			0.279	MBTU/TON	11.151%	0.294	GJ/TON
TECH 3	STEEL (4)	5,800,000	13.300	MBTU/TON	77,140,000	MBTU	110,320	MBTU			0.019	MBTU/TON	0.143%	0.020	GJ/TON
TECH 4	PETROCHEMICAL (Ethene)	1,700,000	19.600	GJ/TON	33,320,000	GJ	570,786	MBTU	602,179	GJ	0.354	GJ/TON	1.807%	0.354	GJ/TON
TECH 5	PETROCHEMICAL (Ethene)	2,860,000	14.500	GJ/TON	41,470,000	GJ	30,000	MWh	108,000	GJ	0.038	GJ/TON	0.260%	0.038	GJ/TON
TECH 6	TBD														
TECH 7	SMELTER (Aluminum)	450,000	14.100	MWh/TON	6,345,000	MWh	11,324	MWh			0.025	MWh/TON	0.178%	0.091	GJ/TON
TECH 8	ALLOY FOR EXTRUSION (3)	45,000	0.381	MWh/TON	17,145	MWh	4,932	MWh	-16,841	MBTU	0.000	MWh/TON	0.000%	0.000	GJ/TON
TECH 9	CHEMICAL (Polyethylene)	200,000	2.607	MBTU/TON	521,400	MBTU	2,880	MWh	9,827	MBTU	0.049	MBTU/TON	1.885%	0.052	GJ/TON
TECH 10	CHEMICAL (Acetone)	101,000	16.990	MBTU/TON	1,715,990	MBTU	576	MWh	1,965	MBTU	0.019	MBTU/TON	0.115%	0.021	GJ/TON

(1) - Plant production in which the project was identified
(2) - Plant energy intensity
(3) - Entails 100% fuel switching. For simplicity, it is assumed no changes in energy intensity
*(4) - Net of increase in electricity consumption = 5780/3 *3.6/1.055*

Source: World Bank

15. A more detailed description of technologies that constitute the initial Project Portfolio is presented as follows:

16. **Technology 1 - Installation of Variable Frequency Drivers (VFDs) for large-scale pumping systems.** VFDs serve to control cooling water pumps for large plants in several industries such as mining, refining, chemicals, and so on. With the installation of a VFD to control one pump, the required pumping capacity can be automatically adjusted to just match the system requirements, and therefore, energy costs can be reduced. With three pumps in service, the total current ranges from 260 amperes to 285 amperes. With the installation of a VFD at one of the pump systems, annual energy savings are estimated at 2,366.5 MWh for each system, representing a total of 4,733 MWh/year. Required investments for both

systems are about BRL 3,005,000. In the Project Portfolio, five occurrences for this technological improvement are assumed, resulting in total savings of 23,665 MWh/year for an investment of BRL 21,578,000.

17. **Technology 2 - Installation of regenerative burners in natural gas furnaces.** The regenerative burners installed on metal melting furnaces have the capability to improve performance reducing fuel consumption by more than 50 percent compared to the conventional ones. This technology is very likely to play a significant role in climate change mitigation in the future. It has energy payback periods ranging from 1.2 years for good to moderate industries and lifecycle GHG emissions of 38 gCO_2e/kWh. Field measurements were carried out in several furnaces to verify the actual natural gas consumption and potential savings (Nm^3/ton). The current and expected consumption (after the installation of regenerative burners) was assessed. Current natural gas consumption was 12,244,900 Nm^3 per year. Potential savings were estimated at 4,897,960 Nm^3 per year (or 167,265 MMBTU per year). At natural gas prices of US$0.49/$Nm^3$, savings represent BRL 1,549,897 per year. The required investment to install regenerative burners is BRL 14,484,000 per plant. In the Project Portfolio, three occurrences for this technological improvement are assumed, resulting in total savings of 501,796 MMBTU or BRL 22,752,000 per year, for a total investment of BRL 62,413,000.

18. **Technology 3 - Heat recovery in large high-pressure steam boilers.** Used in conjunction with a combined heat and power unit, the heat recovery steam boiler can play a significant part in strategies for using primary energy efficiently. The hot flows of flue gas from the upstream combustion processes are conducted into the heat recovery boiler and used for steam generation purposes. The proposed EE improvement consists of vent condenser to be used to preheat makeup water and recover the flash steam. The large condensate receiver in the water treatment area vents approximately 10,000 lbm/h (4.5 tons/h) to the atmosphere. Flow rate was measured based on liquid flow meter and energy balance. A simple heat exchanger arrangement can recover the flash-steam thermal energy and return the condensate to the condensate system. There may be an increase in power consumption, which was quantified. The net result will be financially advantageous**.** It is expected a reduction of natural gas consumption of 3,807,994 Nm^3 per year (130,043 MMBTU per year), with an estimated increase of 5,780 MWh in electricity consumption. The cost estimate for a vent condenser is BRL 1,000,000. In the Project Portfolio, three occurrences for this technological improvement are assumed, requiring an investment of BRL 4,725,000. Improvements will result in total savings of 390,129 MMBTU per year (BRL 14,824,901 per year), with an increase in electricity consumption of 17,340 MWh per year (BRL 5,410,080 per year). Total net savings are estimated at BRL 9,414,821 per year.

19. **Technology 4 - Installation of state-of-the-art burners in large furnaces.** Before the assessment, the company staff studied the potential savings by reducing the rate of fouling and found the 17 furnaces in question were losing between 5 percent and 12 percent of their thermal efficiency every six months as a result of both internal and external fouling in the convective section. Additional data were supplied for two of the furnaces in question, and the savings value of 5 percent in six months was confirmed. Based on the analysis, several opportunities were identified and quantified. It was assumed that 12 out of the 17 furnaces would run 24 hours a day, 365 days per year (8,760 hours). Higher efficiency option should save 5 percent in fuel, corresponding to a natural gas reduction of 159 Nm^3/h × 8,760 h × 12 units = 16,714,080 Nm^3 per year equivalent to 570,786 MMBTU. Cleaning is avoided for 17 units × 1 per year × BRL 110,000 per unit. Total savings equal BRL 23,559,962 per year. Required investments per furnace are equivalent to BRL 731,382, or total investments of BRL 731,382 × 17 = BRL 13,283,491.

20. **Technology 5 - Software for Energy Real-time Optimization (ERTO).** ERTO is an online and real-time implementation with an engineering model, which considers plant control strategies and system reaction to changes in the utilities. ERTO gives operators actionable advice on how best to operate complex, interactive utility systems to minimize utility cost. Many variables change over time in an industrial process: production rates, feed quality, environmental conditions, and pricing of imported fuel and power. Therefore, the operating conditions that minimize costs change over time. Utility plant operations should adapt themselves to minimize cost in real time. Adequate plant operations are able to optimize the use of equipment, such as steam balance managed to minimize vents and letdown; mix of fuels selected to minimize cost within environmental constraints; weekly target established for power import based on calculations; and gas turbine kept fully loaded. Proposed energy optimization software should be able to recover 80 percent of power import lost opportunity and 50 percent of letdown lost opportunity. In addition, ERTO exploits degrees of freedom for further savings, finds new operating strategies, and can lead to savings of up to 3 percent, or BRL 5.1 million/year at an energy cost of BRL 170/MWh. Assuming a total energy consumption of 1,000,000 MWh/year, savings are estimated at 30,000 MWh/year. Total investment costs are BRL 1,510,000 (software: BRL 530,000 and engineering services: BRL 980,000).

21. **Technology 6 - Efficient motor and pumping systems for water and sanitation.** Project identification and studies are being carried out. This category was not part of the original Project Portfolio, which was built based on real case studies identified among ABRACE members. It was introduced on CEF's request to help spur EE in pumping and electric motors for the water and sanitation business. Even though there are no examples from audits carried out for this particular analysis, the World Bank believes that there is a significant potential that can be tapped among water and sanitation utilities in Brazil. On one hand, some of the technologies described above (for example, Technology 1, with VFD) are equally applicable to large motors in the water utility sector. Secondly, studies carried out by the World Bank and IFC earlier, including water and sanitation utilities in Brazil, have demonstrated the significant EE potential that can be captured in this sector.

22. **Technology 7 - Optimization of compressed air systems.** Installation of several optimization systems in compressor house of an aluminum company was identified, including replacement of devices and specific pieces. The compressed air power requirement is 10,000 hp (7,500 kW). Compressed air demand ranges from 33,000 sft³/m to 40,000 sft³/m (57,000 Nm³/h to 75,000 Nm³/h). During the year, all 12 compressors are required to operate continually instead of 7 recently. Therefore, any compressor outage results in compressed air disruption, routine maintenance could not be accomplished, and site operations would be in jeopardy. The solution would be to purchase one new compressor for US$700,000. Efficiency measures could avoid this additional investment. Modified compressor controls and storage were designed to eliminate the operation of one compressor. Storage delays the need for the next compressor to start. Purchase and installation of 20,000 gal (75 m^3) were estimated at BRL 9,656,000 (for five occurrences). Energy savings per system were 11,324 MWh (or 56,620 MWh for five occurrences)

23. **Technology 8 - Conversion from electrical resistance to natural gas for ageing/homogenizing furnaces of aluminum profiles.** In an aluminum smelter, the homogenizing furnace is the final heat treatment process before delivery and further processing of the aluminum logs or billets in an extrusion plant. Basically, two different plant variants, differing in that they operate continuously or discontinuously, have become established on the market. Both types fulfill the metallurgical requirements with sufficient accuracy. The selection between them has to take into account the space required for the

implementation. Unless the space available is a factor, the flexibility required by the user is the essential deciding criterion: frequent changes of format, alloy, and temperature encourage the use of the discontinuous design, but if the role of flexibility in the production sequence is subordinate, the continuous variant is advantageous. A natural gas pipeline was readily available to the plant. Equipment to be converted include four ovens, totaling 1,530 kW. The electricity reduction (by full conversion) was estimated at 4,932 MWh per year, for a corresponding natural gas increase of 493,152.96 Nm^3 per year. The monetary net savings represented BRL 3,944,839, for a total investment of BRL 2,370,000 (for three occurrences in the Project Portfolio).

24. **Technology 9 - Replacement of HVAC and motor of low efficiency.** This intervention resulted in energy savings equivalent to 2,880 MWh per year, or about BRL 777,705 per year. For the entire Project Portfolio, (five occurrences), and energy savings total 14,400 MWh per year, which is equivalent to about BRL 3,888,524 per year. CAPEX is estimated at BRL 1,350,000 per replacement, or BRL 6,750,000 at the Project Portfolio level.

25. **Technology 10 - Improvements in cooling and refrigeration systems: installation of new chillers for the compressor to modulate the load and restart the Freon plants.** Collected data showed that the type of investment may lead to estimated energy savings equivalent to 576 MWh per year or BRL 179,712 per year. To obtain those savings, an investment in a new chiller representing BRL 280,000 will be necessary. For the entire Project Portfolio (five occurrences), the total energy savings will be 2,880 MWh per year or equivalent to BRL 898,560 per year. An average of five new chillers represents an investment cost of BRL 1,400,000.

ANNEX 7: ECONOMIC AND FINANCIAL ANALYSES

COUNTRY: Brazil
Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC

27. **The proposed operation is expected to result in sizeable economic and financial benefits at both the city and country levels, including global environmental benefits.** The Project will support EE investments through the EE Facility (Component 1) and TA/capacity building (Component 2). Given the analytical constraints associated with quantifying benefits from Component 2 that cannot be measured in monetary terms, the economic and financial analyses focus on Component 1, which accounts for 100 percent of the value of the IBRD loan, 100 percent of the CTF funds, and 98 percent of the GCF funds.

28. **Financial and economic analysis of Subcomponent 1.1 (Loan Syndication) is captured through the analysis of the subprojects (Section A).** Financial analysis of Subcomponent 1.2 (GF) is analyzed separately, based on the estimated ramp-up of the EE Facility sub-loan investments and the corresponding value of guarantees sold (Section B).

A. Financial and Economic Analysis of Subprojects

29. **The economic and financial analysis of EE subprojects (cost-benefit analysis) was done for each subsector (public lighting and IEE) for a 'typical' subproject, based on results of energy audits and/or similar subprojects performed in Brazil.** Costs are adjusted to reflect financial and economic values (excluding taxes and subsidies), as appropriate. Benefits are estimated on the basis of savings to users. Detailed results are presented in the following paragraphs.

30. **The finding of the analysis is that all subprojects are economically viable.** The economic analysis demonstrates the value for money that these subprojects offer. Economic returns are substantial, including municipal energy savings, industrial energy savings, and environmental benefits associated with climate change mitigation. Other important co-benefits are expected but have not been quantified in this analysis, including improved provision of municipal services, improved perception of safety particularly for women, improved industrial competitiveness, and improved capacity within CEF.

31. **Given the limited track record of private sector investment in these sectors, if commercial investors were willing to finance these subprojects without credit enhancements, the risk premium is likely to be very high and tenors will be too short to make the subprojects viable.** Thus, the initial phase of investment in these subprojects requires support from concessional financing terms and credit enhancement mechanisms. After a demonstration effect, more investors will come into the market, commercial financing costs will be reduced, and the subprojects can be viable without concessional support.

Public Street Lighting Financial and Economic Analysis

32. **The following provides a feasibility study of investment in public street lighting modernization using energy-efficient LED-based fixtures.** This analysis has been produced using the World Bank's CityLED tool, an Excel-based financial and economic analysis tool developed as part of the BRAZEEC TA project that preceded the preparation of the FinBRAZEEC Project. The tool can also be found online at

http://esmap.org/node/cityled_tool.**he World Bank has published an in-depth report on the market for energy-efficient investments in public street lighting in Brazil—"Lighting Brazilian Cities: Business Models for Energy Efficient Public Street Lighting" (Meyer et al. 2018).**[85]** This report provides more detail on the technology, barriers to investment, market analysis, and investment needs.

33. **The summary of all the key assumptions used in the financial and economic analysis for the public street lighting sector is as follows:**

- Project implementation. The subproject will be implemented over a two-year period.
- The FX rate is assumed to be 3.16 Brazilian reais per U.S. dollar.
- All costs and revenues, as well as the discount rate, are in real terms, net of inflation.
- The financial analysis is inclusive of taxes and subsidies; the economic analysis is exclusive of taxes or subsidies.
- For the financial analysis, the revenue to repay debt is assumed to be the subproject's savings on electricity and O&M expenditures as a result of the installation of LEDs.[86]
- The price of electricity used in the financial analysis is BRL 0.44 per kWh in 2017. Prices are assumed to increase annually by 2 percent in real terms.[87]
- The economic cost of electricity is assumed to be BRL 0.54 per kWh.[88]
- Debt-to-equity ratio is assumed to be 70:30.
- The social cost of carbon is US$30 per tCO_2e in 2015 terms, increasing up to US$80 per tCO_2e by 2050.[89] The cost of carbon is included in the economic analysis but is not taken into account in the financial analysis for the time being, although the subproject may eventually consider the monetization of emission reductions.
- The subproject's benefits and costs are analyzed over 13 years, the assumed lifetime of an LED.

34. **The analysis assumes an 'average' size city for this subproject is 42,500 points of light, which is equivalent to a medium-size city in Brazil with a population of approximately 470,000 people.** This was determined through discussions with CEF on the target market for this facility. The target market has been selected based on the market research conducted under the 'Lighting Brazilian Cities' report, which identified 135 cities (out of 5,570 in Brazil) that are potential candidates for structuring PPPs, given their

[85] http://documents.worldbank.org/curated/en/679281521548635917/Lighting-Brazilian-cities-business-models-for-energy-efficient-public-street-lighting.
[86] In practice, most municipalities will use COSIP revenues—the tax for public street lighting services levied on end users through electricity bills. COSIP revenues are assumed to be structured such that they are sufficient to cover all public street lighting expenditures and a moderate amount of system improvements. Large surpluses of COSIP would lead to higher taxes on end users, which would not be politically popular. Deficits of COSIP would mean the city has insufficient revenues to maintain the basic street lighting services without depleting resources from other municipal budgetary allocations. As such, using the project savings approach allows for an assessment of the attractiveness of these subprojects to the municipality and end users that ultimately provide the source of subproject revenue through COSIP collection. The analysis can also be used by municipalities to inform the amount of COSIP collection required to make the subprojects financially sustainable and bankable.
[87] Based on cost of electricity for public street lighting of the utility Light (B4a tariff, as of October 2017).
[88] This is based on information from Light utility—in the absence of a full analysis of the cost of energy in Brazil, this analysis uses a proxy of the cost of electricity to residential consumers (higher consuming, with no subsidies), excluding taxes.
[89] Based on the 2014 World Bank guidance note: http://globalpractices.worldbank.org/climate/_layouts/15/WopiFrame2.aspx?sourcedoc=/climate/Documents/carbon%20pricing%20guidance%20note%20-%207%2015%202015.docx&action=default.

size and credit profile, among other factors.[90] CEF conducted a further review of these 135 cities to identify 20 cities that fit the target profile of the facility: medium-size cities with a reasonable credit profile and with whom CEF has an existing relationship.

35. **The baseline inventory at year 1 of the subproject used for this feasibility analysis is based upon a technical study conducted by the World Bank Group on the city of Rio de Janeiro in 2014.** This is deemed to be a conservative baseline, given that Rio de Janeiro has greater resources than many municipalities to invest in more efficient technologies. Therefore, their current inventory likely has a larger share of the most efficient conventional technology currently used by municipalizes—HPS. Table 7.1 shows the assumptions for the technology mix of the existing inventory.

Table 7.1. Baseline Technology Mix at Project Year 1

Technology	No. of Lamps	Percent Share
HPS	27,625	65
Mercury vapor	10,625	25
Metal halide	4,250	10
Fluorescent	0	—
Incandescent	0	—
Halogen	0	—
Mixed lights	0	—
Other	0	—
Total	**42,500**	**100**

36. **Lifetime of conventional technology and LEDs.** LEDs have a significantly longer life expectancy than conventional street lighting technology. Even without smart systems, LEDs are expected to last a minimum of 50,000 hours, more than four years (50 percent) longer than the best currently installed technology, HPS. Smart systems can also affect the expected lifetime of the equipment because they are typically used to dim the power of the lamps during dawn and dusk hours of operation. The technical study indicated that dimming of 30 percent for five hours per day would be nearly imperceptible to citizens and would allow the city to optimize its electricity usage by using the lamps at full power only during the darkest hours of the night. Based on these assumptions, the inclusion of smart system technology would extend the expected life of an LED from 50,000 hours (11.9 years) to 55,000 hours (13.1 years).

Table 7.2. Expected Lifetime of Lamp Fixtures

Fixture Type	Average Life (Hours)	Average Life (Years)
HPS	32,000	7.6
Tubular HPS	32,000	7.6
Metal halide	20,000	4.8
Mercury vapor	24,000	5.7
Other	4,000	1.0
LED	50,000	11.9
LED with smart systems	55,000	13.1

[90] These cities are categorized as Group A and Group B in the 'Lighting Brazilian Cities' report.

37. **Project revenues (savings) - electricity and operational.** LEDs are assumed to deliver efficiencies in terms of the number of watts required to produce an equivalent lumen output. The assumption for efficiency of LEDs compared to conventional technologies is provided in table 7.3. For example, table 7.3 indicates that LEDs can produce the same (or better) lumen output as HPS lamps using 45 percent fewer watts.

Table 7.3. Relative conversion efficiency

Technology	Average Conversion Efficiency versus LED (%)
LED	100
Fluorescent	68
Halogen	85
Incandescent	87
Mixed lights	76
Mercury vapor	55
HPS	45
Metal halide	40

38. **Taking into account these efficiency factors and the assumed inventory of the average city described in paragraph 9, the estimated overall electricity savings potential is 47 percent without any smart system controls such as remote dimmers.** This study estimates savings of 55 percent with the installation of LEDs in tandem with the smart system controls.[91] This translates into savings of approximately 15 GWh per year once the subproject is fully implemented after two years. Over a 13-year period, in line with the lifetime of the LED, the subproject is expected to save approximately 193 GWh of electricity for the city.

39. **The O&M savings of the subproject are derived from the benefits of less frequent equipment replacement associated with LEDs due to their longer average useful life compared to existing technologies.** This is a conservative assumption, as there may be other efficiencies in terms of more efficient management of the system overall (for example, smaller labor force required given the existence of remote controls). These benefits accrue in terms of (a) less frequent procurement of equipment (even though LEDs are more expensive, their longer life offsets these higher costs) and (b) lower labor costs associated with the less frequent replacement of burned out lamps.

40. **CAPEX.** The weighted average price of existing technology was derived based on the existing inventory and a survey of existing lamps available in the Brazilian market, determined to be BRL 117 per lamp (approximately US$37), and is considered to have plateaued (that is, no change in real price over the life of the subproject).

[91] This is presumed to be a conservative estimate. Cities with less-efficient inventories dominated by mercury vapor can be expected to realize savings closer to 60 percent. Global experience suggests savings are likely to be higher than expected. For example, the city of Los Angeles experienced savings approaching 70 percent with a simple conversion to LEDs. One reason that savings may be larger than expected is that because LEDs produce a better quality of light and the light can be more effectively directed at the ground, final technical specifications for the LED wattage required to provide an equivalent or better level of lumen output may end up being lower.

41. **To determine a reasonable price range under the subproject scenario, research was conducted on prices recently paid for LED programs around the world, including stakeholder interviews, to give a perspective on the potential prices that could be obtained in Brazil over time.** This analysis shows that the price of LEDs for street lighting varies greatly throughout the world, depending on the existence of domestic manufacturing, the scale of the market, and import/export taxes, among other things. In the case of India, prices of LEDs for street lighting have fallen to under US$100 per point; these low prices can be attributed to the large scale of projects that have been implemented in recent years, spearheaded by a government initiative to support cities to access off-balance-sheet financing (through a public Super-Energy Services Company, super-ESCO, called Energy Efficiency Services Limited).

42. **Interviews with the Brazilian branches of major international manufacturers of LEDs indicate that the price of LEDs for a subproject size of 42,500 points would be approximately BRL 990 (US$313) per point in 2018, after taxes.** This figure assumes 50 percent of the lamp's value is manufactured domestically. Current domestic manufacturing is lower than this (estimated at 25 percent); however, a number of manufacturers have indicated they will increase domestic manufacturing after a few large deals close (including, for example, the PPP for the Belo Horizonte project, for which the concession has been awarded). The analysis assumes LED prices will continue to fall at a rate of 10 percent until they reach a plateau in 2022.[92]

43. **The analysis assumes that the average city will also install smart systems, entailing the ability to remotely control the dimming of LEDs from a centralized management system.** The smart system is expected to cost an additional BRL 97 per point (US$30, about 10 percent of the fixture cost). Thus, inclusive of smart system technology, the total cost per point is estimated to be BRL 1,067 (US$337) per lamp. Additional CAPEX includes installation costs of BRL 0.80 per point and engineering and design costs of BRL 1.1 million.

44. **For the economic analysis, the study uses the same assumptions as for the base case scenario, excluding all taxes (import and domestic) from the price of LEDs.** In this case, the estimated prices are BRL 605 (US$191) for LEDs only and BRL 725 (US$230) for LEDs plus smart systems.

45. **Cost of capital and lending terms/discount rate.** The nominal weighted average cost of capital (WACC) used for this study is 15.5 percent. This assumes a nominal cost of debt of 10 percent, a nominal cost of equity of 17.5 percent, and a debt-to-equity ratio of 70:30. To simplify the model, all future prices are shown in real terms and, therefore, the real WACC (net of inflation) is used as the discount rate. The analysis assumes an inflation rate of 5 percent in Brazil. The real cost of debt is 6.6 percent, the real cost of equity is 14 percent, and thus, the real WACC is 7.4 percent. For the financial analysis, the lending terms are assumed to be a 10-year loan tenor with a 2-year grace period. For the discount rate for economic analysis, 4.8 percent is used to represent the economic opportunity cost of capital in Brazil.[93]

[92] Studies forecast price declines of up to 16 percent per year: Foote, J., and E. Woods. 2014. "Smart Street Lighting: LEDs, Communications Equipment, and Network Management Software for Public Outdoor Lighting: Market Analysis and Forecasts.": Pike Research. Retrieved March 2014 from http://www.navigantresearch.com/research/smart-street-lighting. To be conservative, this analysis assumes a price decline of 10 percent per year for the next 10 years, after which prices will plateau.
[93] Based on the Brazilian interbank rate (*Sistema Especial de Liquidação e Custodia,* [SELIC]) as of October 2017 (8.25 percent), less inflation of 5 percent.

Carbon Accounting

46. **The analysis assumes that, without this Project, municipalities would slowly replace burned-out lamps in the existing inventory with LEDs.** However, given the municipal constraints on financing (under the Fiscal Responsibility Law, described in detail in the Lighting Brazilian Cities report), cities would be limited to using only surplus revenues available from their street lighting budget, after paying for all electricity and O&M costs. For many cities, the source of revenue to fund public street lighting is known as COSIP, a tax levied on end users through their electricity bill.

47. **The Baseline Scenario assumes that the average city has a COSIP surplus of approximately 10 percent of its total expenditures, after paying electricity and O&M costs for street lighting.** In other words, COSIP collection will be BRL 20 million, BRL 18 million of which will be used to cover the current expenditures (including purchase of replacement lamps with conventional technologies such as HPS) with BRL 2 million in surplus. With this surplus, the city will fund its annual system expansion investments, as well as modernization of the system through the purchase of more efficient technologies such as LEDs. The baseline assumes the city will use 25 percent of its total surplus to fund the modernization with LEDs, equal to BRL 0.5 million in year 1. In practice, this means that under the Baseline Scenario, the city would eventually fully convert its inventory to LEDs. However, due to its financing and budget constraints, the process will take place over a long period. By the end of 13 years, the Baseline Scenario assumes that 30 percent of the existing inventory will be replaced by LEDs.

48. **The Project Scenario, as described in the previous paragraphs, involves the establishment of a PPP that will finance the up-front cost of modernization of the entire inventory of public street lights with LEDs.** By bringing in private sector financing through the FinBRAZEEC facilities, the Project is able to overcome one of the key barriers for implementing an LED modernization subproject: up-front financing costs under constrained budget and balance sheet conditions of municipalities. The Project also overcomes other barriers, including improving municipal capacity and reducing the transaction costs involved in the preparation of subprojects through standardized approaches and identifying investors willing to invest in these subprojects through a derisked facility.

49. **GHG savings are calculated based on the comparison of electricity used for public street lighting in the Baseline and Project Scenarios described in the previous paragraphs.** The estimated annual electricity consumption in the Baseline Scenario over 13 years is 415 GWh. In the Project Scenario, this number decreases to 222 GWh, a reduction of 46 percent. These savings are due to the efficiency differential between the LEDs and the inventory assumed in the baseline, as described in the assumptions section. The annual GWh per year is then multiplied by the assumed GEF of Brazil using the IFI Harmonized Database. Based on a 50/50 combined margin, the GEF is 0.44 tCO_2e/MWh. The electricity savings are multiplied by the GEF to determine the estimated GHG emission reductions, resulting in approximately 85,000 tCO_2e reduced over the life of the subproject.

50. **Since public street lighting is partially peak coincident, and because demand in Brazil is increasingly being met with fossil fuels, the actual GEF for public street lighting could be higher based on a time-of-use calculation.**[94] The few studies available on the impact of climate change on hydropower

[94] Public street lighting hours are assumed to be from 6 p.m. to 5 a.m. The first four hours are assumed to be peak coincident during weekday operation.

due to changes in rainfall patterns demonstrate increased use of gas and fuel-oil-based thermal power plants to meet shortfalls. Thus, the annual GHG emissions of the sector in a dry year are four times higher than in years with favorable hydrology.[95]

51. **A summary of the major results from the financial and economic analysis can be found in table 7.4.**

Table 7.4. Summary of Financial and Economic Analysis

Metrics	Financial Analysis	Economic Analysis
Total investment	BRL 53 million (US$16.7 million)	BRL 33 million (US$10.4 million)
Total revenue	BRL 108 million (US$34.2 million)	BRL 139 million (US$44.0 million)
Total electricity savings	193 GWH	193 GWH
Annual GHG reductions	84,952 tCO_2e	84,952 tCO_2e
Total net present value (NPV)	BRL 10.2 million (US$3.2 million)	BRL 49 million (US$15.5 million)
IRR, net	12%	39%
Payback period, non-discounted	6.1 years	3.0 years
Return on investment	1.1	3.3
WACC (net of inflation)	7.4%	4.8%

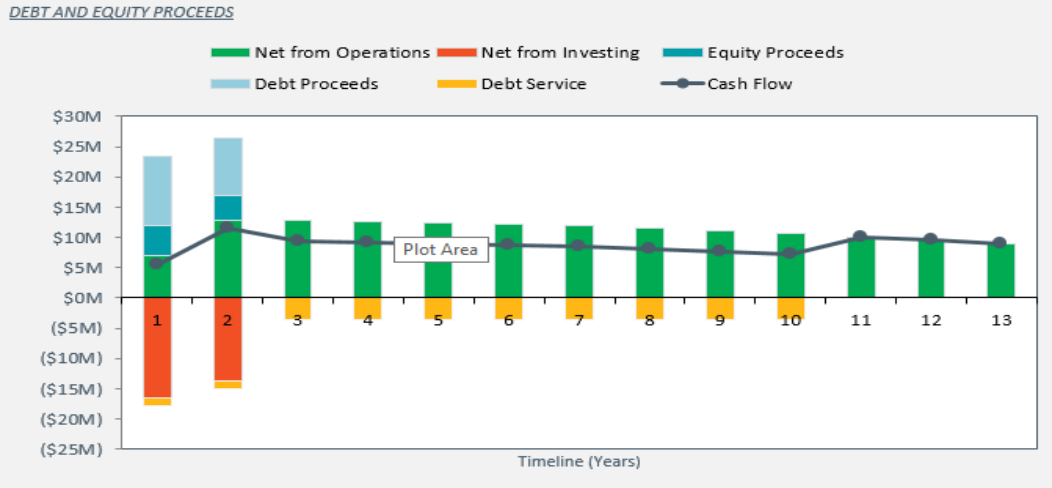
52. **The total electricity savings from the subprojects are estimated at 193 GWh over the 13-year life of the subproject.** The GHG reductions associated with the energy saving are equal to approximately 85,000 tCO_2e over the 13-year period.

53. **The financial returns of the subproject demonstrate that the subprojects are financially viable under the assumptions used.** The real expected IRR is 12 percent (compared to the real WACC of 7.4 percent), and NPV is BRL 10 million (US$3.2 million). The expected payback period is 6.1 years. The total investment is BRL 53 million (US$16.7 million), and the expected non-discounted savings on electricity and O&M expenditures (limited to those associated with lamp replacement only) is BRL 108 million (US$35.4 million). The minimum debt service coverage ratio (DSCR) is 1.3.

54. Figure 7.1 shows the expected cash flows of the subproject:

[95] In 'dry years' such as 2014, GHG emissions increase up to 60 $MtCO_2e$, compared to only 15 $MtCO_2e$ on a wet year. (de Gouvello, et al. 2017. "Low Hydrology Scenario for the Brazilian Power Sector 2016-2030 – Impact of Climate on Greenhouse Gas Emissions." World Bank.)

Figure 7.1. Financial Cash Flows of the ESL subproject (BRL)



Source: World Bank

55. **Without the blended, concessional financing, these subprojects would have an estimated real cost of debt from the private sector of at least 9 percent (12 percent nominal, and this would be substantially higher without the credit enhancement that will be offered by the FinBRAZEEC Project), and the tenor would be shorter (for example, six years).** In this case, the subproject would no longer be bankable. Although the subproject IRR of 12 percent would still be higher than the WACC, the minimum DSCR would drop below 1. Moreover, the higher cost of debt would leave little room for increases in the CAPEX, which could be higher if smaller cities cannot benefit from economies of scale for LED pricing cities and/or if cities include other civil works to upgrade infrastructure and/or bring existing infrastructure up to code.

56. **The results of the economic analysis show that the subproject has an expected EIRR of 39 percent with a payback period of 3 years.** The EIRR is very attractive, primarily due to the assumptions for the unsubsidized cost of electricity and the inclusion of the social benefits of carbon emission reductions (see Carbon Accounting section for details on GHG emissions calculations, and the Assumptions section for the value of carbon emission reduction benefits). The expected economic cost of the investment (excluding taxes) is BRL 33 million (US$10.4 million), and expected non-discounted economic savings on energy and O&M expenditures are BRL 139 million (US$44 million). The strong economic returns of the subproject demonstrate the value-for-money proposition that investments in public street lighting modernization with LEDs offer to society as a whole.

57. **Financial risk assessment.** The analysis identified two key financial risks to the subproject returns:(a) increase in CAPEX due to higher-than-expected price of LEDs and (b) decrease in the price of electricity. The switching values assessment is shown in table 7.5. The hurdle rate is assumed to be the WACC.

Table 7.5. Switching Value Assessment

	Unit	Baseline	Switching Value	
Cost of equipment (LEDs and smart controls; CAPEX)	BRL	1,186	1,385	A 17% increase in the cost of LEDs would lead to an NPV of 0 for this subproject. The baseline price is deemed to be conservative, considering that larger-scale subprojects (such as Belo Horizonte) are expected to achieve substantially lower prices (stakeholder consultations indicate approximately BRL 870 per point). Continued increase in the scale of LED deployment in the country and competition through the PPP tender processes are expected to put downward pressure on LED prices. However, smaller-scale subprojects may face higher prices due to lower economies of scale in the procurement of LEDs.
Electricity tariff	BRL/kWh	0.44	0.38	A 14% decrease in the cost of electricity for public street lighting (in real terms) would lead to an NPV of 0 for this subproject. Given the recent crises in the Brazilian power sector and the resulting increase in dispatch of expensive thermal generation, a decrease in electricity prices of this magnitude is deemed to be unlikely.

58. **The economic analysis of ESL subprojects demonstrates the value-for-money that these subprojects offer.** Economic returns are substantial, and these benefits can ultimately be transferred to citizens through a reduction in the tax collected for public street lighting (COSIP) over the medium term. Moreover, given that public street lighting is often one of the highest municipal expenditures, the financial savings offered by these subprojects can have a major impact on the fiscal sustainability of a municipality.

59. **Nonetheless, the analysis shows that the subprojects are sensitive to the price of LEDs, and *ceteris paribus* less than a 20 percent increase in the price of LEDs would make them unviable.** The financial analysis shows that the bankability of these subprojects is sensitive to the costs of capital and lending terms (specifically tenor and grace period). Given a very limited track record of private sector investment in this sector, if commercial investors are willing to finance these subprojects, the risk premium is likely to be very high and tenors will be too short to make the subprojects viable. Thus, the initial phase of investment in these subprojects requires support from concessional financing terms and credit enhancement mechanisms. After a demonstration effect, more investors will come into the market, commercial financing costs will be reduced, and the subprojects can be viable without concessional support.

Urban Industrial Energy Efficiency Financial and Economic Analysis

60. **For simplification, it was assumed that the implementation of a large IEE program will involve the scaling up of a series of notional 'Project Portfolios'.** Each Project Portfolio encompasses nine different technology/process interventions (for example, HVAC, energy-efficient motors, and heat recovery), based on audited subprojects among industrial clients. Each Project Portfolio represents a typical set of interventions in the IEE space, which may be 'scaled up' in modules depending on the availability of financial resources.

61. **For this analysis, very high capital-intensive subprojects, such as co-generation facilities, were not included in the Project Portfolio.** The idea was to start with faster payback subprojects, able to generate sufficient returns to both the SPV and the host client, and still generate cash that can be used to reinvest in new subprojects.

62. The summary of all the key assumptions used in the financial and economic analysis for the IEE sector is as follows:

- This analysis assumes the Project Portfolio will be implemented over a two-year period.
- The FX rate is assumed to be 3.16 Brazilian Reais per U.S. dollar.
- All costs and revenues, as well as the discount rate, are in real terms, net of inflation.
- The financial analysis is inclusive of taxes and subsidies; the economic analysis is exclusive of taxes or subsidies.
- For the financial analysis, the revenue to repay debt is assumed to be the subproject's savings on electricity and natural gas expenditures. For some technologies, O&M has also been taken into account. Details regarding the technical and financial assumptions for each technology can be found in annex 6.
- The price of electricity used in the economic and financial analysis is BRL 0.31 per kWh in 2017.
- Debt-to-equity ratio is assumed to be 70:30.
- The social cost of carbon is US$30 per tCO_2e in 2015 terms, increasing up to US$80 per tCO_2e by 2050.[96] The cost of carbon is included in the economic analysis but is not taken into account in the financial analysis for the time being, although the subproject may eventually consider the monetization of emission reductions.
- The subprojects' benefits and costs are analyzed over eight years, a conservative time frame by which it is assumed that the industrial entities would replace their existing equipment with the more efficient equipment under a business-as-usual approach.

Financial Analysis

63. **Each Portfolio Project represents investments of about BRL 123.7 million (approximately US$39.1 million) and results in net savings of 125 GWh/year in electricity and 1.5 million MMBTU in natural gas.** Energy savings represent BRL 24.2 million/year in electricity and BRL 58.6 million/year in natural gas. Other savings, such as reduction in O&M costs, are relatively small compared to energy savings. In some cases (such as cleaning cost of furnaces), those were considered and included in the Total Savings column shown in table 7.6.

64. **A summary of the savings (electricity, natural gas, and others) as well as investment requirements and non-discounted paybacks for each one of those technologies is presented in table 7.6.** It also includes the number of occurrences of each technology in the Project Portfolio.

[96] Based on the 2014 World Bank guidance note: http://globalpractices.worldbank.org/climate/_layouts/15/WopiFrame2.aspx?sourcedoc=/climate/Documents/carbon%20pricing%20guidance%20note%20-%207%2015%202015.docx&action=default.

Table 7.6. Summary of Project Portfolio

Technologies within a "Project-Portfolio"	Expected Number of Occurrences	Total Energy Savings Impact per year (Savings per Technology x Number of Occurences in the Project-Portfolio)		Value of annual electricity savings	Value of annual gas savings	Total Savings	Capital Investments	Non-Discounted Pay Back	Combined emission factor (electricity) tCO2e / MWh	Emission Factor (natural gas) tCO2e / MMBTU	Total Emission Reduction
				$312	$38				0.440	0.054	
	#	MWh	MMBTU	BRL/year	BRL/year	BRL/year	BRL 000s	Years	tCO2e / year	tCO2e / year	tCO2e / year
1. Installation of Variable Frequency Drivers (VFDs) for large scale pumping systems	5	23,665		7,383,480		7,383,480	21,578	2.9	10,413	0	10,413
2. Installation of regenerative burners in natural gas furnaces	3		501,796		22,752,004	22,752,004	62,413	2.7	0	27,037	27,037
3. Heat recovery in large high-pressure steam boilers	3	-17,340	390,129	-5,410,080	14,824,902	9,414,822	4,725	0.5	-7,630	21,020	13,391
4. Installation of state-of-the-art burners in large furnaces	1		570,786		21,689,868	23,559,868	13,283	0.6	0	30,754	30,754
5. Energy optimization - software for energy real-time optimization (ERTO)	1	30,000		7,325,455		7,325,455	1,510	0.2	13,200	0	13,200
6. Variable Speed Drivers for Furnace Fans*	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7. Optimization of compressed air systems	5	56,620		5,466,976		5,466,976	9,656	1.8	24,913	0	24,913
8. Conversion from electrical resistance to natural gas for ageing/homogenizing furnaces of aluminum profiles	3	14,796	50,524	4,616,352	-671,519	3,944,833	2,370	0.6	6,510	2,722	9,232
9. Replacement of HVAC and motors of low efficiency	5	14,400		3,888,524		3,888,524	6,750	1.7	6,336	0	6,336
10. Improvements in cooling and refrigeration systems	5	2,880		898,560		898,560	1,400	1.6	1,267	0	1,267
TOTAL	**31**	**125,021**	**1,513,235**	**24,169,267**	**58,595,255**	**82,764,522**	**123,685**	**1.5**	**55,009**	**81,533**	**136,542**

(*) Technology # 6 was eliminated from the Project-Portfolio as originally defined. It will include in the future investments in water and sanitation efficiency motor and pumping systems. Project identification and studies being carried out.

65. **For the financial and economic analysis, it will be assumed that the net operating income of the SPV (therefore, revenues and costs) will be split equally between the SPV itself (F2E) and the host customer.** This method provides the necessary incentives for the industry to break even in the initial years of the project (for example, savings = fixed payments) and reap all the benefits after a certain period (assumed to be after eight years—when project has already reached its payback and loans have been amortized).

66. **The Project Portfolio is attractive, with an IRR (real) of 16.9 percent and an NPV of BRL 42.2 million (US$13.3 million).** The total IEE sub-program including 14.5 Portfolio Projects has an NPV of BRL 613 million (US$194 million). The Project Portfolio is also bankable at the market rates charged by the facility. The lowest Debt Coverage Ratio, happening in year 3, is about 1.42. The real ROE (IRR on equity) is 19.4 percent (a typical equity IRR for those kinds of investments in Brazil), which should make the subproject attractive to several classes of equity holders, such as pension funds, hedge funds, and other investors, which are looking for attractive investments in the green space. The results of the financial analysis are shown in table 7.7.

Table 7.7. IEE Financial Analysis

Financial Analysis ('000s BRL)											
Year			0	1	2	3	4	5	6	7	8
Investments: 1 Project Portfolio			74,211	49,474							
Total Savings				41,382	82,765	82,765	82,765	82,765	82,765	82,765	82,765
Electric Energy = MWh @ BRL/MWh				12,085	24,169	24,169	24,169	24,169	24,169	24,169	24,169
Natural Gas MMBTU/year @ BRL/MMBTU				29,298	58,595	58,595	58,595	58,595	58,595	58,595	58,595
Revenues for F2E				20,691	41,382	41,382	41,382	41,382	41,382	41,382	41,382
Gross Taxes (30%)				6,207	12,415	12,415	12,415	12,415	12,415	12,415	12,415
Tax Shield on Interest				-1,496	-2,493	-2,244	-1,829	-1,413	-997	-582	-166
Net Taxes				4,711	9,921	10,171	10,586	11,002	11,417	11,833	12,248
Net Cash Flow				15,980	31,461	31,212	30,796	30,381	29,965	29,549	29,134
Net Cash Flow After Investments			-74,211	-33,494	31,461	31,212	30,796	30,381	29,965	29,549	29,134
IRR (Real)		17%									
NPV (@10.9 percent real)	0.1	42,261									
Number of Projects Portfolio		14.5									
Total NPV F2E (BRL)		614,394									
IRR on Equity (Real terms)		19%									
Debt (70 percent of Investments)		86,580	51,948	34,632							
Interest			0	-4,987	-8,312	-7,480	-6,095	-4,710	-3,325	-1,939	-554
Amortization			0	0	-8,658	-14,430	-14,430	-14,430	-14,430	-14,430	-5,772
Total Debt Service			0	-4,987	-16,970	-21,910	-20,525	-19,140	-17,755	-16,369	-6,326
DSCR				3.20	1.85	1.42	1.50	1.59	1.69	1.81	4.61
Equity Contribution (30 percent of Investment)		37,106	22,263	14,842							
Free Cash Flow to Equity Holders			-22,263	-19,829	14,491	9,301	10,271	11,241	12,210	13,180	22,808

(*) All figures in constant BRL unless otherwise stated

Economic Analysis

67. **The economic analysis builds upon the financial analysis developed in the previous section, with the typical adjustments,** such as eliminating taxes from CAPEX and energy sources and value added tax when the products are to be exported, excluding financing, depreciation, and tax impacts, including a carbon price for CO_2e, and adjusting the discount rate.

68. **The Project Portfolio is attractive from an economic standpoint, with a real IRR of 37.4 percent and an NPV of BRL 2,855 million (US$904 million).** Details are provided in table 7.8.

Table 7.8 IEE Economic Analysis

Economic Analysis ('000s BRL)											
Year			**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Investments: 1 Project Portfolio			66,790	44,527							
Total Savings				33,106	66,212	66,212	66,212	66,212	66,212	66,212	66,212
Electric Energy = MWh @ BRL/MWh				9,668	19,335	19,335	19,335	19,335	19,335	19,335	19,335
Natural Gas MMBTU/year @ BRL/MMBTU				23,438	46,876	46,876	46,876	46,876	46,876	46,876	46,876
Revenues for F2E				16,553	33,106	33,106	33,106	33,106	33,106	33,106	33,106
GHG reduction (tCO2e/year)				62,511	125,021	125,021	125,021	125,021	125,021	125,021	125,021
Social cost of carbon (BRL/tCO2e)				*106*	*109*	*112*	*115*	*119*	*122*	*125*	*129*
GHG reduction revenue				6,629	13,635	14,022	14,421	14,830	15,252	15,685	16,131
Total Revenues (w/GHG reduction revenues)				23,182	46,740	47,128	47,526	47,936	48,358	48,791	49,237
Net Cash Flow				23,182	46,740	47,128	47,526	47,936	48,358	48,791	49,237
Net Cash Flow After Investments			-66,790	-21,345	46,740	47,128	47,526	47,936	48,358	48,791	49,237
IRR (Real terms)		37.4%									
NPV (@3 percent real)	4.8%	170,937									

69. **It was assumed that each Project Portfolio has an abatement potential of 136,500 tCO_2e per year.** Thus, the yearly abatement potential for the entire IEE sub-program—assuming 14.5 Project Portfolios—is 1.99 million tCO_2e per year resulting in 14.9 million tCO_2e for the life of the IEE sub-program.[97] This is a conservative figure, which excludes savings (and GHG) benefits after year 8, in spite of a longer expected life for the IEE intervention. It also excludes climate benefits resulting from the replacement of more potent refrigerant gases. The cutoff point of eight years was established taking into account a baseline scenario whereby the existing equipment would be replaced after this period, and therefore, the benefits would not be additional. Table 7.9 presents a breakdown per technology/process intervention.

[97] Note that the calculation assumes the annual amounts are only achieved after full implementation of each subproject, which is assumed to take place over two years.

Table 7.9 GHG Emissions of Project Portfolio

Technologies within a "Project-Portfolio"	Expected Number of Occurrences	Combined emission factor (electricity) tCO2e / MWh	Emission Factor (natural gas) tCO2e / MMBTU	Total Emission Reduction
		0.440	0.054	
	#	*tCO2e / year*	*tCO2e / year*	*tCO2e / year*
1. Installation of Variable Frequency Drivers (VFDs) for large scale pumping systems	5	10,413	0	10,413
2. Installation of regenerative burners in natural gas furnaces	3	0	27,037	27,037
3. Heat recovery in large high-pressure steam boilers	3	-7,630	21,020	13,391
4. Installation of state-of-the-art burners in large furnaces	1	0	30,754	30,754
5. Energy optimization - software for energy real-time optimization (ERTO)	1	13,200	0	13,200
6. Variable Speed Drivers for Furnace Fans*	0	n/a	n/a	n/a
7. Optimization of compressed air systems	5	24,913	0	24,913
8. Conversion from electrical resistance to natural gas for ageing/homogenizing furnaces of aluminum profiles	3	6,510	2,722	9,232
9. Replacement of HVAC and motors of low efficiency	5	6,336	0	6,336
10. Improvements in cooling and refrigeration systems	5	1,267	0	1,267
TOTAL	**31**	**55,009**	**81,533**	**136,542**

(*) Technology # 6 was eliminated from the Project-Portfolio as originally defined. It will include in the future investments in water and sanitation efficiency motor and pumping systems. Project identification and studies being carried out.

B. Financial Analysis of the Guarantee Facility

70. **In the base case scenario, of a BBB credit rating target with an average annual sub-loan default rate of 10 percent, the GF is expected to charge an annual guarantee fee of at least 0.8 percent to cover all expenses, including payouts of US$39 million.** This is considered the 'breakeven' fee because it is sufficient to cover all expenses and provides a reasonable ROE (assumed to be 30 percent for this type of asset). This scenario results in full utilization of the GCF grant resources and utilization of US$16 million of GCF resources, meaning approximately US$4 million are expected to be returned to the CTF at the end of the Project. Approximately US$12 million of the IPF contingent loan is expected to be used to meet the GF's capital requirements to maintain a BBB rating. In the base case scenario, none of the IPF funds are required to cover guarantee payouts. Figures 7.2 and 7.3 indicate the expected annual usage of funds and annual expenses, respectively.

Figure 7.2. Use of Funds by Source - Base Case

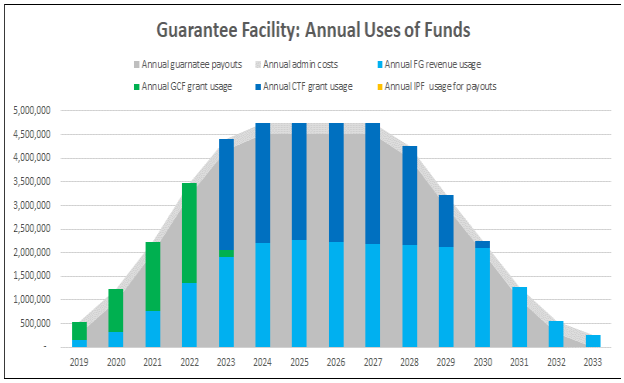
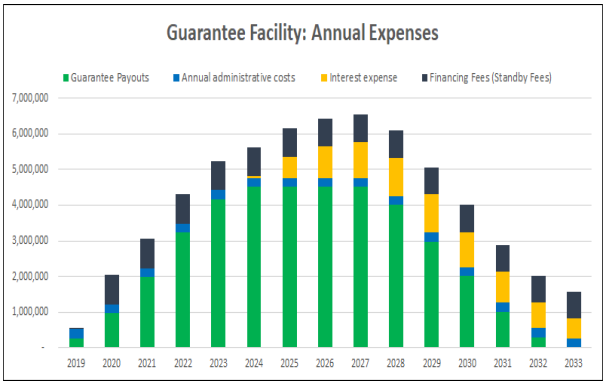


Figure 7.3. Estimated Expenses - Base Case



Source: World Bank

71. **In the upside case under a BBB credit rating scenario, the annual guarantee fee is maintained at the breakeven fee (0.8 percent), but the average annual sub-loan default rate is only 5 percent.** This results in guarantee payouts of US$17 million. Only US$1 million of the GCF grant would be utilized, none of the CTF funds would be utilized, and US$0.3 million of IPF funds would be disbursed to the GF to maintain reserves.

72. **In the downside case with a BBB rating, the annual guarantee fee is again maintained at 0.8 percent but the sub-loan default rate is 20 percent.** This would result in guarantee payouts of US$72 million. All GCF and CTF funds would be utilized in the scenario. Of the World Bank IPF, US$134 million would be disbursed and US$30 million would be utilized by the GF to cover guarantee payouts. The use of funds by source for the downside scenario is shown in figure 7.4. The expected IPF contingent loan disbursement profile in the base case and downside case is provided in figure 7.5:

Figure 7.4. Use of Funds -Downside Scenario

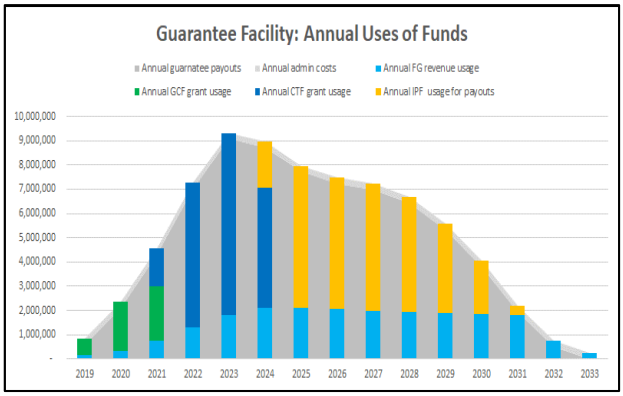
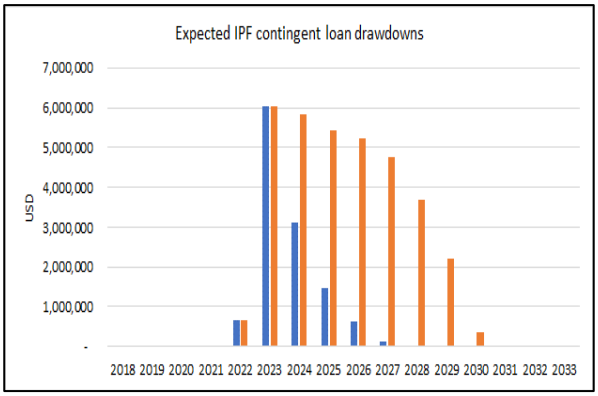


Figure 7.5. Expected IPF Drawdowns



Source: World Bank

73. **A sensitivity analysis was also conducted for the scenario of a AAA credit rating, which changes the assumptions of the minimum reserve requirements in the GF from 15 percent to 25 percent.** In this case, and assuming 10 percent average annual losses, an annual guarantee fee of 1.1 percent would be required to ensure fund sustainability and positive net income. The GF would draw down on US$27 million of the IPF contingent loan to ensure sufficient reserve balances, but these funds would not be used to cover guarantee payouts.

74. **Sensitivity analysis shows that the IPF contingent loan can significantly reduce the cost of the operation of the GF.** The AAA rating scenario is costly if 100 percent of the reserve requirement must sit as cash within the GF—that is, approximately 30 percent increase in the fees, representing approximately US$10 million in fee revenue collected by the GF to cover the additional interest payments associated with the IPF drawdown. If a 100 percent cash reserve approach were taken to achieve the AAA credit rating in the fund, these costs would ultimately be passed on by the syndicated lenders to the subprojects through the sub-loan cost of debt, likely making many subprojects unviable at the higher financing rates. While market sounding has indicated that a minimum level of cash reserves is desired, commercial lenders have indicated they will value the IPF contingent loan as ring-fenced, callable capital to the GF. The precise

reserve requirements—including what share should be held as cash versus callable capital—will continue to be refined by CEF, in consultation with potential syndicated lenders.

75. **Sensitivity analysis also demonstrates the significant value of the GCF and CTF funds to the GF and sub-loans by reducing the cost of funding of the minimum cash reserves required in the fund.** An analysis was conducted to estimate the financial benefit of the GCF grant and CTF contingent recovery grant, as shown in table 7.10. Without the GCF and CTF funds, US$25 million in minimum cash reserves would need to be generated by fees and offset by disbursements of the IPF contingent loan, bringing with it additional interest costs. In this case, the breakeven fee in the base case scenario would increase to 1.7 percent (102 percent increase). As discussed in the previous paragraphs, these additional costs would be passed on to the sub-loans, likely significantly reducing the pipeline and compromising the scale and impact of the Project.

Table 7.10 Sensitivity Analysis of GCF and CTF Funds

Indicator	BBB credit rating		AAA credit rating
	Base case / Break-even	No GCF or CTF grants	Alternative case
Targeted credit rating	BBB	BBB	AAA
Sub-loan average annual default rate (%)	10.0%	10.0%	10.0%
Annual Guarantee Fee (%)	0.8%	1.7%	1.1%
Guarantee Payouts (US$ million)	39.0	27.8	39.0
Cumulative use of GCF, CTF, IPF funds			
GCF grant usage (US$ million)	5.0	-	5.0
CTF grant usage (US$ million)	15.8	-	9.3
IPF disbursed (US$ million)	12.1	30.5	26.9

ANNEX 8: GENDER ACTION PLAN

COUNTRY : Brazil
Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC

I. The Gender Action Plan (GAP) Objective

1. **The GAP aims to identify potential entry points and opportunities to mainstream gender issues within the FinBRAZEEC Project, based on the gender analysis.** The GAP, including M&E indicators, are described in last section of this annex.

II. Project Background

2. **The FinBRAZEEC Project aims at overcoming investment challenges for urban EE subprojects by** (a) unlocking private financing through the reduction of the credit risk of ESL and IEE subprojects and (b) providing TA to enhance the quality of the subprojects. To achieve these goals, FinBRAZEEC proposes the creation of an EE Facility that will offer financing to EE projects in the ESL and IEE sectors. The objective of this facility is to create a new asset class for EE that can attract the interest of a wide range of investors and bondholders. The EE facility will be managed by CEF.

III. Gender Analysis

3. **This section provides an analysis of how gender has been integrated into the Brazilian institutional and legal frameworks, highlights advances and remaining gaps on gender equality, examines the different roles and needs of women in Brazil, and discusses additional vulnerabilities faced by women.**

A. Legal and Institutional Frameworks

4. **Over the past two decades, Brazil has made significant strides to mainstream a gender approach into policy making, promote gender equality, and combat violence against women.** In 2003, the Federal Government created the Secretariat for Policies for Women (SPM) under the Presidency. Throughout the following years, similar institutions were put in place at the state and municipal levels. The National Secretary was in charge of leading the design, implementation, and enforcement of National Plans of Policies for Women, which were developed through highly participatory processes (World Bank, 2016a). Similar efforts were also seen at the subnational level, with several states and some municipal governments designing their own plans or strategies to mainstream gender issues across different sectoral policies.

5. **One of the National Secretary´s initiatives was the creation of the 'Pro-Gender Equity Seal of Approval', and CEF, FinBRAZEEC´s EE financing facility, was one of its winners in two consequent editions.** This program aimed at raising awareness and sensitizing leaders, employers, and workers to promote gender equality and stimulate management practices that promote equal opportunities for men and women within organizations that volunteer to adhere to the program. After presenting a basic diagnosis, the organizations develop an Action Plan, which is then agreed with the SPM Program Committee. The evaluation is based on the fulfillment of the plan, which occurs at the end of each year from the date of signature of the Term of Commitment. The 'Pro-Gender Equity Seal of Approval' is then

granted to organizations that have reached the agreed targets. CEF received the Gender Equality Seal in the first two editions based on its actions to increase the number of women and afro-descendants in managerial positions and the recognition of regional units with better gender indicators (Pinto and Midlej 2012).

6. **To address domestic violence, in 2006, the country enacted the groundbreaking legislation, *Maria da Penha Law***, which made the country a world reference in this front. A *National Pact for Combating Violence Against Women* and the program *Brazilian Women - Living Free of Violence* were also launched, including the creation of one-stop-shop centers for women (*Brazilian Women's Houses*) in all 26 states of the country, integrating public security, justice, health, social welfare, counseling, shelter, employment, and income generation services. In 2015, the Government also passed new legislation recognizing femicide as the act of murdering women because they are women.[98] That same year, a new protocol was established for treating sexual assault survivors, eliminating the need for victims to be examined by both health professionals and law enforcement agents.

7. **In 2009, a *Special Prosecutor's Office for Women* was also created in Brazil's lower chamber of Congress, with the main objective of promoting more gender equitable legislation and policy.** The *National Policy for Comprehensive Attention to Women's Health* and the *Third National Plan of Policies for Women* provided a comprehensive approach to women's health, covering all stages of the lifecycle (World Bank 2016a).

8. **Despite the abovementioned achievements, institutional setbacks and implementation challenges demonstrate that more needs to be done to ensure the effectiveness and sustainability of such policies, laws, and programs.** In 2015, amid political turmoil and fiscal constraints, SPM lost its ministerial status and was merged with the Ministry of Human Rights and Racial Equality. Capacity and political capital of similar entities at the state and municipal bodies varied significantly, affecting their overall ability to operationalize policies. The Maria da Penha Law, for instance, is a federal legislation, but states and municipalities are responsible for its implementation, which has had limited success. Service points created to protect women often do not have the adequate resources. This includes in few states women's police stations and police battalions tasked with the protection of women who are under 'protective measures', courts, and health centers.

B. Gender Inequality and Gender Roles

9. **Advances in the legal and institutional/political spheres have been accompanied by significant improvement in education and health.** Women in Brazil have surpassed men in some education indicators. The female youth's literacy rate (15–24 years), for instance, increased and reached 99 percent in 2014, up from 84 percent in 2004, compared with the 98 percent male rate. Maternal mortality, commonly used as a proxy for women's access to quality healthcare, fell from 120 deaths per 100,000 live births in 1990 to 69 in 2013 (World Bank 2016a).

10. **Nevertheless, progress in other dimensions that are key to ensure sustainable achievements in gender equality is still lagging behind.** According to the World Development Report on Gender Equality

[98] "Brazil Femicide Law Signed by President Rousseff." BBC News: Latin American & Caribbean. Published March 9, 2015. http://www.bbc.com/news/world-latin-america-31810284.

and Development (World Bank 2012), gender equality can be achieved as a result of gains in three dimensions: endowments (for example, education, health, and assets), agency (for example, voice and decision-making power), and economic opportunities. While in the former Brazil has made great progress, as previously described, on the latter two fronts, there are still several gaps to overcome.

11. **Gains in the labor market have been significantly slow, falling short of bridging the gender gap.** Female labor force participation rose only 5 percentage points in the last two decades, from 54 percent in 1995 to 59 percent in 2014, while the share of women employed went from 50 percent to 54 percent over the same period. The unemployment rate for women is almost two times that for men (8.2 percent versus 4.8 percent in 2013).

12. **Occupational segregation is another concern, with 45 percent of women's jobs being concentrated in sectors traditionally related to female roles**, such as accommodation and food, education, health, social services, and domestic services, while 48 percent of the employed men were in the agricultural, industrial, and constructions sectors (Brasil 2014; World Bank 2016a). The labor market in Brazil is also characterized by high levels of informality, with the proportion of women in that condition being slightly higher than men. In 2014, 42.7 percent of the women and 41.5 percent of the men in the labor force were in the informal market (IBGE 2014). Moreover, sectors traditionally associated with female work tend to have lower growth potential and higher levels of informality, further limiting their economic opportunities.

13. **In the energy sector, women represented between 20 percent and 25 percent of the total labor force in 2017 worldwide.**[99] Although the rate is still low, women have been gaining space in this field. In 2006, the share of female workers in the electricity sector in Brazil, for example, was 16.7 percent (Dieese 2006). The renewable energy sector, specifically, where women account for approximately 35 percent of the labor force globally,[100] seems to be a key driver of female participation in the energy sector.

14. **Gender occupational segregation patterns are reflected on and reinforced by the vocational training courses offered in Brazil.** While women comprise the majority of students in areas such as education (80.4 percent) and health (82 percent), men are focused on industrial processes (80.6 percent), information and communication (62.3 percent), natural resources (60.7 percent) and infrastructure (59.7 percent) (Brasil 2014; World Bank 2016a).

15. **Gender gaps in wages are also persistent even in female-dominated occupations, and women tend to spend more hours working. In 2013,** women professionals in Brazil made on average 40 percent less than men. In the male-dominated 'managerial positions', the gap widens to almost 90 percent (ILO 2016). Overall, female workers make BRL 10.2 per hour, versus BRL 12.2 per hour earned by men.[101] Brazilian women also tend to spend four times the number of weekly hours than men do on domestic tasks. When added to their paid work, they spend on average 41.5 hours per week working, in contrast to 37.3 hours of work carried out by men (World Bank 2016a).

[99] AES. Published July 13, 2017. http://www.aesbrasilsustentabilidade.com.br/pt/noticias/item/mulheres-no-mercado-de-energia-renovaveis.
[100] AES. Published July 13, 2017. http://www.aesbrasilsustentabilidade.com.br/pt/noticias/item/mulheres-no-mercado-de-energia-renovaveis.
[101] Currency exchange rate on October 6, 2017: US$1 = BRL 3.16.

16. **Women in Brazil also receive fewer benefits than men.** Female workers have on average 84.5 percent of the pension levels received by their male counterparts (ILO 2016). This is usually a consequence of "the lower wages earned by women during their working life, shorter periods of contribution and career breaks, higher incidence of part-time work, higher proportion of women receiving benefits from survivors' pensions and from noncontributory old-age pensions…" (ILO 2016, 33).

C. Additional Vulnerabilities and Social Norms

17. **Gender inequality in Brazil is also heavily based on and exacerbated by race and ethnicity.** For all the disadvantages and inequities mentioned in this document, the gender gaps are significantly wider when looking specifically at afro-descendant and indigenous women, as well as their geographic location. For that reason, race and gender issues were both included in the previously mentioned 2012–2015 National Plans for Women, and in 2014, a national law was created to establish a race-based affirmative action program for federal civil servant positions countrywide (World Bank 2016b).

18. **Women in Brazil are also extremely vulnerable to violence.** Despite the 10 years of Maria da Penha Law, data shows that Brazil is ranked fifth in Violence Against Women global rates, according to the 2015 Violence Map of the United Nations. Between 1980 and 2013, more than 106,000 women were victims of homicide in the country, and the number of femicides per year increased from 1,353 to 4,762—an increment of 252 percent. In 2013, 33 percent were victims of their own or former partners or another relative. The majority of them also came from vulnerable areas, and 66.7 percent of the victims were afro-descendants (Waiselfisz 2015).

19. **Victimization in public spaces is also a major concern.** A recent national survey showed that 74 percent of women under 24 years have been victimized at least once in public spaces. Almost 25 percent of all women interviewed suffered an aggression within the past year and, among those, 39 percent had been victimized on the streets. Finally, 40 percent also declared to have suffered some type of harassment, 78 percent of which had happened on the streets (FBSP 2017).

20. **Women's victimization and perception of insecurity may hinder their overall mobility.** Consequently, victimization or fear of victimization can influence their work choices and options, their ability to take on extra work activities, or simply their right for a better quality of life. This issue is so relevant that in the capital city, Brasília, the Government adopted a measure to improve women's safety on public transport in 2014 by allowing women to request to get off buses anywhere along a route after 10 p.m.—including areas where there are no traditional bus stops.[102] Other cities were considering similar options.

21. **Cultural and social norms reflect and partially explain gender inequalities discussed in the previous section and also result in a context of permissiveness to violence against women.** In Brazil´s patriarchal culture, which favors traditional and dominant male gender roles, a national survey showed that one in three citizens believes that a woman is to blame for a rape. The survey also showed that 42

[102] "Brasília, Brazil Now Lets Women Choose Where to Get off the Bus at Night". November 23, 2014. Available at http://thecityfix.com/blog/brasilia-brazil-women-bus-stop-night-safety-sexual-assault-luisa-zottis/.

percent of the interviewed men think that women that 'do not deserve respect' should be raped. It is thus not surprising that 85 percent of the women are afraid of being victims of sexual violence (FBSP 2016).

IV. Project Beneficiaries and the Potential Gender Role of EE

22. **The FinBRAZEEC Project provides entry points and opportunities to influence some of the main gender issues faced by Brazil today.** The country has made significant achievements to overcome gender inequality in areas such as education and health, but a lot still needs to be done to bridge the gaps in the labor market and the provision of economic opportunities. Violence against women and racial disparities are also great concerns, and further exacerbate gender disparities as they affect a whole range of outcomes. Women's safety can be increased through improved street lighting, female employment can be encouraged, and adoption of gender-sensitive policies can be promoted amid implementing entities and beneficiary businesses.

23. **Evidence shows that interventions that focus on improving street lighting tend to reduce crime and perception of insecurity.** Such outcomes are a result of a modification of the environment that reduces the opportunities for offenders. The theory behind these types of interventions is based on two main ideas. First, they are part of what criminology defines as 'situational crime prevention', which focuses on reducing the opportunities for crime while also increasing an offender's perception of the risks of being caught (Jacobs 1961). Second, installing or improving street lighting can foster social control and community cohesion, which can also lead to lower crime rates. In addition, as community members perceive the intervention as a positive investment in their communities, there is more interest in taking care of these areas (Clark 2008; Sampson, Raudenbush, and Earls 1997).

24. **Lack of street lighting or poor lighting quality and/or coverage can have different impacts on men and women.** Even when we consider the issue of insecurity as the main adverse social impact, men and women are affected in different ways. Overall, studies indicate that lack of street lighting favors crimes and the feeling of insecurity, which may restrict access to work and education, especially in vulnerable areas where workers study at night.

25. **The 2017 Public Security Yearbook,[103] published by the Brazilian Forum on Public Security, presents data that can reveal gender inequalities in relation to the types of crimes in which men and women are victimized.** Women are more prone to rape, assault, and robbery, while men are exposed to robbery, murder, and homicide. While the homicide rate among men is 90 per 100,000 inhabitants, the rate for women is 10 per 100,000 inhabitants. Homicide victims in Brazil also have an age and racial cutoff, since the main victims are black youths between 15 and 24 years. Men are also the main perpetrators of crime, which is demonstrated by the prison population profile, composed 93 percent of men.

26. In 2016, 49,497 women were raped in Brazil, which equates to approximately 135 women raped per day. The result was the second highest since it began to be published in the Public Security Yearbook. The data presented in the document are sourced from the Departments of Public Safety of the respective states. Data sourced from the Ministry of Health, by means of the Information System for Notifiable Diseases (SINAN), and analyzed by the**,** Institute of Applied Economic Research (*Instituto de Pesquisa*

[103] http://www.forumseguranca.org.br/wp-content/uploads/2017/12/ANUARIO_11_2017.pdf.

Econômica Aplicada [IPEA]) study (2017)[104] show data reported by the health services and indicate that 53 percent of rapes of adult women are carried out by strangers, in public roads (48.7 percent), usually on working days (88 percent of the cases). SINAN data, while pointing out that rape is a serious crime committed against women in the context of domestic violence, do not exclude the streets as a place of risk to women.

27. **According to estimates from the Public Security Yearbook, the cost of violence in Brazil represents 5.9 percent of the GDP,** including public and private expenditures, which corresponds to approximately BRL 373 billion per year.

28. **In this context, it is possible to suggest that investments in strategies to expand the coverage of public street lighting represent different impacts for men and women,** mainly the security condition, guaranteeing the fundamental right to freedom of movement, as well as expanding the possibilities for work and education for both men and women, especially young persons.

29. **Street lighting can also have a specific impact on women´s perception of safety.** Safety audits conducted as part of the United Nations Women's Safer Cities Program in several countries, from Mexico to Tanzania and India, have concluded that public lighting is a key tool to improve women's sense of insecurity and prevent violence against women in public spaces. Improvements in lighting near bus stops and near public toilets are some of the most common recommendations.[105]

30. **Given that 50 percent of the investments in the CEF EE Facility component will be targeted at ESL subprojects, it is expected that the Project will have a significant impact on women's and men's perception of safety and in some types of crime rates, such as assaults, property crimes, and thefts.** The Projects' EE facility will primarily lend to SPVs established by the private sector, which will be granted concessions by municipalities to modernize and operate the street lighting system on a PPP basis. The Project could recommend that such interventions be targeted at areas where women's victimization and perception of insecurity are higher and in 'hot spots' where crime and homicides rates are higher. Administrative police and health system data and victimization surveys, if available, can provide a baseline for the selection of target areas. Such targeted interventions are therefore expected to improve quality of life of women as well as the broader beneficiary communities. Crime indicators can be monitored to measure results.

31. **With the promotion of ESL and IEE in Brazil, the Project will likely also benefit intermediary industries delivering EE-related goods and services, such as manufacturers of efficient industrial equipment, as well as LED manufacturers.** Increased demand could generate more jobs in these areas, and a special focus could be made on the incentive to employ women. Although these are not outcomes that will be enforced or necessarily measured by the Project, they should be taken into consideration.

32. **Businesses and manufacturers operating in the EE sector will most likely benefit from increasing sales and activity, which could generate more jobs.** Businesses selling EE -related goods and services, such as manufacturers of efficient industrial equipment, as well as LED manufacturers, may need to

[104] http://www.ipea.gov.br/portal/images/stories/PDFs/TDs/td_2313.pdf.
[105] "Better Lighting, Wider Pavements: Steps towards Preventing Sexual Violence in New Delhi." May 6, 2013. Available at http://www.unwomen.org/en/news/stories/2013/5/better-lighting-wider-pavements-steps-towards-preventing-sexual-violence-in-new-delhi.

support increased demand with additional hiring. In such case, the FinBRAZEEC Project can provide TA and propose an incentive structure to participating businesses aiming to encourage female employment. Results can be monitored through sex-disaggregated employment numbers in these entities.

33. **Finally, CEF could provide TA to participating industries regarding adoption of gender-related policies.** As part of the TA component, workshops and discussions could be organized to share lessons learned in the development and implementation of the policies that led the institution to win the 'Pro-Gender Equity Seal of Approval'. These efforts will help raise awareness; disseminate good practices of nondiscrimination in terms of recruitment, equal remuneration, and promotions; and highlight the benefits of gender-sensitive working conditions (including antiharassment policies, separate sanitation facilities, and so on) on employee satisfaction and performance. To monitor results, an indicator such as 'number of gender-sensitive policies adopted' could be adopted.

V. The GAP

34. The plan outlined in this last section describes expected outputs and outcomes that are informed by the present gender analysis, which aim at addressing some gender gaps that are crucial for Brazil's development and which should contribute to greater gender equality in subproject activities. This work will be performed parallel to the Project in collaboration with CEF, and will be adjusted as needed during the Project implementation.

Table 8.1. The GAP

#	Activities	Outputs	Timeline	Indicators	Target		Responsibilities
					Baseline	End Line	
I	**Outcome 1: Improved women's safety and quality of life**						
1	Improvement of street lighting in pilot areas with high rates of victimization	Street lighting improved for poor communities, targeted at areas with high levels of women's and men's victimization and perception of insecurity	1 year after sub-project implementation complete	• Increased perception of safety among men and women, with an age cutoff, in 4 pilot targeted areas (*Target TBD after baseline is collected*) • Reduced victimization of men and women (by type of crimes)	TBD during implementation TBD during implementation	TBD after baseline is defined TBD after baseline	• Beneficiary municipalities and CEF (identification of areas with police and health administrative data) • World Bank (survey and data analysis)
II	**Outcome 2: Gender policies disseminated and documented**						
2	Sharing CEF good practices and lessons learned with the implementation of gender-based policies	Workshop and trainings with awareness-raising activities organized for benefited EE industries	Before Project implementation	• # of workshops organized • # of IEE winning the 'Pro-Gender Equity Seal of Approval' • # of gender-sensitive policies adopted by participating businesses	0 0	TBD after total number of IE benefited is confirmed	• CEF • CEF

#	Activities	Outputs	Timeline	Indicators	Target		Responsibilities
					Baseline	End Line	
III	**Outcome 3: Promote female employment in the EE sector**						
3	Promote female employment through incentive structures, quotas, and so on within participating businesses	Higher female employment rates in the EE sector.	Annual	• Sex-disaggregated employment numbers in EE businesses	TBD	TBD	• CEF and World Bank gender specialist
IV	**Outcome 4: Promote gender awareness campaign**						
4	Promote gender awareness campaign in participating companies	Improved perception of gender inequalities among employees, especially regarding the kinds of violence to which men and women are exposed and ways of protecting/reporting	Annual	• Number of employees trained (disaggregated data) • Number of campaigns carried out	TBD	TBD	• CEF and World Bank gender specialist

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