Public Disclosure Authorized

Public Disclosure Authorized

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

FOR OFFICIAL USE ONLY

Report No: PAD2970

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED INTERNATIONAL DEVELOPMENT ASSOCIATION SCALE-UP FACILITY CREDIT
IN THE AMOUNT OF EUR 121.9 MILLION
(US$140 MILLION EQUIVALENT)

PROPOSED CLEAN TECHNOLOGY FUND CONTINGENT RECOVERY GRANT
IN THE AMOUNT OF US$67.2 MILLION

TO THE

WEST AFRICAN DEVELOPMENT BANK

AND A

PROPOSED INTERNATIONAL DEVELOPMENT ASSOCIATION REGIONAL GRANT
IN THE AMOUNT OF 7.20 MILLION SDR
(US$10 MILLION EQUIVALENT)

PROPOSED CLEAN TECHNOLOGY FUND GRANT
IN THE AMOUNT OF US$7.5 MILLION

TO THE

ECOWAS CENTER FOR RENEWABLE ENERGY AND ENERGY EFFICIENCY

FOR A

REGIONAL OFF-GRID ELECTRIFICATION PROJECT

March 27, 2019

Energy and Extractives Global Practice
Africa Region

This document is being made publicly available prior to Board presentation. This does not imply a presumed outcome. This document may be updated following Board consideration and the updated document will be made publicly available in accordance with the Bank's policy on Access to information.

CURRENCY EQUIVALENTS

(Exchange Rate Effective January 31, 2019)

Currency Unit =	U.S. Dollars (US$)
US$ 1 .00 =	SDR 0.71392875
US$ 1.00 =	EUR 0.87051143

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

ACBP	Africa Climate Business Plan
AFD	*Agence Française de Développement (*French Development Agency)
AfDB	African Development Bank
B2B	Business-to-Business
BCEAO	*Banque Centrale des Etats de l'Afrique de l'Ouest* (Central Bank of West African States)
BOAD	*Banque Ouest Africaine de Développement* (West African Development Bank)
CAD	Current Account Deficit
CAR	Central African Republic
CEMAC	Central African Economic and Monetary Community
CET	Common External Tariff
CFI	Commercial Financial Institution
CIF	Climate Investment Funds
CPF	Country Partnership Framework
CTF	Clean Technology Fund
DA	Designated Account
DFID	U.K. Department for International Development
DFIL	Disbursement and Financial Information Letter
DGIS	Directorate General for International Cooperation – Government of Netherlands
DPF	Development Policy Financing
DSA	Debt Sustainability Analysis
E&S	Environmental and Social
ECOSHAM	ECOWAS Standards Harmonization Model

ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Center for Renewable Energy and Energy Efficiency
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
ENREP	Electricity Network Reinforcement and Expansion Project
EREP	ECOWAS Renewable Energy Policy
ESDP	Energy Sector Directions Paper
ESEF	ECOWAS Sustainable Energy Forum
ESMAP	Energy Sector Management Assistance Program
ESMS	Environmental and Social Management System
ESRM	Environment and Social Risk Management
EU	European Union
FCI GP	Finance Competitiveness and Innovation Global Practice
FM	Financial Management
FI	Financial Intermediary
FIRR	Financial Internal Rate of Return
FTE	Full-time Equivalent
GBV	Gender-based Violence
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
GOB	*Gestion des Opérations Bancaires* (Banking Operations Management)
GOGLA	Global Off-Grid Lighting Association
GP	Global Practice
GRS	Grievance Redress Service
IE	Impact Evaluation
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
IFR	Interim Financial Report
IFRS	International Financial Reporting Standards
IPF	Investment Project Finance
IPSAS	International Public-Sector Accounting Standards
IRR	Internal Rate of Return
ISA	International Solar Alliance
KPI	Key Performance Indicator
LDC	Least Developed Country
LGQA	Lighting Global Quality Assurance
M&E	Monitoring and Evaluation
MFD	Maximizing finance for development

MFI	Microfinance Institution
MIGA	Multilateral Investment Guarantee Agency
MSMEs	Micro, Small, and Medium Enterprises
MTF	Multi-Tier Framework
O&M	Operation and Maintenance
OGE	Off-Grid Electric
OHS	Occupational Health and Safety
PAYGO	Pay As You Go
PPA	Project Preparation Advance
PDO	Project Development Objective
PIU	Project Implementation Unit
POM	Project Operations Manual
PPP	Purchasing Power Parity
PPSD	Project Procurement Strategy for Development
PSW	Private Sector Window
PRI	Political Risk Insurance
PV	Photovoltaic
QA	Quality Assurance
REA	Rural Electrification Agency
ROGEP	Regional Off-Grid Electrification Project
SDG	Sustainable Development Goal
SEA	Sexual Exploitation and Abuse
SEforALL	Sustainable Energy for All
SHS	Solar Home System(s)
SLGP	Small Loan Guarantee Program
SMEs	Small and Medium Enterprises
SOE	Statement of Expenditures
SOE	State owned enterprises
SOP	Series of Projects
SRMI	Solar Risk Mitigation Initiative
SUF	Scale-up Facility
TA	Technical Assistance
THC	Technical Harmonization Committee
TOR	Terms of Reference
TOT	Training of Trainers
UEMOA/WAEMU	*Union Economique et Monétaire Ouest Africaine* (West African Economic and Monetary Union)
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Program
USD/US$	United States Dollar

USAID	U.S. Agency for International Development
VAT	Value Added Tax
WHO	World Health Organization
WTP	Willingness to Pay
ZECI	Zola Electricity Côte d'Ivoire

Regional Vice President:	Hafez M. H. Ghanem
Country Director:	Rachid Benmessaoud
Senior Global Practice Director:	Riccardo Puliti
Practice Manager:	Charles Joseph Cormier
Task Team Leader:	Raihan Elahi

CONTENTS

DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
Western Africa	Regional Off-Grid Electrification Project	
Project ID	Financing Instrument	Environmental Assessment Category
P160708	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
17-Apr-2019	31-Dec-2030
Bank/IFC Collaboration	Joint Level
Yes	Complementary or Interdependent project requiring active coordination

Proposed Development Objective(s)

PDO for SOP1 is to increase electricity access of households and businesses using modern stand-alone solar systems through a harmonized regional approach.

Components

Component Name	Cost (US$, millions)
1A: Enabling Environment	12.50
1B: Entrepreneurship Technical Support	7.00
1C: Entrepreneurship Financing Support	5.00
1D: Barrier Removal for Challenging Markets	33.00
2A: Line of Credit for Stand-alone Solar Businesses	209.00
2B: Contingent Grant Facility for CFIs	67.20

Organizations

Borrower:	West African Development Bank (BOAD) ECOWAS Center for Renewable Energy and Energy Efficiency (ECREEE)
Implementing Agency:	ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) West African Development Bank (BOAD)

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	333.70
Total Financing	333.70
of which IBRD/IDA	150.00
Financing Gap	0.00

DETAILS

Private Sector Investors/Shareholders

Equity	Amount	Debt	Amount
Government Contribution	190.00		
IDA (Credit/Grant)	150.00		
Other Donors	40.00		
Non-Government Contributions	143.70		
Private Sector Equity	69.00		
Trust Funds	74.70		
Total	**333.70**		**0.00**

IDA Resources (in US$, Millions)

	Credit Amount	Grant Amount	Guarantee Amount	Total Amount
Western Africa	140.00	10.00	0.00	150.00
Regional	0.00	10.00	0.00	10.00
Scale-up Facility (SUF)	140.00	0.00	0.00	140.00
Total	**140.00**	**10.00**	**0.00**	**150.00**

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Annual	3.95	13.83	17.78	33.58	51.35	63.20	13.83	0.00	0.00	0.00
Cumulative	3.95	17.78	35.55	69.13	120.48	183.68	197.50	197.50	197.50	197.50

INSTITUTIONAL DATA

Practice Area (Lead)	Contributing Practice Areas
Energy & Extractives	Finance, Competitiveness and Innovation

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	Substantial
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Moderate
7. Environment and Social	Moderate
8. Stakeholders	Moderate
9. Other	Moderate
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
ECREEE and BOAD shall ensure that the design, construction, permitting, completion, testing, commissioning and decommissioning (including but not limited appropriate disposal of solar panels), insurance, ownership, operation, maintenance, management and monitoring of sub-projects under Parts 1.C, 1.D and 2 of the Project are undertaken in compliance with: (A) the Environmental and Social Instruments; (B) the applicable requirements of the Performance Standards; and (C) the Applicable Environmental and Social Laws. Schedule 2, Section I. B (a) ECREEE; and Schedule 2, Section I. C (a) BOAD

Sections and Description
ECREEE to deliver to the Association an Annual Environmental and Social Monitoring Report in the form attached to the Project Operations Manual within forty-five (45) days after the end of each Fiscal Year. Schedule 2, Section I. B (g)

BOAD to deliver to the Association an Annual Environmental and Social Monitoring Report in the form attached to the Project Operations Manual within sixty (60) days after the end of each Fiscal Year. Schedule 2, Section I. C (g).

Sections and Description
In carrying out Part 1 of the Project, ECREEE shall seek at all times the oversight of the ECOWAS Commission through its Commissioner, Energy and Mines, including the a priori approval by the ECOWAS Commission of its Annual Work Plan and Budget before its submission to the Association. Schedule 2, Section I. A. 1 (b)

Sections and Description
ECREEE to maintain, operate and publicize the availability of, throughout Project implementation, a functional grievance redress mechanism for Component 1 of the Project, with adequate staffing and processes throughout Project implementation, in form and substance satisfactory to the Association; to register, hear and determine fairly and in good faith all complaints raised in relation to Part 1 the Project, including those related to the environmental and social matters, and take all measures necessary to implement the determinations made by such mechanism in a manner satisfactory to the Association. Schedule 2, Section I. H.

Sections and Description
BOAD shall, not later than three (3) months after the Effective Date, establish, and thereafter maintain, operate and publicize the availability of, throughout Project implementation, a functional grievance redress mechanism for Component 2 of the Project, with adequate staffing and processes throughout Project implementation, in form and substance satisfactory to the Association; to register, hear and determine fairly and in good faith all complaints raised in relation to Part 2 the Project, including those related to the environmental and social matters, and take all measures necessary to implement the determinations made by such mechanism in a manner satisfactory to the

Association. Schedule 2, Section I. G

Sections and Description
ECREEE shall employ, not later than three (3) months after the Effective Date, an environmental, health and safety specialist, under terms of reference and with qualifications and experience satisfactory to the Association. Schedule 2, Section I. A. 1(a)

Sections and Description
ECREEE to maintain, throughout Project implementation, at least one (1) environmental and health and safety specialist and at least one (1) gender specialist (with experience in social development issues) and adequate numbers of qualified supporting staff, to be responsible for the management of the environmental, social, labor and health and safety matters for Part 1 of the Project and for the coordination of the implementation of the Environmental and Social Instruments. Schedule 2, Section I. A. 1(a)

BOAD to maintain, throughout Project implementation, at least one (1) dedicated environmental, health and safety specialist and one (1) dedicated specialist in social development issues, including labor as required, and adequate numbers of qualified supporting staff, to be responsible for the management of the environmental, social, labor and health and safety matters for Part 2 of the Project and for the coordination of the implementation of the Environmental and Social Instruments. Schedule 2, Section I. A

Sections and Description
ECREEE to train its fiduciary staff on World Bank procedures not later than one month after Effective Date. Schedule 2, Section I. G (a)

Sections and Description
ECREEE to prepare and submit to the Association semi-annual internal audit reports generated by the ECOWAS' office of the auditor general not later than four (4) months after the end of the period covered by the audit report. Schedule 2, Section I. G (c)

BOAD to ensure that its internal audit department includes the Project within its work plan and provides a semi-annual internal audit report to the Association not later than forty (45) days after the end of the relevant semi-annual period. Schedule 2, Section I. F (c)

Sections and Description
BOAD to configure and set up a "multi-project" computerized accounting system, satisfactory to the Association,

not later than three (3) months after the Effective Date.to fit the needs of Part 2 of the Project and generate useful information and financial statements Schedule 2, Section I. F (a)

Sections and Description
ECREEE to prepare and submit annual audited financial statements of ECREEE to the Association not later than fifteen (15) months after the end of the period covered by the annual audited financial statements. Schedule 2, Section I. G (d)

BOAD to prepare and submit annual audited financial statements of BOAD to the Association not later than June 30 of each Fiscal Year. Schedule 2, Section I. F (d)

Sections and Description
ECREEE to recruit, not later than fourth (4) months after the Effective Date,
an independent external auditor, with qualifications and experience satisfactory to the Association and under terms of reference approved by the Association. Schedule 2, Section I. G (b)

BOAD to ensure that its external auditor, when acting as the independent auditor of the Project, shall have qualifications and experience satisfactory to the Association and shall carry out its functions under terms of reference approved by the Association. Schedule 2, Section I. F (b)

Sections and Description
Under the ECREEE Financing Agreement, the Co-financing Deadline for the effectiveness of the ECREEE CTF Grant Agreement and of the ESMAP Grant Agreement is June 30, 2020. Article IV, 4.02

Conditions

Type	Description
Effectiveness	Adoption of the updated Project Operations Manual (in form and substance satisfactory to the Association. Article V, 5.01 ECREEE; Article V, 5.01 (a) BOAD

Type	Description
Effectiveness	BOAD shall submit evidence satisfactory to the Association attesting to the existence of a pipeline of proposed Subsidiary Credits for the first twelve months after the Effective Date. Article V, 5.01 (b)

	At least one (1) Subsidiary Credit Agreement has been executed in form and substance satisfactory to the Association. Article V, 5.01 (c)

Type	Description
Disbursement	No withdrawals shall be made: (a) for Contingent Recovery Grants guaranteeing the loss against Sub-Credits approved by BOAD prior to the date of the CTF Contingent Recovery Grant Agreement; Schedule 2, Section III. B (a) CTF Grant Agreement or (b) for a Contingent Recovery Grant, unless and until BOAD, upon the non-objection of the World Bank, shall have approved the financial loss of the CFI as verified by an independent agent due to the underperformance of the technology for which a Sub-Credit has been extended. Schedule 2, Section III. B (b) CTF Grant Agreement

I. STRATEGIC CONTEXT

A. Regional Context

1. **Around 50 percent of the population in West Africa, including the Sahel region, lives on less than US$1.90 per day.**[1] West Africa is home to around 33 percent of the continent's population, with around 17 percent of the land area. Overall, the West Africa region has persistent levels of poverty, with over 70 percent of the population living below US$3.10 per day. There is however a wide socioeconomic disparity across countries. For example, over 65 percent of the people in Liberia, Guinea-Bissau, and the Central African Republic (CAR) live on less than US$1.90 per day compared to 11 percent in Mauritania. Table 1 presents select demographic, socioeconomic, poverty, and income distribution indicators for the 19 countries[2] that are to be covered by the project. All together these countries cover a land area of 8.5 million km^2, which is equivalent to Brazil. A significant number of these countries face conditions of fragility, notably the CAR, Chad, Côte d'Ivoire, The Gambia, Guinea-Bissau, Liberia, Mali, and Togo.

2. **The West Africa region faces a range of macroeconomic challenges.** The region accounted for 28 percent of Africa's gross domestic product (GDP) in 2015—at US$1,606 billion based on a purchasing power parity (PPP) valuation. Economic growth in this region is driven by the large economies, such as Nigeria, Côte d'Ivoire, and Ghana.[3] Real GDP growth in West Africa has been projected to increase modestly from 3.6 percent in 2018 to 3.8 percent in 2019, driven by increased economic output from the region's larger economies—Nigeria, Ghana, Côte d'Ivoire, and Senegal—as well as impressive growth from several smaller countries—Benin, Burkina Faso, Sierra Leone, and Togo.[4] Countries across West Africa and the Sahel have struggled to diversify their economies to shift away from less productive (agricultural) to more productive sectors (services). The transition has been slow due to overdependence of many states on the agricultural sector as a source of livelihood, food security, and export revenue. Job creation in the formal economy of most countries remains relatively limited, as a majority of people are employed by the informal agricultural economy and lack the education and skills required for the services sector.

3. **Intra-regional trade in West Africa is mainly informal and well below its potential.** Enhancing intra-regional trade is important for establishing opportunities for economies of scale and to allow goods and resources to flow from areas of abundance to areas of deficit. Tariffs as well as import and export restrictions through bans or quotas are critical barriers to regional trade. Many West African countries regularly impose such restrictions either to protect local producers and industries (import restrictions) or to account for short-term food security concerns (export restrictions). ECOWAS adopted a common external tariff (CET) in January 2015 to attain near-complete integration by 2020. The CET is aimed at minimizing lost revenues that may arise from competition in external tariff rates between the member states.[5] The region has yet to fully benefit from this CET policy.

[1] The World Bank defines extreme poverty as living on less than US$1.25 per day and moderate poverty as less than US$2 a day.
[2] 15 members of the Economic Community of West African States (ECOWAS) and four neighboring countries: Cameroon, the Central African Republic, Chad, and Mauritania
[3] Africa's Development Dynamics 2018: Growth, Jobs and Inequalities - African Union Commission, Organization for Economic Co-operation and Development (OECD) Development Centre.
[4] African Economic Outlook 2016. African Development Bank (AfDB), OECD, United Nations Development Program (UNDP).
[5] African Economic Outlook 2017. AfDB. OECD. UNDP.

Table 1. Basic Demographic, Socioeconomic, Poverty, and Income Distribution Indicators of Project Countries, 2016

Country	Population (thousands)	Land Area (thousands of km^2)	Population Density (population per km^2)	GDP Based on PPP Valuation (US$, millions)	GDP per Capita (PPP Valuation, US$)	Population Below National Poverty Line[a] (%)			Population Below International Poverty Line (%)		Gini Coefficient[b] Index
						Rural	Urban	National	Below US$1.90	Below US$3.10	
Benin	11,167	115	97	24,312	2,177	39.7	31.4	36.2	53.1	75.6	43.4
Burkina Faso	18,634	274	68	32,985	1,770	47.5	13.7	40.1	43.7	74.7	35.3
Cabo Verde	527	4	131	3,583	6,799	44.3	13.2	26.6	8.1	25.1	47.2
Cameroon	23,924	475	50	77,237	3,228	56.8	8.9	37.5	24.0	43.5	46.5
Central African Republic	4,998	623	8	3,206	641	69.4	49.6	62.0	66.3	82.3	56.2
Chad	14,497	1,284	11	30,587	2,110	52.5	20.9	46.7	38.4	64.8	43.3
Côte d'Ivoire	23,254	322	72	87,120	3,746	56.8	35.9	46.3	29.0	55.1	43.2
Gambia, The	2,055	11	182	3,387	1,648	73.9	32.7	48.4	45.3	68.0	47.3
Ghana	28,033	239	118	120,786	4,309	37.9	10.6	24.2	25.2	49.0	42.8
Guinea	12,947	246	53	16,084	1,242	64.7	35.4	55.2	35.3	68.7	33.7
Guinea-Bissau	1,888	36	52	2,851	1,510	75.6	51.0	69.3	67.1	83.6	50.7
Liberia	4,615	111	41	3,881	841	67.7	55.1	63.8	68.6	89.6	36.5
Mali	18,135	1,240	15	38,085	2,100	50.6	18.9	43.6	49.3	77.7	33.0
Mauritania	4,166	1,031	4	16,710	4,010	59.4	20.8	42.0	5.9	22.1	32.4
Niger	20,715	1,267	16	20,266	978	55.2	18.6	48.9	45.7	75.5	34.0
Nigeria	186,988	924	202	1,088,938	5,824	52.8	34.1	46.0	53.5	76.5	43.0
Senegal	15,589	197	79	39,717	2,548	57.1	33.1	46.7	38.0	66.3	40.3
Sierra Leone	6,592	72	91	10,636	1,613	66.1	31.2	52.9	52.3	80.0	34.0
Togo	7,497	57	132	11,609	1,548	68.7	35.9	55.1	54.2	74.5	46.0

Sources: United Nations, Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2015 Revision. AfDB Statistics Department, various domestic authorities, Online Database, Country Demographic and Health Surveys, AfDB, and World Bank estimates*.

Notes: a. The national poverty line is defined as two-thirds of the average consumption.

b. The Gini coefficient is based on income distribution.

4. **Regional cooperation is critical to end extreme poverty and boost shared prosperity in the West Africa and Sahel region.** The region is diverse—economically, culturally, and ecologically—presenting both opportunities and challenges for regional cooperation. Countries in the region have moved forward politically and economically toward greater cooperation since 1945, when the creation of the CFA franc brought the francophone countries of this region into a single currency union. In 1975, 15 countries came together through the treaty of Lagos to form ECOWAS,[6] which more than 40 years later is still promoting economic cooperation and regional integration as a tool for accelerated development as per the ECOWAS Vision 2020.[7] Using the CFA franc as a common currency, the West African Economic and Monetary Union (WAEMU/UEMOA[8]) was established in 1994 among West African coastal and Sahel states. In December 2014, five Sahelian countries established the G5 Sahel to coordinate policies and strategies for development and security. These five Sahelian countries—Burkina Faso, Mali, Mauritania, Niger, and Chad—share a common history, geography, and culture and face similar developmental challenges arising from their landlocked geography, low population density, and little state presence in rural areas. One of the guiding principles of the G5 Sahel is to coordinate actions to address high levels of poverty, anemic economic growth, and socioeconomic indicators that are below those of neighboring countries.

B. Sectoral and Institutional Context

5. **Sub-Saharan Africa suffers from an overwhelming deficit in access to reliable electricity.** About 600 million people in Sub-Saharan Africa do not have access to electricity, resulting in an overall electrification rate of about 43 percent. The access deficit is even further pronounced in countries such as the CAR, Chad, Guinea-Bissau, Liberia, Niger, and Sierra Leone. In addition, household access to electricity varies considerably between urban and rural areas. Of the 406 million people residing in the targeted 19 countries, it is estimated that 208 million inhabitants have no access to electricity, about 70 percent of whom live in rural areas. The rural electrification rate averages around 18 percent, while eight countries—Burkina Faso, Chad, the Central African Republic, Guinea, Guinea-Bissau, Liberia, Mauritania, and Niger—have less than 5 percent of their rural population electrified. Of the 198 million people with access to electricity services, about 67 percent reside in urban areas, but many suffer from unreliable electricity supply. The urban electrification rate in the region averages around 67 percent, with countries such as Ghana and Cameroon at the higher end with about 90 percent urban electrification and countries such as the CAR and Sierra Leone at the lower end with less than 15 percent. Also, about 33 percent of people living in urban areas are well within the reach of a grid network, but at present they do not have access to electricity. Figure 1 illustrates the electricity access rates in the project countries.

6. **West Africa has been experiencing the most rapid energy demand growth of the Sub-Saharan sub-regions because of the rapidly growing population.**[9] Current national and global energy policies for the electrification of Africa are not sufficient to allow for alleviation of electricity poverty by 2040. With the current electrification rate, more than two decades will be required to end energy poverty in Sub-

[6] Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Sierra Leone, Senegal, and Togo.
[7] The ECOWAS Vision 2020 is a resolution adopted by ECOWAS in June 2007 to significantly raise the standard of living of the people through conscious and inclusive programs.
[8] Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo.
[9] IEA (International Energy Agency) and World Bank. 2015. *Sustainable Energy for All 2015 - Progress Toward Sustainable Energy*.

Saharan Africa.[10] At the same time, electricity in the region remains among the costliest in the world, at US$0.25 per kWh on average, more than twice the global average, due to high reliance on fossil fuels for electricity production.[11]

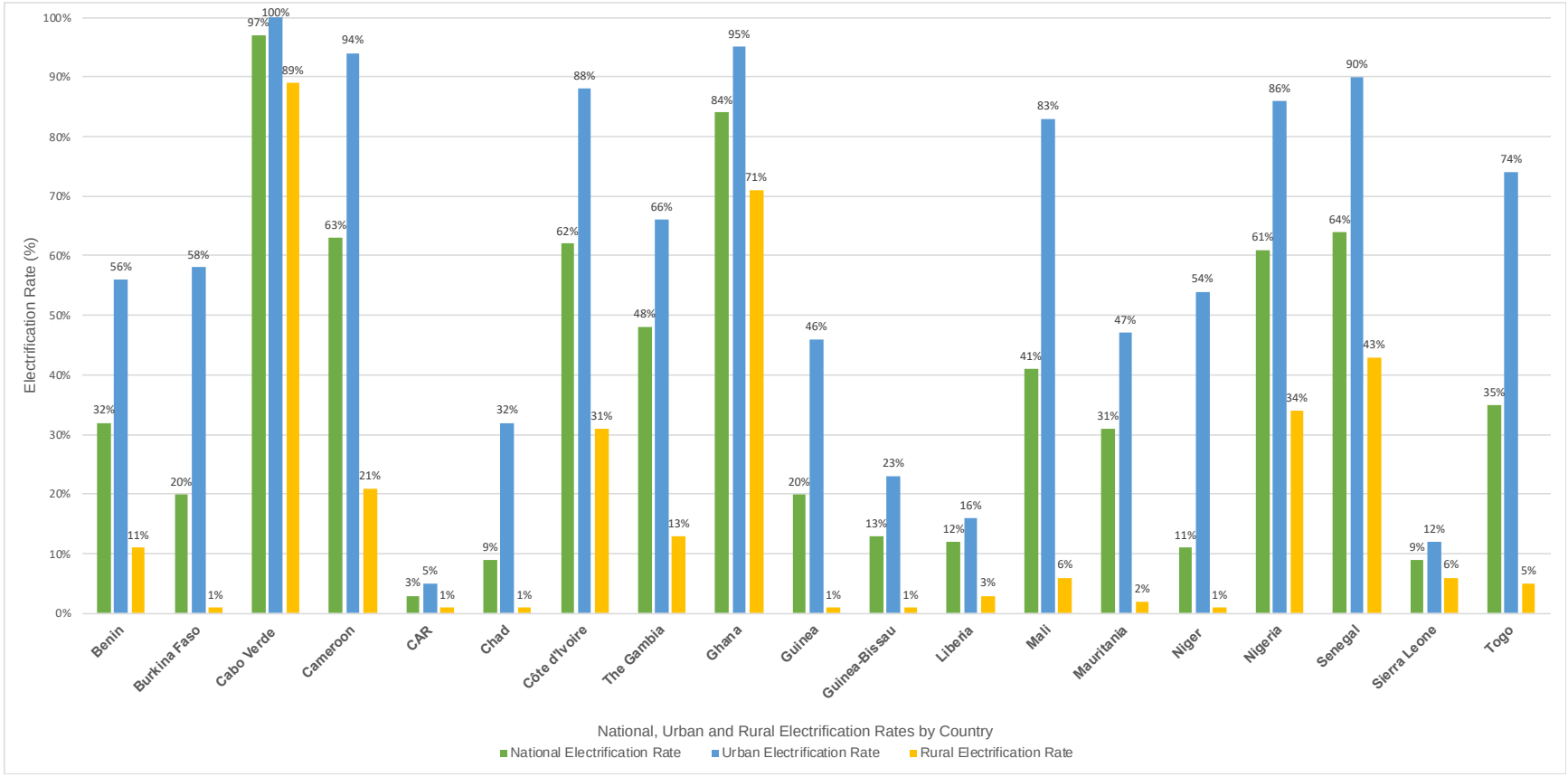
7. **The electrification rate of public institutions such as schools and health clinics is very low, and efforts made to electrify them have been insufficient.** Access to essential medicines and technologies, many of which rely on electricity, is one of the four key factors to ensuring universal health coverage by the World Health Organization (WHO). A study of 11 major Sub-Saharan African countries found that roughly one in four health facilities had no access to electricity, and only about one-third of hospitals had reliable electricity access.[12] About 350 million people in Sub-Saharan Africa are serviced by hospitals that do not have reliable power. It is well known that multiple education outcomes improve from electrification of schools, such as extended studying hours, facilitation of information and communication technology in the classroom, enhanced staff retention and teacher training, and better school performance based on attendance, completion rates, and test scores. About three out of every four children in Sub-Saharan Africa go to schools that lack electricity and thus electric lights, fans, computers, and printers.

8. **The lack of electricity access contributes to increased greenhouse gas (GHG) emissions due to increased reliance on carbon-intensive fuels such as firewood, kerosene, and diesel.** A typical rural household, whose basic energy needs could be met by a 25 W stand-alone solar system, emits about 0.37 tCO_2 per year through use of conventional modes of energy. Furthermore, kerosene and diesel are expensive alternatives for the poor to meet their basic electricity needs.

9. **Countries in the West Africa and the Sahel regions are trying to improve access to electricity through various approaches**. These include a combination of extending grid connections, off-grid solutions, and various business models including concessions, franchising, rural electrification agencies (REAs), rural electrification funds, fee-for-service approaches, leasing, and so on. Countries such as Senegal and Mali adopted a private concession model to scale up mini-grids in rural areas, with mixed results. On the other hand, countries such as Nigeria and Ghana (Ghana Electrification Scheme (2006–2020) have achieved good results for rural electrification based on a government investment approach. Most countries have endorsed Sustainable Development Goal (SDG) 7 and seek to provide universal access to affordable, reliable, and sustainable electricity by 2030. Figure 2 illustrates the planned electricity access trajectory of the ECOWAS member countries.

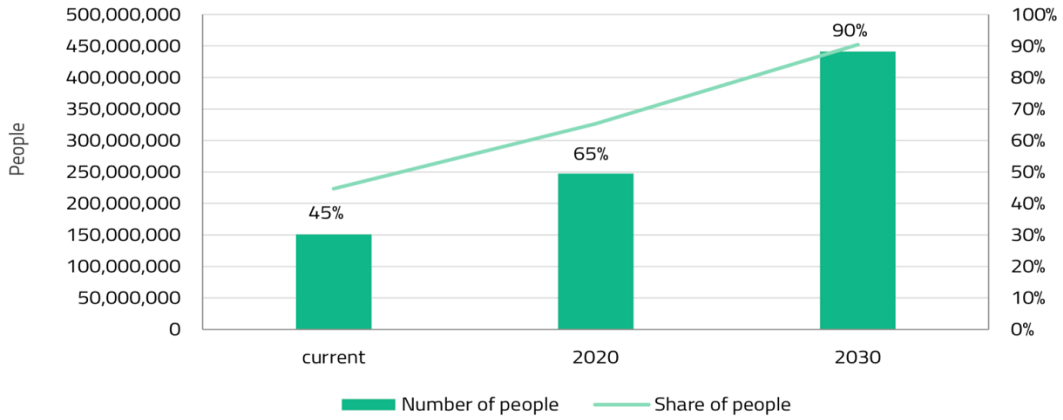
[10] Ouedraogo, Nadia S. 2017. "Modeling Sustainable Long-term Electricity Supply-Demand in Africa." *Applied Energy* 190 (C): 1047–1067.
[11] https://www.worldbank.org/en/news/feature/2018/04/20/regional-power-trade-west-africa-offers-promise-affordable-reliable-electricity.
[12] *https://www.who.int/sustainable-development/health-sector/health-risks/energy-access/en/*

Figure 1. National, Urban, and Rural Electrification Rates by Country (2016)



Source: International Energy Agency: Energy Access Outlook 2017.
Note: CAR = Central African Republic.

Figure 2. ECOWAS Electricity Access Trajectory through 2030



Source: ECOWAS Center for Renewable Energy (ECREEE), From Vision to Coordinated Action, 2017.

10. **Global achievement in the stand-alone solar sector.**[13] As of 2017, the global stand-alone solar sector has provided improved electricity access (Tier 1 to Tier 3[14]) to an estimated 73 million households, or over 360 million people, thus transforming lives that were previously reliant on kerosene and solid fuels for most of their lighting and basic electricity needs. The sector's growth since 2010 has been impressive. Over 130 million stand-alone solar devices had been sold since 2010, with total sales value exceeding US$3.9 billion. The sector has introduced innovative products catering to lighting and productive uses, such as communication, cooling, entertainment, refrigeration, and so on.

11. **Stand-alone solar systems have a large market potential in West Africa and the Sahel.** Currently, less than 3 percent of the region is served by stand-alone solar systems, equivalent to approximately 5 million individuals.[15] The market assessment[16] carried out in 2018 identified that about 31 million households could be electrified using stand-alone solar systems in West Africa and the Sahel. The potential value of the household solar market is estimated to be about US$6.6 billion. The assessment further identified about 800,000 educational and healthcare facilities that

Box 1: Stand-alone Solar Systems:

Solar lanterns: Enabling Tier 1 electricity access;

Solar Home Systems (SHS): several lights, efficient appliances: Tier 1–Tier 3 electricity access;

Component-based solar systems: PV module, battery, lights, inverter, wiring. These systems are modular and meet larger loads to electrify schools, health centers and productive uses, such as solar water pumps for drinking water, irrigation, and so on.

Pay as you go (PAYGO) business model

Payment scheme tailored to consumer affordability

[13] Off-Grid Solar Market Trends Report 2018, January 2018.
[14] Tier 1 refers to task lighting and phone charging with daily consumption of > 12 Wh, Tier 2 refers to general lighting and phone charging and television and fan with daily consumption of > 200 Wh; and Tier 3 refers to Tier 2 and any medium-power appliances, such as refrigerator. Daily consumption is > 1,000 Wh.
[15] Numbers do not include Cabo Verde, The Gambia, Ghana, Guinea, and Togo as specific data was not available.
[16] GreenMax Market Assessment 2018, ECREEE

could be electrified with stand-alone solar systems with an investment estimate of US$1.5 billion. A detailed discussion of the stand-alone solar market characteristics is provided in Annex 12. The share of the rural population served by decentralized renewable energy sources (mini-grids and stand-alone systems) is expected to reach 22 percent by 2020 and 25 percent by 2030.[17]

12. **Uptake of stand-alone solar systems in West Africa and the Sahel faces several barriers from the supply side.** These barriers stem from the perception that the West African market is fragmented—many countries with small, dispersed population; lack of appropriate policy and regulatory environments; absence of supporting ecosystems for the solar industry; poor access to finance; and lack of clear information on the demand and customer segments. Moreover, the region has yet to significantly benefit from the innovative solar PV technologies and disruptive business models, such as PAYGO, compared to East Africa. Lessons from East African countries and South Asia in this regard could help West Africa leapfrog its development phase (see paragraphs 59–63).

13. **The private sector can play an important role in tackling the power crisis in Africa,[18] especially through renewable energy investments.** According to the market study, solar manufacturers and importers however consider that investing in the West African countries is a riskier proposition given its fragmentation. A detailed analysis of stand-alone solar systems market growth barriers is provided in Table 2.1 in Annex 2.

14. **The World Bank Group has supported several regional projects to develop the energy sector in West Africa as well as projects to increase access to electricity through stand-alone solar systems (see Box 2).** Regional energy projects in West Africa have been designed to expand grid electrification, increase grid-connected access, or build utility-scale solar infrastructure through private investment and to show the value of pursuing a regional approach to increasing electricity access. Promoting electrification using stand-alone solar systems requires a different regional approach, which relies on establishing a business-friendly ecosystem to attract private sector investments to provide electricity to people without grid electricity, in a decentralized manner. Projects[19] financed by the World Bank in the Africa region with stand-alone solar components have adopted a market-based approach, implemented by the private sector, to provide access to electricity to the people.

C. Relevance to Higher Level Objectives

15. **The proposed project maximizes finance for development (MFD) by crowding in private investment to deploy a set of innovative technologies and disruptive business models.** Historically, low electricity demand of rural economies makes it difficult to attract private investments to extend the

[17] From Vision to Coordinated Action, Consolidation of SEforALL Action Agendas, National Renewable Energy Action Plans, and National Energy Efficiency Action Plans of the ECOWAS region countries 2017.
[18] Muzenda, Dambudzo. 2009. "Increasing Private Investment in African Energy Infrastructure." Background paper presented at NEPAD-OECD Africa Investment Initiative. November 11–12, 2009. https://www.oecd.org/investment/investmentfordevelopment/43966848.pdf.
[19] Ethiopia: Electricity Network Reinforcement and Expansion Project (P119893), Niger: Solar Electricity Access Project (P160170), Rwanda: Renewable Energy Fund Project (P160691), Zambia: Electricity Service Access Project (P162760), and Kenya: Off-Grid Solar Access Project (P160009).

electricity grid network in remote and rural areas, and therefore, the expansion of electricity services in rural areas is typically subsidized. With a few exceptions, electricity distribution in peri-urban and rural areas in Sub-Saharan Africa haves also been managed by public utilities, as cost-reflective tariffs are not affordable to most households. However, the private sector has been taking the lead to integrate the innovation of solar PV technologies, mobile money, and new business models such as PAYGO, and it is disrupting the conventional approach to electrification. Such business models increasingly take into account the lower levels of electricity consumption of the rural population and are anchored around productive uses of electricity. Consistent with the MFD approach, this project will facilitate the creation of favorable ecosystems and develop regional markets with adequate economies of scale to attract private investments and to sustainably meet electricity demands of the off-grid economies.

Box 2: World Bank Group Support to Increase Electricity Access

Solar Development in Sub-Saharan Africa - Phase 1 (Sahel) (P162580) is a Bank funded regional project supporting a harmonized and systematic regional approach to scale up cost-competitive solar generation by leveraging private capital. A harmonized regional approach is key to tackling the main challenges identified for the scale-up of solar energy in the West Africa region. A regional systematic approach to solar deployment is expected to lead to lower cost of electricity, improved variable renewable energy integration capacities, and increased solar contribution to the energy mix. The development objective of this project is to promote the deployment of competitively procured Regional Solar Parks in West Africa and enable the dispatch of intermittent solar energy.

The ECOWAS Regional Electricity Access Project (P164044) is a Bank funded regional project to support on-grid electrification in the ECOWAS region. The project objective is to increase access to reliable energy services in targeted areas through the densification of the grid around substations financed for regional power trade. This project follows a series of projects (SOP) approach and in the first phase includes: Guinea Bissau, Mali, and The Gambia. The project will support a regional coordination mechanism and a joint procurement process to leverage economies of scale.

IFC's Small Loan Guarantee Program (SLGP) 41038 uses IDA Private Sector Window (PSW) and partners with commercial financial institutions (CFIs) to increase access to finance and commercial viability of Small and Medium Enterprises (SMEs). SLGP uses unfunded Risk-sharing Facilities (RSFs), competitive pricing for CFIs and simplified eligibility criteria and structure for streamlined investment processing. The program extends advisory and operational support for CFIs, implemented by banks and non-bank financial institutions. SLGP benefits SMEs with a loan size between US$10,000 and US$1,000,000, and emphasis is given to expand reach to underserved SMEs such as women, climate, and smaller SMEs**.**

16. **The proposed project will contribute to the human capital development in West Africa and the Sahel region.** The project will create new employment in the electricity service delivery business using stand-alone solar technologies. The project, through its various technical interventions, will develop local entrepreneurs' skills and knowledge to increase their value proposition and create new business opportunities. The project will implement a pilot to test business models to electrify schools and health clinics critical for human capital development in West Africa and the Sahel region.

17. **The proposed project contributes to SDG 7 of energy access and Sustainable Energy for All (SEforALL) targets.** The SEforALL Action Agenda is supported in the West Africa and Sahel region through ECOWAS. To support West African countries to achieve their electrification targets by 2030, ECOWAS adopted (a) the White Paper on Access to Modern Energy Services in 2006 and (b) the ECOWAS Renewable

Energy Policy (EREP) in 2012. The EREP explores the vast renewable energy generation potential that exists in the region through the support of the private sector. The project is also aligned with the project countries' electricity access objectives as well as with the World Bank's Regional Integration strategy[20].

18. **The proposed project aligns with the Africa Climate Business Plan (ACBP) target to electrify 5 million off-grid consumers by 2023 and the World Bank's Energy Sector Directions Paper (ESDP), which focus on helping client countries secure affordable, reliable, and sustainable energy supply.** The project also follows the principles set out in the new strategic directions for the World Bank's Africa Energy Practice in off-grid solar (OGS) energy, which includes the following six ways in which the World Bank can catalyze the stand-alone solar systems market in Sub-Saharan Africa: (a) develop the policy and regulatory environment for stand-alone solar systems; (b) support Governments to mainstream stand-alone solar systems planning; (c) facilitate access to working capital; (d) issue guarantees to reduce risk for commercial lenders; (e) use performance-based grants to push the market; and (f) support receptive markets through quality assurance (QA) and consumer awareness activities.

19. **The project is part of the Global Solar Risk Mitigation Initiative (SRMI)**, an integrated approach to tackle policy, technical, and financial issues associated with scaling up solar energy deployment, especially in some of the world's poorest countries. The SRMI was developed in support of the objective of the *International Solar Alliance (ISA)* mobilizing finance for solar investments and is led by the World Bank and French Development Agency (*Agence Française de Développement, AFD)*. The project provides technical assistance (TA) and investment support for an enabling environment for solar businesses in West Africa through harmonization of policies, standardization of products, and aggregation of demand and offers financial risk mitigation instruments utilizing climate finance from the Clean Technology Fund (CTF).

20. **The project supports resilience building and long-term behavioral change.** This project will allow countries to increase electricity access by promoting standalone-alone solar technology. This will reduce carbon emissions significantly as people converting to solar-based renewable energy technologies would stop burning fossil fuel for their electricity needs.

21. **The project is consistent with the objectives of Sahel Alliance,** which is an international cooperation platform for the Sahel region, launched by France, Germany, and the European Union, along with the World Bank, AfDB, and UNDP in July 2017. The Sahel Alliance seeks to improve development outcomes using common diagnostics and effective aid coordination, to stabilize the security situation and eradicate poverty, as well as increase employment in rural areas. The donors to the Sahel Alliance have allocated about €6 billion of investments to the G5 Sahel countries (Burkina Faso, Chad, Mali, Mauritania, and Niger) for the implementation of over 500 projects with a capacity to transform the region by 2023. In the energy sector, the Sahel Alliance seeks to double access to electricity between 2018 and 2023.

22. **The project has a potentially transformational impact in West Africa and the Sahel region.** Creating a market for solar products could be a game changer for the West Africa region. The project will benefit from the IDA18 Scale-up Facility (SUF) to establish a regional line of credit that can be accessed by

[20] Africa – Regional Integration and Cooperation Assistance Strategy for the period FY18-FY23. Report No 121912-AFR

eligible Commercial Financial Institution (CFIs)[21] to provide finance to private companies promoting electrification services through standalone-alone solar system. The CTF grant and contingent recovery grant will be used to build technical and financial capacity of entrepreneurs to enter the solar space and to comfort the CFIs to lend to solar entrepreneurs by mitigating the technology risk of new and innovative solar technology and business models being promoted by these entrepreneurs. This is critical as CFIs have so far kept a distance from financing these disruptive technologies. Grants from the Energy Sector Management Assistance Program (ESMAP) supported by the Government of the Netherlands Directorate-General for International Cooperation (DGIS) will be used to support businesses operating in challenging markets, such as Sahel countries. Without this support, solar companies would remain only in countries that have a vibrant economy. The project, through a regional approach and its designed interventions, will attract credible private sector companies to support all countries in West Africa and the Sahel.

23. **The project is well aligned with IDA18 SUF soft filters.** The project invests in regional integration through supporting cross-boundary trade and creating a regional market for standalone-alone solar products in West Africa and the Sahel Region. The project will build capacity of local entrepreneurs and attract them in electricity service businesses using modern standalone-alone solar technology—this will create new jobs, employment opportunities, economic transformation, and growth. The project will also enable people with affordability challenges to benefit, by providing electricity services commensurate with their needs and promoting sustainable business models with mobile money and PAYGO approaches. Female-led households, female-led businesses, and female entrepreneurs will be encouraged to participate and benefit from the project. The project will contribute to climate change mitigation and adaptation by providing renewable energy options to people to switch from conventional energy sources such as diesel and kerosene. The project design includes partnering with International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA) to benefit from the IDA PSW.

24. **The project will be implemented in collaboration with several development partners along with IFC and MIGA.** The Government of the Netherlands (DGIS), a key ESMAP donor, has indicated interest to support the project. The DGIS is keen to support solar businesses operating in challenging markets, such as those in Sahel countries. This dedicated support is critical because left to commercial market forces only, the high risk of operating in challenging markets will reduce the development in those countries compared to their neighbors. CTF financing supports the use of innovative solar technologies and business models. Contingent recovery grant financing from the CTF would provide comfort to the CFIs that support entrepreneurs promoting such innovative solar technologies and business models. Support from CTF can also attract credible entrepreneurs from other industries to enter the solar space. The project design further benefits from the World Bank Group's flagship program Lighting' Africa' working jointly with IFC in promoting standalone-alone solar electrification in Sub-Saharan Africa. The IDA PSW managed by IFC and MIGA will be used to benefit PSW-eligible project countries.

D. Rationale for a Regional SOP

25. **To establish a regional market of stand-alone solar products in the West Africa and Sahel region, a regional SOP approach will be followed.** The overall development objective of the SOP is to increase

[21] CFIs include (a) commercial banks, (b) leasing companies, (c) microfinance institutions (MFIs), and (d) debt funds.

electricity access of households, businesses, and public institutions using modern stand-alone solar technology through a harmonized regional approach. Lessons from one project will help identify interventions of subsequent projects and allow a flexible program design with course correction to achieve the ultimate objective. A detailed description of the SOP approach is provided in Annex 2, however, at this stage the actual number of subsequent projects under the SOP has not been defined.

26. **There is a strong regional rationale for the project.** The proposed project will promote disruptive technologies through innovative business models by developing a regional market in West Africa and the Sahel region, which have been so far too fragmented. The 19 project countries represent a geographic size equivalent to Brazil, but with almost double the population size. Hence, a regional approach can attract larger market players to benefit all the countries of this region. This initiative will be beneficial for the larger economies of this region, as it will develop markets beyond their country territories. The West Africa and Sahel regional markets currently represent about 12 percent of worldwide sales with over 2 million systems sold in 2017 and over 500 local companies dealing with stand-alone solar systems—at various stages of growth in 19 project countries.[22] A regional program can leverage the region's economies of scale and harmonize policies and business procedures to scale impact. A regional program could help all project countries adopt a regional standard on the QA framework and related import and tax regulations to establish a regional market. This would increase trade and create new jobs. A regional access to finance facility could support private companies operating in multiple countries.

27. **The SOP1 will be limited to regional organizations to support interventions that are regional in nature.** Regional organizations with the ability to motivate and influence their member countries have been considered as most suitable to implement this project. Regional organizations will be able to encourage their member countries to learn from each other and adopt suitable business-friendly policies to help create the market. Regional development banks are suitable as regional financial intermediaries (FIs) as they can support CFIs across multiple countries and allow private solar companies to benefit from a larger contiguous regional market supported by cross-border trade policies and CET policies promoted by the project. The regional implementing agencies will be ECREEE and the West African Development Bank (BOAD). ECREEE will focus on regional capacity-building interventions benefiting all 19 countries, while BOAD will establish a line of credit through which eligible CFIs could access financing to support private solar companies operating in the region.

28. **Lessons from the SOP1 implementation will strengthen the design of the second and subsequent projects.** As BOAD will focus mostly on its eight-member countries, efforts will be made to identify suitable FIs in subsequent projects to extend access to finance support to the remaining 11 project countries. The subsequent projects will support the electrification of public institutions based on lessons from the pilot initiative of the SOP1. This could require support from MIGA to provide political risk insurance (PRI) to private solar companies if electrification of public institutions is structured through concessions (see Annex 9 for more details). The subsequent projects may further benefit from national IDA contributions to support specific activities that are more national in nature, which is consistent with the findings and recommendations to develop and support a regional market. Funding from other development partners would be sought to meet the electrification needs of the 19 countries.

[22] Analysis by ECREEE.

29. **The SOP1 will use specific indicators to observe the evolution of the market and identify progress made by each country.** This will enable the design of regional and country-specific interventions to be supported under subsequent projects and the identification of where dedicated support would be required, for instance, to adopt and implement the regional policies and standards developed under SOP1.[23] The design and composition of subsequent SOPs will also be informed by the readiness to allocate national IDA for solar market development and to increase electricity access.

II. PROJECT DESCRIPTION

30. The SOP1 will focus on supporting and developing viable business ecosystems in the project countries through a regional-level initiative. To develop a regional market, the project will (a) identify policy barriers affecting the growth of the stand-alone solar market, create awareness among the policy makers on the benefit of removing such policy barriers, and provide targeted support to remove barriers in challenging markets; (b) help the countries adopt the CET to facilitate cross-border trade of stand-alone solar products; (c) develop a regional quality assurance framework to facilitate supply of eligible stand-alone solar products across the 19 project countries; (d) build human capital by providing training to develop adequate and required skills through a structured entrepreneurship development facility, which will ensure reliable service to the beneficiaries and create employment opportunities at the local level; (e) provide access to finance to solar companies and beneficiaries in this new line of business; and (f) reduce risk of promoting new technologies and business models.

31. This project will partner with IFC to benefit from the IDA PSW to extend a risk mitigation facility to eligible CFIs. Pilot initiatives to electrify public institutions such as schools and health clinics using stand-alone solar technologies will be undertaken in Niger and Nigeria to identify suitable business models, which will be replicated through subsequent projects under the SOP.

A. Project Development Objective

PDO Statement

32. PDO for SOP1 is to increase electricity access of households and businesses using modern stand-alone solar systems through a harmonized regional approach.

33. The PDO of the SOP is to increase electricity access of households, businesses and public institutions using modern stand-alone solar systems through a harmonized regional approach. The proposed design and scope of the subsequent SOP projects is detailed in Annex 2 table 2.3.

[23] The subsequent projects could be similar to Niger Solar Electricity Access Project (NESAP) P160170.

PDO Level Indicators

Table 2. PDO-level Results Indicators

Indicator	Baseline	SOP1 Target
People provided with new or improved electricity service (of which female)	0	1,755,000 (877,500)
Households provided with access to electricity through stand-alone solar systems (of which female-headed households)	0	585,000 (58,500)
SMEs provided with access to electricity through stand-alone solar systems (of which women-led SMEs)	0	65,000 (6,500)
GHG CO_2 emission reduction (Metric tons)	0	385,000
Commercial financial institutions engaged in financing of solar companies	0	57
Regional Standard of Quality Assurance (QA) framework for stand-alone solar systems prepared and adopted by ECOWAS	No	Yes
Market Observatory Indicator: Country-specific information on volume, price, and type of products	No	Yes
Annual publication of beneficiary feedback received from citizens reached through the consumer education and citizen engagement program	No	Yes

B. Project Components

Component 1: Develop a Regional Market (US$57.5 million equivalent, of which IDA Regional Grant US$10.0 million, CTF Grant US$7.5 million, and a proposed DGIS[24] Grant US$40.0 million)

Subcomponent 1A: Enabling Environment (US$12.5 million, of which IDA Regional Grant US$7.0 million equivalent, CTF Grant US$1.5 million, and a proposed DGIS Grant US$4.0 million)

34. ECREEE will implement this subcomponent in partnership with national governments of the 19 project countries. ECREEE will follow a consultative process with its focal persons in the Ministry of Energy of all project countries and other stakeholders to implement this subcomponent. ECREEE will undertake project launch workshops in all 19 countries soon after the project is effective to ensure participation of national, regional, and international stakeholders in each project country.

35. This subcomponent aims to transfer and share knowledge of technological innovations and new business models across the region, in a harmonized manner, which will serve to improve the enabling environment for stand-alone SHS in the region. Success stories of one country will be used to motivate others to adopt new policies and change mindsets. This subcomponent will finance (a) policy and analytical work to influence energy access policy in the region, especially in addressing trade barriers, promoting quality and standards for off-grid products, promoting mobile money, and addressing other barriers; (b) the establishment of a network of support centers to promote entrepreneurship development in the off-grid space; (c) training and knowledge exchange programs; (d) promotional campaigns and consumer awareness programs to promote solar standalone-alone systems; (e) capacity building of banks and financial institutions; (f) development of new business models for promoting

[24] Directorate-General of International Cooperation (DGIS), Ministry of Foreign Affairs, Government of Netherlands.

standalone-alone solar systems for electrification of public institutions (schools, health clinics, and so on) and for productive use applications (such as water pumping, irrigation); and (g) the establishment and operation of a Project Implementation Unit (PIU) at ECREEE. ECREEE will implement these activities in collaboration with the participating countries and other agencies/consultants. These will be further detailed in the Project Operations Manual (POM). Annex 2 provides information on country eligibility for different funding sources.

Subcomponent 1B: Entrepreneurship Technical Support (US$7.0 million, of which IDA Regional Grant US$3.0 million, CTF Grant US$1.0 million, and a proposed DGIS Grant US$3.0 million)

36. **This subcomponent will provide differentiated support to entrepreneurial businesses across the enterprise development life cycle (start-up, early stage, growth, and maturity).** The technical support will seek to enhance the capacity, skills, and expertise of eligible businesses. This subcomponent will also remove information and knowledge barriers to attract new players to the stand-alone solar system market. The entrepreneurship technical support facility will be coordinated with the ECOWAS certification scheme for PV installers/technicians and will be framed within the ECREEE private sector support facility successfully operated since 2015. This subcomponent will finance (a) entrepreneurship and business training to start-ups and early-stage ('Stage 1'[25] and 'Stage 2') stand-alone solar businesses in the participating countries; (b) customized business acceleration support in the form of TA to early-stage ('Stage 2') businesses that have advanced beyond the start-up stage but are still developing and iterating their business model, adapting technology, and finalizing product marketing strategies; (c) facilitation of entry to the solar industry for successful local businesses that are operating in non-solar industries; and (d) targeted training for women entrepreneurs in all categories mentioned earlier. All the TA and advisory work will be implemented by ECREEE in partnership with selected organizations, which will be selected based on TA themes and the organizations capacity to provide that support.

Subcomponent 1C: Entrepreneurship Financial Support (US$5.0 million, of which CTF Grant US$2.0 million and a proposed DGIS Grant US$3.0 million)

37. **Matching grants** will be offered to startup-up ('Stage 1') businesses to support entry of new solar businesses. This funding would be up to US$25,000 to assist these entrepreneurs develop their ideas into viable businesses or developing and test marketing their products. Each business receiving a grant would be required to provide a matching cash contribution to demonstrate commitment to the proposal. Grants will be provided on a milestone basis to eligible, competitively selected businesses and will be used on specific eligible activities defined during project implementation. The solar entrepreneurs will follow commercial practices as approved in the World Bank Procurement Regulations for IPF Borrowers.

38. Stage 2 businesses that are operational in the region and interested in expanding their activities might receive matching grant support as well, provided their activities target eligible countries for CTF funds or Sahel countries.

[25] Solar companies are divided into three stages based on the level of expertise, capacity, and size. Detail added in annex 2.

39. ECREEE will implement this subcomponent through a qualified Fund Manager. The implementation guidelines for entrepreneurship financial support is provided in Table 2.6. Details on the application process and the evaluation to decision for the matching grants will be included in the POM.

Subcomponent 1D: Barrier Removal for Challenging Markets (US$33.0 million, of which CTF Grant US$3.0 million and a proposed DGIS Grant US$30.0 million)

40. **Targeted financial incentives** will be provided to entrepreneurs and businesses operating in challenging markets, such as countries in the Sahel region. Left alone to commercial incentives, solar businesses will tend to operate solely in vibrant economies and ignore challenging markets. To ensure equitable geographical reach, solar businesses operating in challenging markets will receive grant funding support under this subcomponent. Upon submission of a satisfactory 'market entry' business plan, companies will receive market entry grant support to facilitate their move into challenging markets. At the operational stage, following a successful market entry, the solar businesses will be eligible for performance-based grants, which will help in keeping solar products affordable to the end consumers. These performance-based grants—which finance the outcomes of solar businesses such as households electrified, tier level of electricity access provided, etc., would encourage blending with commercial financing that reduces the business' cost of capital. The level of grant financing to be allocated to businesses will be determined at the implementation phase and based on specific barriers each business would face in operating a solar business in an eligible country. The project monitoring and evaluation (M&E) framework will be used to identify countries/markets that are falling behind development of the other project countries and would become eligible to benefit from this subcomponent accordingly. In case the DGIS proposed grant does not materialize, this component will be funded only with CTF funds at pilot scale in SOP1 and additional financial resources will be secured under subsequent SOPs.

41. ECREEE will implement this subcomponent through the employment of a qualified Fund Manager. Eligibility criteria for this subcomponent will be specified in the POM, which will focus on the identification of countries with a challenging market. Under the ROGEP SOP1, this subcomponent will specifically target countries eligible for the CTF and the Sahel countries. More details on the application process and the evaluation to decision on providing the targeted incentives will be provided in the POM.

Component 2: Access to Finance for Stand-alone Solar System Businesses (US$276.2 million equivalent, of which IDA (SUF) US$140.0 million, CTF Contingent Recovery Grant US$67.2 million and Private Sector Equity US$69.0 million)

Subcomponent 2A: Line of Credit for Stand-alone Solar Businesses (US$209.0 million equivalent, of which IDA (SUF) US$140.0 million and Private Sector Equity US$69.0 million)

42. This subcomponent will facilitate access to debt financing in support of the stand-alone solar systems market. This subcomponent will support (a) solar equipment distributors supplying stand-alone solar products to households and productive end users; (b) households and productive end users of solar equipment; and (c) energy service companies[26] electrifying public institutions, such as schools and health

[26] Solar equipment distributors sell products that meet standards set by Lighting Africa. Energy service companies sell products, systems, and services that meet contractually defined key performance indicators (KPIs).

centers. Women entrepreneurs will have an equal level of access to financing.

43. The World Bank will lend IDA SUF funds to BOAD, which meets the requirements set out in the Guidelines for Financial Intermediary Financing.[27] A detailed assessment of BOAD's performance is provided in Annex 6. The World Bank will lend in euros to BOAD on IDA SUF terms. These are the same as IBRD terms for middle-income countries. BOAD will lend the SUF funds through the following four financing channels: (a) commercial banks; (b) leasing companies; (c) MFIs; and (d) debt funds. The lending would be at or near market terms that cover the cost of funds, operating costs, hedging costs if any, and a profit element to be determined by BOAD in line with its other lending operations to eligible CFIs. BOAD will identify CFIs based on eligibility criteria set out in the POM, which will include the performance level of the CFIs, such as their level of profitability, non-performing loans, etc. The CFIs will indicate the number, size, and type of deals they expect to support using the line of credit.

44. The project, under this subcomponent, will finance the credit facility to be established at, and operated by, BOAD. Details on the operation of the credit facility will be provided in the POM. BOAD will extend this line of credit to eligible CFIs operating in WAEMU countries.

Subcomponent 2B: Contingent Grant Facility for CFIs (CTF Contingent Recovery Grant US$67.2 million)

45. The contingent grant facility will provide comfort to the CFIs to lend to businesses providing innovative solar technologies following disruptive business models. The businesses promoting stand-alone solar systems do not have a track record and hence are affected by the perception that they have higher risk. The contingent grant facility will provide comfort to the CFIs against technology and implementation risks, which are elaborated in Annex 2 and will be further detailed in the POM. This facility will be structured to help 'Stage 2' and 'Stage 3' solar companies raise debt from CFIs and raise investment capital. This facility leverages about three times the financing in loan and equity from CFIs and solar businesses. Under the SOP1, this subcomponent will only benefit CTF eligible countries.

46. The contingent grant facility will support lending to 'Stage 3' solar companies by covering up to 50 percent of the loan principal in case of a default resulting from the nonperformance or underperformance of the underlying technology. The facility will offer a higher level of cover for Stage 2 companies of up to 80 percent of the loan principal, in case of technology and implementation risk. The higher level of cover for Stage 2 companies reflects the increased challenges Stage 2 companies face in meeting lender requirements for a sufficient business track record and loan collateral. This contingent grant facility, along with subcomponent 2A, will support lending to these businesses and provide more comfort to the market on the underlying technology. As the FI, BOAD will administer the contingent grant facility as needed by the CFIs, if solar companies cannot generate sufficient revenues, which result in an inability to pay debt obligations. BOAD, through the contingent grant facility, can provide the CFIs with funds to cover their losses on such loans, up to the prescribed limits of 50 percent or 80 percent as the case may be. Annex 2 provides more details on the structure of the facility.

47. While all other project components will be completing their planned activities by June 30, 2024, to allow adequate time to the CFIs to submit claims in case of solar company's inability to repay their

[27] http://intresources.worldbank.org/INTOPCS/Resources/380831-1360104418611/Guidance_Note_FIF.pdf.

loans, due to technology or implementation-related issues, this facility will remain active until December 31, 2030. Between 2024 and 2030, this facility will only review claims from the CFIs, and if the claims are found eligible, the CFIs will be compensated from the contingent grant facility. On December 31, 2030, the remaining balance of the contingent grant facility will be refunded to the CTF.

48. Under the SOP1, this subcomponent will only benefit CTF eligible countries (detailed in Annex 2). Lessons from the SOP1 will be used to raise additional funding for similar interventions from other funding sources to benefit all project countries. By providing cover for innovative technology and implementation risks, CTF support will be complementary to risk facilities covering commercial and political risks that may be offered by other donors under the project platform, as described in paragraphs 55 to 58.

Project Cost and Financing

49. The cost and financing of each project component, including a breakdown into subcomponents, is shown in Table 3.

Table 3. Breakdown of the Cost and Financing for the SOP1 (US$, millions)

Project Components	IDA Regional Grant	IDA SUF	CTF Grant	CTF Contingent Recovery Grant	Proposed DGIS Grant*[a]	Private Sector Equity	Total
Component 1. Develop a Regional Market	**10**	—	**7.5**	—	**40**	—	**57.5**
1A: Enabling Environment	7	—	1.5	—	4	—	12.5
1B: Entrepreneurship Technical Support	3	—	1	—	3	—	7.0
1C: Entrepreneurship Financing Support	—	—	2	—	3	—	5.0
1D: Barrier Removal for Challenging Markets	—	—	3	—	30	—	33.0
Component 2. Access to Finance for Stand-alone Solar System Businesses	—	**140**	—	**67.2**	—	**69**	**276.2**
2A: Line of Credit for Stand-alone Solar Businesses	—	140	—	—	—	69	209.0
2B: Contingent Grant Facility for CFIs	—	—	—	67.2	—	—	67.2
Total financing required	**10**	**140**	**7.5**	**67.2**	**40**	**69**	**333.7**

**Note:* a. *Discussions are underway with the Netherlands' Minister for Development Cooperation on this proposed source of cofinancing. If this source of cofinancing does not materialize, the project will be restructured accordingly*.

C. Project Beneficiaries

50. The ultimate project beneficiaries will be the people currently living without access to electricity connection or living with unreliable electricity supply within the 19 countries. The project has an ambitious target of providing electricity services to about 1.7 million people, about half of whom would be female. The project will provide the beneficiaries with the choice of stand-alone solar systems of differing size to meet a varied level of electricity demand—from only lighting to mobile phone charging to operating some efficient household appliances to operating solar-powered appliances for productive uses. The project will also use innovative business models, such as PAYGO—that combines benefits of microfinance schemes with mobile money features to make the modern stand-alone solar technology affordable to the rural people—by offering an extended period to pay the cost of the solar product and appliances, usually in installments over six months to three years. In the SOP1, the beneficiaries will include households and

businesses who otherwise would wait for years or decades for grid electricity or would use expensive and fossil fuel-based electricity to meet their electricity demand. Lessons from the pilot initiative to electrify public institutions would be implemented under the subsequent project, which would benefit students and mothers as schools and health clinics will be electrified under the SOP.

51. The project will also benefit solar companies and local entrepreneurs that would get technical support to build their capacity and skill to successfully serve consumers and meet their electricity demand through stand-alone solar systems. The CFIs will benefit from the project as it will support them to open a new lending channel and involve them in a new market. The Governments of the project countries will benefit as this project will help them achieve the SDG objective of providing universal access to affordable and reliable electricity and, in the process, increase employment opportunities for its people by supporting private sector businesses in providing electricity services. The project will provide entrepreneurship support facility to local companies, through a series of training, capacity building and incubation support, to ensure market sustainability and satisfactory electricity service delivery.

D. Results Chain

52. A market assessment of the 19 countries has been carried out to identify the major supply- and demand-side barriers to establish a sustainable market. On the basis of this market study, the ECREEE PIU will build capacity and support an awareness campaign to remove these barriers and help create an ecosystem to develop a regional market of solar products.

53. The entrepreneurship facility will ensure the participation of local entrepreneurs in distribution and after-sales service of stand-alone solar systems. It will help establish local electricity service companies based on solar systems. The contingent grant facilities will help CFIs reduce their risk exposure to provide lending support to solar companies and make the solar businesses bankable.

54. Component 2 will provide the much-needed liquidity in the market that can support solar businesses. This is critical when there are competing businesses for limited debt capital. Component 2 will provide dedicated funding for solar businesses that would help this market grow. Figure 3 provides a flow diagram on how the project interventions help the project achieve its development objectives.

Figure 3. Theory of Change: From Project Interventions to Results

E. Rationale for World Bank Involvement and Role of Partners

55. Through this project, the World Bank will assist the establishment of a platform, implemented by several regional organizations, from which multiple interventions can be applied to solve electricity access challenges of West Africa and the Sahel region. The SOP approach allows the World Bank to take a longer-term perspective toward building a regional market, which requires changing behaviors, fostering new business practices, and adapting policies to the emerging market. This project will leverage the World Bank's limited resources and crowd in multiple development partners over the SOP time frame to support the project objective. The different development partners will be invited to provide complementary offerings such as additional funding or additional risk coverage. In addition, this project will provide IFC

and MIGA with more opportunities to support specific interventions to attract private sector investments in the project countries using the IDA PSW. One of the most critical reasons for the World Bank involvement is the objective of developing a regional market, which will establish sustainable market forces that will continue to provide electricity services to the beneficiaries, even after the project closure. The 19 countries supported under the project are at different stages of attracting private investment in the stand-alone solar space. The SOP1 creates a platform, through which multiple development partners could support the development of the regional solar market in West Africa and the Sahel region. Box 3 indicates how IFC and MIGA will support the SOP1 and subsequent projects.

Box 3: Planned World Bank Group Support

The International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA) will support ROGEP using the IDA Private Sector Window (PSW).

IFC has used the IDA PSW to establish its Small Loans Guarantee Program (SLGP) to support financing of SME loans. IFC will enter into risk-sharing agreement with eligible CFIs to cover 50 percent loss against future nonperforming loans offered to stand-alone solar businesses. The guarantee can be in local currency or in U.S. dollars depending on the CFIs' preference. IFC's SLGP can support 16 of the 19 ROGEP countries (based on PSW eligibility), BOAD is partnering with IFC to benefit from the SLGP program.

MIGA coverage would be critical to attract private investment to electrify public institutions given the high perceived country and sector nonpayment risk under the Power Purchase Agreement (PPA) with the public institutions and/or subgovernment with limited payment track record. MIGA risk mitigation would be developed based on the pilot schemes to electrify public institutions under the ROGEP SOP1. A brief description of MIGA risk coverage is provided in annex 9.

56. West Africa and the Sahel host a community of bilateral and multilateral agencies that are active in the off-grid sector. Some of these are (i) The Scaling-up Renewable Energy Program, a multi-donor program within the framework of CIF targeting Benin, Ghana, Liberia, and Mali as pilot countries for engagements; (ii) The EU-funded Electrification Financing Initiative (ElectriFI) to support private sector-driven rural electrification investments; (iii) The DFID[28]-funded Green Mini-Grids initiative's Africa Regional Facility in cooperation with AfDB and ESMAP to explore funding opportunities for rural electrification in the ECOWAS region; and (iv) the DFID Energy Africa initiative on off-grid in Ghana, Nigeria, Senegal, and Sierra Leone, among others. The Green Climate Fund (GCF) is exploring opportunities to support energy access and efficiency initiatives in the region.

57. **Partnering with World Bank Global Practices (GPs) on Health, Education, and Agriculture.** The SOP will promote stand-alone solar technologies to electrify public institutions and for productive uses. To sustainably electrify public institutions, interested parties need to understand and agree on the benefits and costs associated. The project will closely coordinate with the World Bank Health and Education GPs to identify a suitable implementation design that addresses the key issue of operation and maintenance. In addition, the project will explore the feasibility of cooperating with the Africa Centers of Excellence for Development Impact. These universities could become the first centers used to provide incubation and training to the local entrepreneurs supported under the project. The Health GP could provide entrepreneurs and donors, who are currently funding rural health clinics and medical equipment, with information regarding the project's ability to finance sustainable electricity supply. A joint effort

[28] U.K. Department for International Development.

would increase the likelihood of meeting health outcome objectives. The agriculture sector could be the largest beneficiary of solar systems used for productive purposes, such as solar irrigation, solar milk chillers for dairy farms, and solar egg incubation for poultry farms.

F. Lessons Learned and Reflected in the Project Design

58. The project design benefits extensively from previous and current World Bank operations that successfully helped develop markets for stand-alone solar systems. Some of these operations include the Sri Lanka: Renewable Energy for Rural Economic Development Project (P077761), the Bangladesh: Rural Electrification and Renewable Energy Development Project (P071794), and the Ethiopia: Electricity Network Reinforcement and Expansion Project (P119893), among others. The ESMAP-funded and World Bank-executed Lighting Africa Program (P146987), a joint initiative of the World Bank and IFC, also provided lessons on how to successfully build a market from the ground up by combining private sector expertise of IFC with the World Bank's proven track record in supporting Governments.

59. Lessons from the abovementioned projects suggest that creating a market needs holistic interventions. While access to finance is a major barrier, providing funding support solves only part of the problem. Support should be provided to create an ecosystem to let successful markets emerge. Otherwise, project activities may not remain sustainable after the project closing. However, if a market is developed by creating demand, strengthening supply and distribution chains, creating awareness and capacity building, and identifying as well as removing policy barriers, then a sustainable market can be created where the impact could be much larger than the ring-fenced project benefits.

60. The enabling environment subcomponent of the project is designed based on lessons from the Lighting Africa Program, which helped create viable stand-alone solar markets in Kenya, Tanzania, Ethiopia, and Uganda. A similar approach was followed when designing projects in recent years for Rwanda, Zambia, and Niger. These projects are now at the implementation stage and are also showing signs of emerging into viable stand-alone solar markets.

61. Given the risk-averse nature of CFIs, and the limited track record of solar companies, financial institutions are reluctant to lend to solar companies on commercial terms. Hence, the progress in this space has depended on the amount of donor funds and patient capital these solar companies could raise. Many donors have established lines of credit to provide liquidity support to financial institutions and attract them to provide access to finance to solar companies. However, this also had limited results. In most World Bank-funded projects, this challenge was mitigated by using a public FI, such as a development bank, to manage the line of credit and support private sector companies. Hence, progress in this front had been limited to countries that had well-performing publicly owned FIs. Bangladesh and Ethiopia are such examples. Since the actual market risk of solar businesses is much less than what is perceived by the financial institutions, risk mitigation facilities that reduce the risk exposure of the financial institutions at the time of default can effectively attract them in this sector. In Uganda, the Government had to include a guarantee facility to mitigate the risk of financial institutions to attract them to borrow from the line of credit set up at the Uganda Energy Credit Capitalization Company, using World Bank funds, and then lend to private solar companies. The project included a similar risk mitigation subcomponent.

62. Off-grid programs in Bangladesh and Sri Lanka have shown that improved access to capital, reliable after-sales service, and investment of time and resources in market development and regular stakeholder engagement were key to scaling up the projects.[29] Similar results were experienced in Ethiopia. In these projects, developing a solar market started as a small component and soon after transformed into a major undertaking. The Bangladesh RERED Rural Electrification and Renewable Energy Development Project implemented through the Infrastructure Development Company Limited and MFIs has electrified 4.5 million households through a line of credit facility. While the project received a total funding of US$434 million from the World Bank, it started with a target of electrifying 64,000 households with an allocation of US$25 million in 2002. Experience with the Ethiopia ENREP is similar.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

63. The ROGEP SOP1 will be implemented at a regional level by two regional implementing agencies: (a) ECREEE and (b) BOAD.

64. **ECREEE is a specialized technical agency that supports several countries in West Africa and the Sahel in mainstreaming renewable energy and energy efficiency policies in ECOWAS' regional activities.** ECREEE has a harmonized regional approach to achieving universal electrification. It is also engaged in several energy initiatives including access to modern cooking solutions, programs to reduce system loss in the distribution sector, and it manages instruments to finance sustainable energy projects. ECREEE's mandate is to focus on activities at the regional level that can assist and add value to member states' activities in renewable energy and energy efficiency. It has strong links with regional and international centers of excellence, international finance and technology partners, and bilateral and multilateral agencies, and development banks. Given ECREEE's mandate and its relationship with most countries in West Africa and the Sahel, there is considerable advantage in making ECREEE the implementing agency of the proposed project.

65. ECREEE will implement project activities to develop a regional market, conduct market intelligence studies, provide policy and regulatory support, conduct consumer education activities for institutions and end consumers, develop a regional QA framework for the products and services, provide business development support to the private sector enterprises in the project, and engage with the public institutions to be electrified under the project. BOAD will provide a line of credit facility to CFIs to provide working capital and medium-term financing needs of solar companies.

66. ECREEE has established a PIU, responsible to implement Component 1 of the SOP1 including M&E of all project activities and coordination with BOAD, project stakeholders such as government counterparts, solar industry associations, and development partners, among others. The key PIU staff consist of a project coordinator, a technical coordinator, a coordinator for private sector support facility, a finance expert, and a financial management (FM) specialist. As per ECREEE's statutes, the ECOWAS Commission will provide oversight of ECREEE's implementation of the project through its Commissioner,

[29] Govindarajalu, C., Raihan Elahi, and Jayantha Nagendra.2008. *Electricity Beyond the Grid: Innovative Programs in Bangladesh and Sri Lanka.* ESMAP, World Bank

Energy and Mines. The ECREEE Executive Director will secure the approval of project implementation workplan and budget from the ECOWAS Commission and the Project Coordinator will have the delegated authority to implement Component 1. In addition, the ECREEE PIU has been staffed with a procurement specialist, a gender specialist (with experience in social development issues), a geographic information system (GIS) specialist, an M&E specialist, and relevant support staff. The PIU will appoint an environmental, health, and safety specialist soon after the project becomes effective. The detailed PIU structure will be in the POM. The PIU cost has been funded by the Project Preparation Advance (PPA).

67. **BOAD is the common development finance institution of the member states of WAEMU.** It was established by an agreement signed on November 14, 1973 and became operational in 1976. BOAD's primary objective is to promote balanced development of its member states and to foster economic integration within West Africa by financing priority development projects. Its member states include Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. BOAD benefits from its experience of implementing the World Bank-funded WAEMU Affordable Housing Finance (P161658) Project. BOAD also has credible lines of credit established with CFIs in its member countries that could enable private solar companies to access finance. BOAD is a suitable regional development bank that can play the role of an FI to extend lines of credit to eligible CFIs. The private stand-alone solar companies and end consumers will then access working capital financing and/or debt financing from their preferred CFIs.

68. The World Bank will directly lend funds to BOAD for subcomponent 2A. BOAD will provide a line of credit facility to eligible CFIs operating in eight WAEMU countries. These CFIs will on lend ROGEP funds to private solar companies based on standards set in ROGEP POM. The participating CFIs will have to comply with the World Bank's Guidelines for Financial Intermediary Financing. BOAD complies with the FI eligibility assessment (details provided in Annex 6). BOAD will follow its institutional mechanism to implement Component 2, details of which will be provided in the POM.

B. Results Monitoring and Evaluation Arrangements

69. The ECREEE PIU is responsible for the overall project M&E. The PIU is staffed with an M&E expert, who will be coordinating with PIU staff responsible for implementation different activities. ECREEE will also coordinate with BOAD to understand the results achieved from Component 2. BOAD has finalized a reporting format based on consultation with ECREEE and the World Bank. The CFIs receiving a line of credit from BOAD will provide information as per the reporting format. The private solar companies receiving financing from the CFIs will provide information based on a similar reporting format as part of their financing agreement. ECREEE will submit quarterly progress reports, compiling all these details, to the World Bank within 45 days after the end of each quarter.

C. Sustainability

70. The project interventions are aimed at attracting private capital to meet electricity demands of remote economies, through a market-based approach. The project will identify electricity demands of communities without reliable grid electricity and will help the private investor in supporting businesses that would provide electricity service to those communities in a financially sustainable manner. This approach will ensure that even after the project is closed, the market would sustain itself.

71. Experience from World Bank-funded stand-alone solar projects implemented through a market-based approach demonstrated that developing a business-friendly environment crowds in investment in the sector. This unlocks the market potential as it would no longer depend on the governments' ability to support electrification initiatives through its budgetary resources.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic, and Financial Analysis

Economic and Financial Analysis

72. The project facilitates creating a market for stand-alone solar products to electrify households and businesses. At present, these households and businesses either do not have access to grid electricity or are affected by unreliable electricity supply. Most of these households and businesses meet their electricity needs by using kerosene, candles, dry cell batteries and, or diesel generators. An economic and financial analysis has been carried out for households of different income levels by replacing their conventional way of meeting electricity demand with stand-alone solar systems. Similar analysis of water pumping by replacing diesel water pumps with solar water pumps has also been carried out. The summary result of the analysis result is provided in Table 4.

73. The SOP1 is considered economically viable with an economic internal rate of return (EIRR) for pico solar systems at 44 percent, SHS at 35 percent, and solar water pumps at 33 percent. The analysis estimates economic benefits conservatively based on avoided costs of electricity substitutes for each consumer group. Specifically, for solar lanterns and SHS, the estimate is based on comparing the cost of solar systems with the costs of using dry cell batteries, kerosene lamps, candles, and cell phone chargers. In the case of water pumps for irrigation, the avoided cost is that of a diesel water pump.

Table 4. Economic and Financial Analysis of Stand-alone Solar Solutions

	EIRR (%)	FIRR (%)
Pico Solar System (SS) (3W) - MTF Tier 1-level Electricity Access	44	29
SHS (50W) - MTF Tier 2-level Electricity Access	35	22
Solar Water Pump – Productive uses of solar	33	24

Note: EIRR = Economic Internal rate of return; FIRR = Financial internal rate of return.

74. The SOP1 is considered financially viable for the sale of pico solar systems, SHS, and solar water pumps. The financial analysis showed FIRRs for pico solar systems at 29 percent, SHS at 22 percent, and solar water pump at 24 percent. The pico solar systems and SHS, respectively, provide MTF Tier 1 and 2-level electricity access. The solar water pumps for irrigation demonstrate financial viability to farmers by calculating the financial savings from switching from diesel water pumps to solar-powered water pumps.

75. **FIRR of Financial Intermediary Approach.** The project seeks to crowd in the private sector by channeling funds through commercial lenders that have efficient loan identification and supervision systems and by improving the capability of the private sector to distribute and maintain solar equipment. Once the market has been primed, the commercial lenders will become more familiar with this business

and be ready to keep lending in the future, with less donor support, thus eventually developing a sustainable market for stand-alone solar products. The FIRR of the Financial Intermediation is about 14 percent (see detailed analysis in Annex 3 Table 3.10).

Technical

76. ROGEP supports the promotion of stand-alone solar systems that can range from a small solar lantern that can be used as a reading lamp to a large stand-alone solar system that can be used to electrify a health clinic or an SME for productive uses. All these systems come with (a) a solar panel that converts sunlight to electricity; (b) a battery to store electricity to be supplied as per demand; (c) a charge controller/inverter to protect the battery from overcharging or over-discharging; and (d) lights, switches, and outlets to operate appliances such as mobile phone charging or TV, fan, radio, or other efficient appliances that can be operated with stand-alone solar systems. The physical size of the systems varies depending on their capacity. Most stand-alone solar systems are housed within the user's residence, with the solar panel being put in the sun for battery charging. Larger systems would require installation of the solar panel either on the roof of the building being electrified or at the yard of the consumer.

77. The project will ensure that users of stand-alone solar systems are appropriately trained to operate them to ensure a useful life. Users should also be trained on what appliances should not be operating with solar systems, for instance, because they will deplete the battery charge and reduce the useful life of the systems. Focused training and awareness campaigns will be conducted to inform potential beneficiaries on productive uses of stand-alone solar systems. At present, only solar water pumping for drinking water and irrigation has been largely used. Information on other agribusiness process activities using solar will be made available through the project.

B. Fiduciary

(i) Financial Management

78. An assessment of the FM arrangements of the implementing entities, ECREEE and BOAD, has been conducted with the objective to determine whether these agencies have adequate FM arrangements (including planning and budgeting, accounting, internal control, funds flow, financial reporting, and auditing). The FM arrangements are acceptable if they are considered capable of (a) recording correctly all budgets, transactions, and balances; (b) supporting the preparation of regular and reliable financial statements; (c) safeguarding the entity's assets; and (d) being subject to auditing acceptable to the World Bank. The FM assessment was carried out in accordance with the FM Manual for World Bank Investment Project Financing Operations effective on March 1, 2010 and revised on February 10, 2017.

79. There are adequate FM arrangements in the implementing entities provided the following capacity strengthening measures are implemented:

(a) **Accounting staff.** The two implementing entities are adequately staffed and all accounting staff will be trained on World Bank FM procedures within one month of project effectiveness.

(b) **Computerized accounting information system.** BOAD will configure its existing accounting software to accommodate the ROGEP accounts and meet the line of credit business requirements within three months of project effectiveness.

(c) **FM Manual.** The POM will include a specific annex on FM arrangements applicable to ECREEE and BOAD line of credit.

(d) **Internal control.** ECREEE has submitted its audited financial statements of 2015, 2016, and 2017 to the World Bank. In addition, the terms of reference (TOR) of the external audit of the project will include an annual interim review of the institutional internal controls applicable to the project. The ECREEE PIU structure will be stated in the POM to adequately define roles and responsibilities and to ensure segregation of duties in a manner acceptable to the World Bank.

(e) **External audit.** BOAD has appointed an external auditor. ECREEE will appoint an external auditor for the project within four months after effectiveness.

80. The conclusion of the FM assessment is that the proposed FM arrangements, including the mitigation measures, meet the World Bank's minimum FM requirements under the World Bank Policy and Directive for Investment Project Finance (IPF) and are therefore adequate to provide, with reasonable assurance, accurate and timely information on the status of the project as required by the World Bank. The overall FM risk for the project is rated Substantial for ECREEE and Moderate for BOAD. Detailed FM arrangements including risk mitigation measures are provided in the FM Action Plan in Annex 1.

(ii) Procurement

81. Procurement under Subcomponents 1A, 1B, 1C, and 1D will be carried out in accordance with the World Bank procedures: the World Bank Procurement Regulations for IPF Borrowers (July 2016, revised in November 2017 and August 2018); 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants', dated October 15, 2006, and revised in January 2011 and July 2016; and other provisions stipulated in the Financing Agreements. Solar entrepreneurs will be selected following a set of eligibility criteria stated in the POM to benefit from Subcomponents 1C and 1D. Subcomponent 2A and 2B will follow the FI approach.

82. A Procurement Plan for ECREEE covering the activities of the first 18 months of project implementation has been discussed and agreed. The approved Procurement Plan will be disclosed on the World Bank's external website. The Procurement Plan will be updated annually in agreement with the World Bank or as required to reflect actual implementation needs and improvements in institutional capacity.

C. Safeguards

83. The World Bank environment and social (E&S) standards and management system requirements applied to this project will be governed by the provisions of OP/BP 4.03 (Performance Standards for Private Sector Activities). The approach is consistent with the policy provisions for projects involving FIs. The project is categorized FI-2 in line with OP 4.03. This categorization is based on the review of the prospective project activities (with relatively limited associated E&S risks and impacts) and an expectation that, in accordance with BP 4.03 paragraph 21, potential adverse E&S risks or impacts will be few in number, generally site specific, largely reversible, and readily addressed through mitigation measures.

84. Key E&S risks include waste management (disposal and recycling of solar panels, used SHS units, and lead acid and lithium ion batteries), occupational health and safety (OHS) and labor issues for solar

companies' workers, risks related to gender issues, and inclusion of vulnerable groups. Land-related issues are not expected to be significant, apart from potential voluntary land donation or very minor physical or economic displacement where panel installations may be on the ground (especially in cases of public buildings) that will require a proper protocol.

85. ROGEP is a complex project that involves a multilevel implementation structure. The approach to implementation of E&S risk management measures is that of putting in place and continually strengthening a formal Environmental and Social Management System (ESMS) in line with OP/BP 4.03. ECREEE, BOAD, CFIs, private sector solar companies, government agencies, specialized E&S consulting firms, and experts will play important roles.

86. Based on the overall project design and the assessment of the existing E&S risk management systems of key implementing entities, there are two core elements of the E&S risk management system design that are expected to ensure that project-specific risks are adequately addressed as follows:

(a) **Operational E&S sustainability level.** Lending to solar companies will require participating CFIs that will lend to solar companies to put in place and implement E&S screening and monitoring procedures commensurate with the scope and nature of E&S risks and impacts to ensure that solar companies adequately manage relevant risks and impacts at their level—such as OHS and labor issues related to their own workforce—and as part of their interactions with customers during and after the equipment installation process. This is applicable to the components implemented through BOAD as well as ECREEE.

BOAD currently has institutional E&S risk management systems that include specific provisions for lending through CFIs, as well as institutional capacity that supports their implementation (see Annex 1 for more details). However, since BOAD never had a sector-specific credit line, current policy provisions are not adapted to the specific E&S risk aspects of lending in the OGS sector,[30] as opposed to cross-sectoral credit lines for micro, small, and medium enterprises (MSMEs), microfinance, or housing. Therefore, BOAD—with assistance from ECREEE—has prepared and disclosed an Environment and Social Risk Management (ESRM) and Sector Guide for Off-Grid Solar for Commercial Financial Institutions on February 8, 2019. These will be required for use by CFIs that will avail the project credit line. This guide is aligned with the existing institutional E&S risk management systems of the two institutions and will be built into the POM. This guide addresses E&S risks in the OGS sector and provides requirements and tools for the CFIs and the borrowing solar companies. E&S sector guides are a good practice to complement the general institutional E&S risk management systems in the financial sector, and BOAD may continue to improve its institutional systems in the future by developing additional sectoral guidance should it design credit lines in other sectors (for example, agriculture or services).

[30] For the implementation of ROGEP, it is an important part of the E&S assessment to understand that to date, BOAD has not implemented any sector-specific credit lines and therefore its institutional systems are not adapted to this type of lending (as opposed to current credit lines that are cross-sectoral to MSMEs and microfinance). The risk management tools underlying the E&S institutional processes for cross-sectoral credit lines are broad and may create unnecessary burden on CFIs when they evaluate sector-specific E&S risks for solar off-grid companies.

(b) **Strategic E&S risk management and capacity building.** Some of the key risks associated with the project are systemic and cannot be addressed at the operational level alone. Examples include waste management/used battery recycling solutions at the level of countries and region, gender issues, overall E&S capacity building for participating CFIs and solar companies, and knowledge exchange for key stakeholders. ECREEE and BOAD have designed this ESRM Strategy to complement the POM with special focus on the risks, mitigation factors, and capacity building of stakeholders. The strategy is an important element of the overall strategy in creating access to energy in the region. The project will be implemented such that it will not pose any risks to the environment and the society that is expected to benefit. The strategy, and its supporting budget, focus on identification, avoidance, and mitigation of the risks associated with the operations of the project and the businesses along the value chain, including the end users. Subcomponent 1A will support the implementation of the ESRM Strategy.

D. Climate Co-Benefits

87. The climate co-benefit of the project is estimated to be 100 percent.

E. Gender

88. Project countries face significant challenges in closing gender gaps in the domain of economic opportunities, in particular with regard to the number of jobs, quality of jobs, and access to credit. Women have lower rates of labor force participation in most of the project countries and are more likely to work in low-productive sectors and often engage in less profitable areas due to market segregation. Women entrepreneurs have to overcome greater bottlenecks than their male peers for growing their businesses including barriers in access to finance and limited capacity and skills. The project aims to close these gender gaps in the domain of economic opportunities by (a) engaging with women entrepreneurs and providing them training and capacity-building support; (b) improving women entrepreneurs' access to credit; and (c) increasing women's awareness on opportunities in stand-alone solar systems market. The outcomes of these actions will be monitored through specific gender indicators, included in the results framework. The project will also have positive development outcomes for women, particularly female-headed households through improving access to electricity. Lack of access to electricity service disproportionately impacts women, in particular because of their reliance on electricity to fulfill household chores, which in many contexts are seen as primarily the responsibility of women.

89. As the household is often the center of small-scale enterprises for women, unavailability of electricity at home negatively impacts women's ability to generate income through such enterprises. Improving access to electricity of female owned- enterprises will also contribute to improving their productivity and profitability. Lack of electrification of healthcare facilities can also result in unsafe deliveries and obstacles in dealing with maternal and childbirth emergencies due to lack of refrigeration of vaccines and medicines. Female-headed households in project countries tend to be poorer and relatively more vulnerable, and therefore, increasing their access to electricity will be particularly important to improve development outcomes for this group. See Annex 4 for more details.

F. Citizen Engagement

90. The project will be implemented through a market-based approach and accordingly will facilitate both the supply side and the demand side of the equation. As the project deals with innovative technologies and disruptive business models, its success will depend on successful awareness campaigns and capacity building of the ultimate project beneficiaries—citizens. The project supports interventions to inform and train the end beneficiaries and citizens on the use and maintenance of stand-alone solar system to reduce misuse and ensure appropriate care of the products. Adequate awareness campaigns and information dissemination will be conducted to inform citizens on the diverse benefits of stand-alone solar systems. Specific Impact Assessment studies on the project interventions will be carried out along with regular surveys to loop in beneficiary feedback. Most often, these technologies are known for lighting and mobile phone charging. The productive use aspect of these products is largely unknown to most of the potential beneficiaries, and the project will ensure adequate citizen engagement to achieve intended benefits. Under Subcomponent 1A, to unlock regional demand through consumer awareness and promotional campaigns, the project will host local community events in a subset of participating countries on an annual basis to demonstrate the productive uses of these products and to educate consumers on the proper operations of these products to maximize their useful life. These local community events will be organized and hosted by the PIU in collaboration with the national and local governments.

Grievance Redress Mechanisms

91. 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.

V. KEY RISKS

92. The 2018 Off-Grid Solar Market Trends Report found that West Africa's share of global sales of PAYGO solar products is 12 percent, compared to 86 percent in East Africa. Hence, technology and benefits of stand-alone solar systems are unknown to most of the project countries. Accordingly, though the solution offered through this project is well proven in many parts of the globe, the risk level of this project is on the higher side given the unfamiliarity of beneficiaries and countries where the project would be implemented. Overall the project risk is considered Substantial. Detailed risks/barriers associated with the project and market development are presented in Annex 5 and in Table 2.1 in Annex 2.

93. **Political and governance risks (Substantial).** Many project countries have a volatile political situation. Some countries are not adequately informed of the benefits of stand-alone solar systems and have limited political commitment to off-grid electrification. SOP1 will build regional knowledge and capacity and change behavior of the countries through demonstrating the impact of stand-alone solar systems in achieving electrification access. Project launch workshops will be organized in each country to inform political leaders and interested stakeholders of the benefit and potential of the project.

94. **Macroeconomic risks (Substantial).** The project will promote regional cooperation and cross-border trade and implement the CET within the ECOWAS countries and beyond. This would require a series of discussions within the countries. Most of the countries have indicated their willingness toward moving to a harmonized regional market. The project will support a series of awareness campaign initiatives to disseminate the benefits of regional cooperation.

95. **Sector strategies and policies risks (Substantial).** Overall policy environment varies considerably within project countries. Sector strategies and policies on achieving electricity access in many ROGEP countries are mostly focused on grid extension along with incentivizing the publicly owned, vertically integrated power utilities. The weak institutional arrangements and limited inter-ministerial and intercountry coordination add to the riskiness of the project. Engaging the private sector to promote electrification using stand-alone solar systems would be a completely new idea for many existing institutions. It is expected that taking a regional approach, where the countries can learn from the regional neighbors on how to benefit from this innovative technology, through a series of regional and national workshops, would be an effective path toward changing strategies, policies, and behavior. ROGEP will support regional knowledge sharing on integrated electrification planning and strategy development.

96. **Technical design risks (Moderate).** The proposed design of the SOP is based on the long-term experience of the World Bank and lessons learned from successful projects that increased the electrification rate of the countries where the projects were implemented. The SOP followed a consultative approach to design the project, including substantial feedback from the solar industry associations, development partners, and country stakeholders. However, little information exists in the public domain regarding the nascent stand-alone solar systems market in the project countries, making the private sector players skeptical of the project countries. The technical design risk is considered Moderate given successful experience with solar technology globally. SOP1 includes an expected funding of US$40 million from DGIS. In case this does not materialize, the components funded by this grant would have to be scaled down and new funding sources have to be secured under subsequent SOP operations.

97. **Institutional capacity for implementation and sustainability risks (Substantial).** The expansive scale of the proposed project required ECREEE to establish a PIU using the funding support from the project preparation advance, and the established PIU has been at the core of the project preparation. As this is the first engagement of ECREEE with a World Bank-funded project, an oversight arrangement by the ECOWAS Commission on ECREEE implementation of ROGEP will be introduced through the POM. BOAD will implement the project using its institutional system. It will also implement a stand-alone solar systems project for the first time under ROGEP.

98. **Fiduciary risks (Moderate).** The ECREEE PIU has been established with qualified fiduciary staff. The ECREEE implementation arrangements will follow the World Bank Procurement Regulations for IPF

Borrowers. The components implemented by BOAD will follow World Bank Guidelines for Financial Intermediary Financing. Furthermore, the project will submit quarterly progress reports and annual audit of its project accounts and entity audits confirming the use of project funds. Actions to mitigate FM and procurement risks have been identified.

99. **Environment and Social risks (Moderate).** Key E&S risks include waste management (disposal and recycling of solar panels, used SHS units, and lead acid and lithium ion batteries); water quantity and quality for panel washing; and OHS issues for solar companies' workers. The E&S risk of the project would be managed by putting in place a formal ESMS in line with OP/BP 4.03.

100. **Stakeholders risks (Moderate).** The project design benefitted from a stakeholder consultative approach. Two regional workshops and national workshops in project countries were conducted to get feedback on project scope and design. The same level of interaction will continue during project implementation to keep the project stakeholders informed of project results and achievements.

101. **Other (Security) (Moderate).** The ROGEP is based on a market-based approach and accordingly the implementation of project areas will be mostly determined by the supply and demand forces. This aspect will address the risk of the project being implemented in areas with high risk of security. Furthermore, as more jobs will be created at a local level following the project implementation, this may also have a positive impact on security aspects. Some governments are keen to support street light facilities in villages to improve the sense of security in villages by lighting up common places at night time.

VI. RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY: Western Africa
Regional Off-Grid Electrification Project

Project Development Objectives(s)

PDO for SOP1 is to increase electricity access of households and businesses using modern stand-alone solar systems through a harmonized regional approach.

Project Development Objective Indicators

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Increase electricity access to households								
People provided with new or improved electricity service (CRI, Number)		0.00	5,000.00	20,000.00	100,000.00	500,000.00	1,000,000.00	1,755,000.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
People provided with new or improved electricity service - Female (CRI, Number)		0.00	2,500.00	10,000.00	50,000.00	250,000.00	500,000.00	877,500.00
Households provided with access to electricity through stand-alone solar systems (Number)		0.00	1,000.00	6,600.00	33,000.00	160,000.00	330,000.00	585,000.00
Households provided with access to electricity through stand-alone solar systems of which female headed households (Number)		0.00	100.00	660.00	3,300.00	16,000.00	33,000.00	58,500.00
Increase electricity access to businesses								
SMEs provided with access to electricity through stand-alone solar systems (Number)		0.00	2,000.00	8,000.00	20,000.00	30,000.00	50,000.00	65,000.00
SMEs provided with access to electricity through stand-alone solar systems of which		0.00	200.00	800.00	2,000.00	3,000.00	5,000.00	6,500.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
women led SMEs (Number)								
Use of modern stand-alone solar technology through a harmonized regional approach								
GHG CO2 emission reduction (Metric ton)		0.00	10,000.00	60,000.00	120,000.00	170,000.00	300,000.00	385,000.00
Commercial financial institutions engaged in financing of solar companies (Number)		0.00	3.00	10.00	20.00	35.00	45.00	57.00
Regional Standard of Quality Assurance (QA) framework for stand-alone solar systems prepared and adopted by ECOWAS (Yes/No)		No	No	No	Yes	Yes	Yes	Yes
Market Observatory Indicator: Country Specific information on Volume, Price and type of products (Yes/No)		No	Yes	Yes	Yes	Yes	Yes	Yes
Annual publication of beneficiary feedback received from citizens		No	No	Yes	Yes	Yes	Yes	Yes

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
reached through the consumer education and citizen engagement program (Yes/No)								

Intermediate Results Indicators by Components

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Developing a Regional Market								
Women-led companies operating non-solar sectors (Tier 3) reported increased awareness and information to engage in solar business (Number)		0.00	2.00	4.00	6.00	10.00	15.00	20.00
Certified installers of Solar PVs in participating countries as a result of ROGEP assistance (Number)		0.00	50.00	100.00	240.00	350.00	600.00	730.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Participating countries that show year-on-year progress towards achieving national renewable energy and electricity access targets (Number)		11.00	12.00	13.00	16.00	17.00	18.00	19.00
Entrepreneurship Facility								
Women-led companies operating in the solar sector (Tier 1 and 2) benefitting from the technical support from the project (Number)		6.00	8.00	10.00	15.00	20.00	25.00	35.00
Women-led companies operating in the solar sector (Tier 1 and 2) benefiting from the Entrepreneurship Facility and reported increased capacity and skills (Number)		0.00	5.00	8.00	10.00	15.00	18.00	20.00
Full time jobs created by Start up (Tiers 1), Early Stage (Tier 2) and Growth/Mature (Tier 3) companies. Data disaggregated by gender of owners of companies		0.00	50.00	100.00	150.00	200.00	250.00	300.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
(Number)								
Women-led companies operating in the solar sector (Tier 1 and 2) that received technical support recorded increased incomes (Number)		0.00	0.00	2.00	5.00	7.00	10.00	11.00
Women hired for full time jobs created by Tier 1,2,3 companies as a result of participation in ROGEP (Number)		0.00	5.00	10.00	15.00	20.00	25.00	30.00
Access to Finance								
Beneficiaries of credit line that are women-led companies operating in the solar and non-solar sectors (Tier 2, 3) (Number)		0.00	1.00	2.00	3.00	4.00	5.00	6.00
Loans (in USD) accessed by households, productive end-users, distribution companies and energy service companies through debt facilities. (Amount(USD))		0.00	20,000,000.00	40,000,000.00	60,000,000.00	100,000,000.00	120,000,000.00	140,000,000.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Households, productive end-users, distribution companies and energy service companies accessing debt facilities. (Number)		0.00	5.00	10.00	15.00	30.00	50.00	70.00
CFI to report on amount of loans disbursed, amount of loans repaid, amount of NPLs to BOAD (Yes/No)		No	Yes	Yes	Yes	Yes	Yes	Yes

Monitoring & Evaluation Plan: PDO Indicators					
Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
People provided with new or improved electricity service		Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE

People provided with new or improved electricity service - Female		Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE
Households provided with access to electricity through stand-alone solar systems	A household is a house and its occupants regarded as a unit. The purchase of a stand-alone solar PV systems will be considered as a proxy for use of the system. In other words, whether the use is immediate or delayed, once an equipment is purchased, it will be considered is provision of access to electricity.				
Households provided with access to electricity through stand-alone solar systems of which female headed households					
SMEs provided with access to electricity through stand-alone solar systems	Productive end use/application of solar power systems include the following: (i) Connectivity, (ii) Small	Bi-annual	ECREEE M&E		ECREEE

	Medium Enterprise (SME) applications, and (iii) Value added applications. Productive End Use (PEU) of energy refers to activities that increase income or productivity in different sectors such as agriculture (e.g. irrigation, grain milling), manufacturing (e.g. carpentry, welding, and sewing), and the service sector (e.g. restaurants using electric lights, sound systems, refrigerators, mobile charging stations etc.)				
SMEs provided with access to electricity through stand-alone solar systems of which women led SMEs					
GHG CO2 emission reduction		Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE
Commercial financial institutions engaged in financing of solar companies	Commercial financial institutions (CFIs) include	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE

	banks, micro finance companies and leasing companies.				
Regional Standard of Quality Assurance (QA) framework for stand-alone solar systems prepared and adopted by ECOWAS	ECREEE has prepared a quality assurance framework to be adopted by ECOWAS for implementation by all project countries.	Bi-annual	ECREEE M&E	ECREEE M&E	ECREEE
Market Observatory Indicator: Country Specific information on Volume, Price and type of products		Biannual.	ECREEE M&E	ECREEE M&E	ECREEE
Annual publication of beneficiary feedback received from citizens reached through the consumer education and citizen engagement program	TBD				

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Women-led companies operating non-solar sectors (Tier 3) reported increased	Non solar companies will be targeted and informed	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE

awareness and information to engage in solar business	about potential business gains they stand to make should they investment in the off-grid industry, especially, distribution of solar equipment. They will be guided to undertake expansion into the solar industry. Targeted non-solar businesses include those operating in industries such as agricultural supply, agribusiness, retailing, or other areas that require strong, local distribution chains who have similar operational capabilities that might be transferred to the solar industry.				
Certified installers of Solar PVs in participating countries as a result of ROGEP assistance	Installer certification mandates are one of the policy tools used to ensure that Standards and Quality Assurance frameworks are adhered to. The mandate of	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE

	the installer is the stamped and signed certificate issued by the relevant certification authority in each participating country.				
Participating countries that show year-on-year progress towards achieving national renewable energy and electricity access targets	Each year, actual data for each renewable energy indicator will be compared to the target. The observed differences will determine whether progress is being made or not.	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE
Women-led companies operating in the solar sector (Tier 1 and 2) benefitting from the technical support from the project	Data for this indicator will be obtained by disaggregating data for "Number of entrepreneurs benefitting from the technical and financial support from the project"	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE
Women-led companies operating in the solar sector (Tier 1 and 2) benefiting from the Entrepreneurship Facility and reported increased capacity and skills	Data for this indicator will be obtained by disaggregating data for "Number of entrepreneurs benefitting from the technical and financial	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE

	support from the project"				
Full time jobs created by Start up (Tiers 1), Early Stage (Tier 2) and Growth/Mature (Tier 3) companies. Data disaggregated by gender of owners of companies	Number of full-time employees of recruited as result of ROGEP assistance. For seasonal employment Full Time Equivalents (FTE) shall be calculated. FTE represents the number of working hours that one full-time employee completes during a fixed time period, such as one month or one year. FTE converts workload hours into the number of people required to complete that work, which can help to simplify scheduling. FTE will be calculated as follows: 1. Note that the FTE Base for Part-Time/Full-Time Temp/Casual Hourly FTE calculations is 40 hrs/week; 2. Estimate how many hours the employee will work	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE

	during an average pay period within the contract dates to calculate FTE.				
Women-led companies operating in the solar sector (Tier 1 and 2) that received technical support recorded increased incomes	Companies or businesses receiving funding from the facility who have also received training or capacity building assistance will be requested to report o application of acquired skills and income from sales of solar equipment procured as result of ROGEP				
Women hired for full time jobs created by Tier 1,2,3 companies as a result of participation in ROGEP					
Beneficiaries of credit line that are women-led companies operating in the solar and non-solar sectors (Tier 2, 3)	To obtain the percentage of beneficiaries of credit line that are female entrepreneurs, two variables will be needed: (i) the numerator-- the number of female beneficiaries and (ii) the denominator, the total number of	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE

	beneficiaries.				
Loans (in USD) accessed by households, productive end-users, distribution companies and energy service companies through debt facilities.	The amount will be expressed in USD. USD equivalents of loans given in local currencies will be calculated by the commercial financial institution, the prevailing exchange rate at the time that the loan was contracted.	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE
Households, productive end-users, distribution companies and energy service companies accessing debt facilities.	Four categories of potential beneficiaries of financing through borrowing from banks, commercial financial institutions or leasing companies or microfinance companies are reference in this indicator-- (a) households, (b) productive end-users, (c) distribution companies and (3) energy service companies. Households: A household is a house and its occupants	Bi-annual	ECREEE M&E	ECREEE Monitoring and Evaluation	ECREEE

	regarded as a unit. Productive end use/application of solar power systems include the following: (i) Connectivity, (ii) Small Medium Enterprise (SME) applications, and (iii) Value added applications. Productive End Use (PEU) of energy refers to activities that increase income or productivity in different sectors such as agriculture (e.g. irrigation, grain milling), manufacturing (e.g. carpentry, welding, and sewing), and the service sector (e.g. restaurants using electric lights, sound systems, refrigerators, mobile charging stations etc.)				
CFI to report on amount of loans disbursed, amount of loans repaid,	This indicator will measure the performance of the	Bi-annual	CFI reports to BOAD		BOAD

amount of NPLs to BOAD	loans extended by the CFIs to the solar entrepreneurs.				

ANNEX 1: IMPLEMENTATION ARRANGEMENTS AND SUPPORT PLAN

REGION: Western Africa
Regional Off-Grid Electrification Project (ROGEP)

Project Institutional and Implementation Arrangements

1. ECREEE has established a PIU and is responsible for M&E of project activities. ECOWAS Commission will provide oversight on the ROGEP implementation through its Commissioner, Energy and Mines. ECREEE will be responsible for implementing TA and capacity-building activities (Component 1), such as conducting market intelligence studies, providing policy and regulatory support, conducting consumer education activities for institutions and end consumers, assisting in a robust QA framework for the products and services, providing business development support to the private sector enterprises in the project, engaging with the public institutions to be electrified under the project, providing financing support to early stage solar businesses, and providing financial incentives to companies operating in challenging markets.

2. The World Bank will directly lend funds to BOAD for the access to finance component (Component 2). BOAD will provide a line of credit facility to eligible CFIs operating in WAEMU countries. These CFIs will lend funds to private solar companies based on standards set in the POM. BOAD will have to comply with the World Bank's Guidelines for Financial Intermediary Financing to remain an eligible World Bank borrower. In addition, BOAD will use contingent recovery grant funds from CTF to provide comfort to CFIs when lending to entrepreneurs promoting innovative solar technologies following new business models.

Financial Management

3. An assessment of the FM arrangements of the implementing entities, ECREEE and BOAD, has been conducted. The objective of the assessment was to determine whether these agencies have adequate FM arrangements (including planning and budgeting, accounting, internal control, funds flow, financial reporting, and auditing). The FM arrangements are acceptable if they are considered capable of (a) recording correctly all budgets, transactions, and balances; (b) supporting the preparation of regular and reliable financial statements; (c) safeguarding the entity's assets; and (d) being subject to auditing arrangements acceptable to the World Bank. The FM assessment was carried out in accordance with the FM Manual for World Bank Investment Project Financing Operations that became effective on March 1, 2010 and revised on February 10, 2017.

4. **Institutional and implementation arrangements.** The project will have two regional implementing agencies: (a) ECREEE and (b) BOAD. ECREEE will receive regional IDA grant, CTF grant, and

ESMAP Grants from DGIS. It will be responsible for implementing TA; undertaking capacity-building activities; and providing financing support to solar companies through matching grants, market entry grants, and performance grants (Component 1). BOAD will receive IDA SUF loan and CTF contingent recovery grant to implement the access to finance activities (Component 2). BOAD will provide line of credit facility to CFIs to provide working capital and medium-term financing needs of solar companies. BOAD will use a contingent grant facility to comfort the CFIs against technology risk, when lending to solar entrepreneurs promoting innovating technologies. ECREEE and BOAD will receive funds directly from the World Bank, which will be disbursed using a report-based disbursement mechanism.

Summary of FM Assessment by Entity

ECREEE

5. For the implementation of ROGEP, ECREEE has established a PIU with a project coordinator, who is supported by an FM specialist and other specialists. The ECOWAS Commission will provide oversight on ROGEP implementation which will be detailed in the POM. ECREEE will have the overall responsibility for the FM of the project.

6. ECREEE is not familiar with World Bank-financed projects as ROGEP is its first engagement with the World Bank. It has started implementing the PPA for ROGEP and gained experience on World Bank policies and regulations. ECREEE has some experience implementing donor-funded projects. In addition, ECREEE has (a) sound FM regulations in relation to ECOWAS financial rules; (b) a manual of administrative and FM procedures with adequate segregation of duties; (c) qualified and experienced FM staff (FM specialist, accountant, accountant assistant, and ECOWAS financial controller); (d) adequate accounting software and accounting policies and procedures; (e) acceptable budgeting arrangements; and (f) the Internal Audit Department of ECOWAS that performs post reviews of ECREEE's activities.

7. However, the FM assessment identified the following weaknesses: (a) an inadequate internal control environment as individuals are not held accountable for failing to comply with their internal control responsibilities; (b) an inadequate organizational structure prevails as authority is not adequately delegated and reporting lines are not properly established; and (c) the ECOWAS accounting manual is being used and has not been updated to support ROGEP. These risks, if not mitigated adequately, may weaken the fiduciary environment and delay project implementation.

8. The following risk mitigation measures have been agreed to: (a) raise management awareness by providing training on the importance of maintaining an adequate control environment within ECREEE; (b) ensure ECOWAS Commission oversight on ROGEP implementation and reflect the detail arrangement in POM; (c) strengthen the PIU organization structure to clarify roles and responsibilities in the POM; (d) ensure delegated authority to project coordinator to implement ROGEP to avoid implementation delays

and reflect in the POM; (e) include a specific annex on FM in the POM including fiduciary procedures applicable to World Bank-financed operations; (f) recruit an external auditor to audit the PPA along with the first fiscal year of the project; (g) train the FM staff on World Bank fiduciary procedures no later than one month after effectiveness; and (h) provide internal audit reports conducted on a semester basis to IDA.

9. In the meantime, some of these weaknesses have been addressed. The entity audit report of 2015, 2016, and 2017 has recently been completed and submitted to the World Bank. The organizational structure has been corrected and reporting lines are now correctly established. FM procedures applicable to ROGEP will be included in the POM.

10. The FM risk for the project was initially rated High mainly because of the weak internal control environment and the delays in performing external audits. ECREEE has agreed to reflect the abovementioned risk mitigation measures in the POM and accordingly the overall FM residual risk for the project is rated Substantial. The FM arrangements satisfies the minimum requirements under World Bank Policy and Directive for IPF, which will be reflected in the POM.

West African Development Bank

11. **BOAD will be responsible for maintaining satisfactory FM arrangements throughout the life of the lines of credit and contingent grant facility**. This institution will constitute the operational link with the World Bank (IDA) on matters related to the implementation of the line of credit and contingent grant facility. The Head of Finance of BOAD will oversee FM for Component C 2. The fiduciary staff will be trained on the World Bank's FM and disbursement guidelines.

12. **The overall FM risk of the financing to be managed by BOAD is Moderate** and the proposed mitigation measures are (a) the configuration of BOAD's existing accounting software to accommodate the accounts of the new financing and to meet the line of credit business accountability requirements; (b) the induction training of BOAD's FM staff and internal auditors on the World Bank's FM and disbursement guidelines and procedures; (c) incorporating of a specific annex in the POM related to the FM arrangements applicable to the line of credit to be managed by BOAD that are acceptable to the World Bank; (d) BOAD to ensure that its internal audit department includes the project within its work plan; and (e) the preparation and submission to the World Bank of semiannual internal audit reports within 45 days after the end of each internal audit period.

13. BOAD has adequate FM arrangements in place provided the risk mitigation measures are implemented on time, as further detailed in the following paragraphs.

Planning and Budgeting Arrangements

14. For ECREEE, the budgeting process from elaboration to execution and control will be clearly defined in the POM and the budget will be reviewed and adopted by the Board before the beginning of its execution. A clear oversight arrangement of ROGEP implementation by ECOWAS Commission, through the Commissioner, Energy and Mines, will be explained in the POM. Annual draft budgets will be submitted to the World Bank for no-objection before adoption and implementation.

15. BOAD will prepare annual budgets based on its work plans and thereafter submit them to the World Bank at least two months before the beginning of their fiscal year for review and approval. The budgets will follow budgeting guidelines in BOAD's entity, FM Manuals, and POM. During the financial year, budgets will be monitored on a semiannual basis using interim financial reports (IFRs.) The IFRs will compare budget and actual expenditure and significant variances will need to be explained. These IFRs will be expected to be submitted to the World Bank within 45 days after the end of the reporting period.

Accounting Arrangements

ECREEE

16. The current accounting standards used by ECREEE, International Public Sector Accounting Standards (IPSAS), will be applicable to the project. The IPSAS are the accounting standard for public sector financial reporting worldwide. Annual financial statements will be prepared by ECREEE in accordance with the IPSAS. The project accounting will be managed through the accounting software SAP of ECREEE.

BOAD

17. BOAD will use its institutional accounting policies and procedures for the project. To capture project-specific FM requirements, BOAD will include a specific annex in the POM related to the FM arrangements applicable to the line of credit that are acceptable to the World Bank.

18. BOAD has qualified and experienced staff headed by an FM manager. These arrangements are adequate to prepare the accounts related to the line of credit and contingent grant facility. All accounting staff of BOAD will be trained on World Bank FM and disbursement guidelines.

19. BOAD will use Banking Operations Management (*Gestion des Opérations Bancaires,* GOB) for both project and loan management. This should be adequate to manage the line of credit accounts and contingent grant facility, but the GOB needs to be configured to accommodate the World Bank-financed project activities and meet the line of credit and contingent grant facility business accountability requirements. System configuration is to be completed within three months after effectiveness. The

system will also be configured to generate IFRs in the format agreed. In the meantime, IFRs will be prepared using Microsoft Excel.

20. BOAD will use International Financial Reporting Standards (IFRS) issued by the International Federation of Accountants. BOAD's 2017 financial statements were prepared in compliance with IFRS.

Internal Control Arrangements

21. **Governance and anticorruption arrangements**. To enhance transparency and accountability, ECREEE and BOAD will publish the project's budget and audited financial statements on its website each year. With respect to dealing with fraud and anticorruption, the World Bank Anticorruption Guidelines referred to in the Financing Agreement will apply.

ECREEE

22. The project will rely on the existing internal control system comprising (a) policies, rules, and procedures documented into the ECOWAS Financial Regulations; (b) a financial controller position who controls all the transactions before approval and reports to the chief financial controller in ECOWAS headquarters; and (c) an internal audit function headed by a chief internal auditor. However, the assessment identified the following weaknesses in ECREEE's control environment: (a) authorities are delegated and a reporting line is established without any oversight and (b) individuals are not held accountable for their internal control responsibilities.

23. The ECOWAS financial and accounting procedures manual used by ECREEE includes provisions pertaining to segregation of duties, fixed asset management, and accounts reconciliation. For the project, adequate delegation of authority and roles and responsibilities of all stakeholders will be clarified in the POM.

24. The chief internal auditor has confirmed that the work program of the current internal audit function will be updated to include the new project specificities.

BOAD

25. BOAD has an adequately staffed Internal Audit Unit that should effectively conduct the internal audits of the project. However, BOAD's Internal Audit Unit needs to include the project within its work plan to ensure that the audits are done semiannually using a risk-based approach. These semiannual internal audit reports need to be submitted to the World Bank within 45 days after the end of the semiannual period. Internal auditors will also be provided training on the World Bank's FM and disbursement guidelines.

26. BOAD has a functional Audit Committee which is essential in ensuring that the management addresses issues raised by both internal and external auditors. It also provides independence to the Head of Internal Audit who reports to it from a functional perspective while reporting to the management from an administrative perspective.

Financial Reporting Arrangements

27. **ECREEE and BOAD will prepare semiannual unaudited IFRs in form and content satisfactory to the World Bank, which will be submitted to the World Bank within 45 days after the end of the reporting period**. The formats and contents of the IFR will be agreed between the World Bank and both implementing entities. The semiannual IFR will include the following information: (a) statement of sources and uses of funds, (b) statement of uses of funds by project activity/component including comparison with budget for the semester and cumulative, and (c) the designated and project account reconciliation statements and related bank statements.

28. ECREEE and BOAD will also produce the project's annual financial statements in accordance with the applicable financial reporting standards (IPSAS for ECREEE and IFRS for BOAD) and World Bank requirements.

Funds Flow and Disbursement Arrangements

Designated Accounts

29. **ECREEE.** A Designated Account (DA) has been opened at Ecobank Cabo Verde for the PPA. The same DA will be used by the project. The DA will be replenished through the submission of withdrawal applications. Requests for reimbursement and reporting on the use of advances will be accompanied by a statement of expenditure (SOE) providing information on payments for eligible expenditures and records required by the World Bank. All supporting documentation will be retained at ECREEE and must be made available for periodic review by the World Bank's missions and external auditors.

30. BOAD will open a DA to receive funds for Sub-component 2A from the World Bank. This DA will be denominated in euros. The DA will be maintained in either the Central Bank of West African States (*Banque Centrale des Etats de l'Afrique de l'Ouest,* BCEAO) or a commercial bank acceptable to the World Bank. The signatories to the DA should be in line with the FM Manuals of the implementing entities and they should be submitted to the World Bank between the signing of the project and its effectiveness. Payments for eligible expenditure can be made from the DA. For Sub-component 2B, an independent third-party verification agent will review the claims made by the CFIs to benefit from the contingent recovery grant. The CFIs will be responsible for submitting all evidence to determine whether the loan

default was because of underperformance of technology. If the claims are found satisfactory then upon receiving request from BOAD, the World Bank will transfer the requested amount to the CFI.

31. **Disbursement methods.** The following disbursement methods may be used under the project: reimbursement, advance, direct payment, and special commitment as specified in the Disbursement and Financial Information Letter (DFIL) and in accordance with the Disbursement Guidelines for Investment Project Financing, dated February 2017.

32. For ECREEE, disbursements would be transactions based whereby withdrawal applications will be supported with an SOE. Report-based disbursement will be used for funds disbursed to the DA of BOAD. Upon effectiveness, a Withdrawal Application will be submitted to the World Bank, supported by a six-month cash flow forecast and, following the approval of the Withdrawal Application, the World Bank will disburse the initial advance to the DA. Subsequent advances supported by Withdrawal Applications together with semiannual unaudited IFRs supported by a six-month cash flow forecast will be submitted to the World Bank within 45 days after the end of the calendar semiannual period.

33. The DFILs provide details of the disbursement methods, required documentation, DA ceiling, and minimum application size.

Figure 1.1. ECREEE Funds Flow Diagram

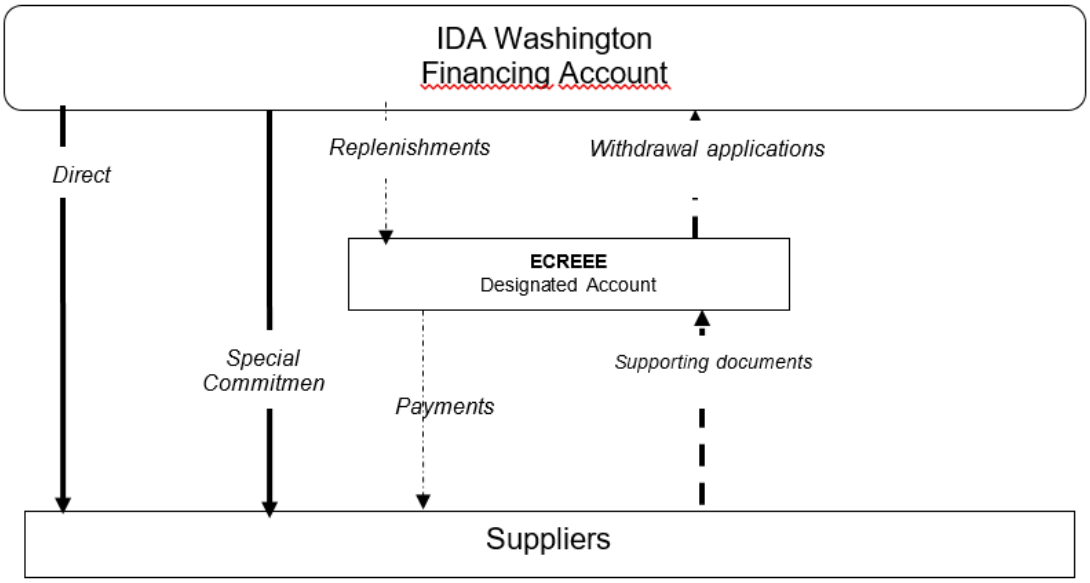
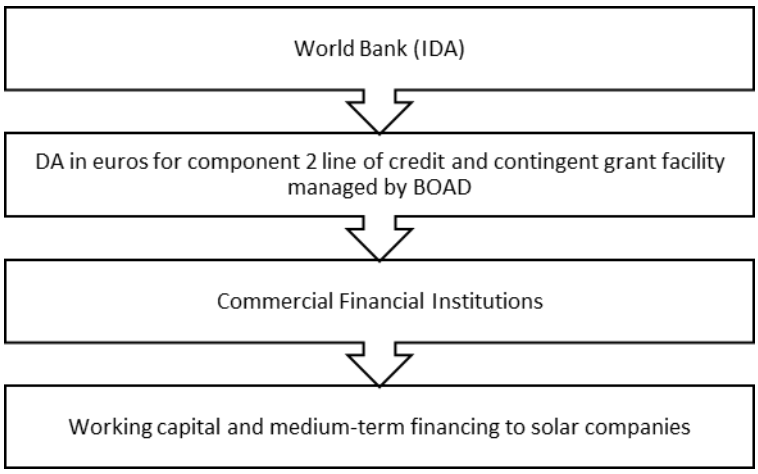


Figure 1.2. BOAD Funds Flow Diagram



Auditing Arrangements

34. **For all implementing entities.** The external audit of the project's funds will be done by a private audit firm acceptable to the World Bank based on TOR cleared by the World Bank. For ECREEE, the TOR of the external audit of the project will include an annual interim review of the institutional internal controls applicable to the project. The audit will be carried out in accordance with the International Standards on Auditing. The audit report together with the Management Letter will be submitted to the World Bank within six months after the end of the financial year. The financial years for preparing audited accounts will follow the financial year of the implementing entity. Audit reports will be publicly disclosed by the World Bank in accordance with the World Bank disclosure policy.

FM Action plan

35. The FM Action Plan described in Table 1.1 has been developed to mitigate the overall FM risks.

Table 1.1. FM Action Plan for ECREEE

No.	Action	Due Date	Responsible Entity
1	Recruit an independent external auditor for ROGEP satisfactory to the Association.	Four months after effectiveness.	ECREEE
2	Training its staff on fiduciary aspects of World Bank procedures that apply to the Project.	Not later than one month after effectiveness.	ECREEE
3	ECREEE submits annual audited financial statements of the entity.	15 months after end of the audit period.	ECREEE

No.	Action	Due Date	Responsible Entity
4	Require ECREEE to provide its semiannual internal audit reports generated by the ECOWAS' office of the auditor general.	4 months s after each semester end.	ECREEE

Table 1.2. FM Action Plan for BOAD

No.	Action	Due Date	Responsibility
1	Configure and set up a "multi-project" computerized accounting system, satisfactory to the Association, to fit the needs of Part 2 of the Project and generate useful information and financial statements.	Within 3 months after effectiveness.	BOAD
2	Submit semiannual internal audit reports to the World Bank.	Within 60 days after the end of the audit period.	BOAD
3	Ensure that BOAD's internal audit department includes the Project within its work plan and provides semiannual internal audit report to the Association after the end of the relevant semiannual period.	Within 60 days after the end of the audit period.	BOAD
4	Ensure that BOAD's external auditor, when acting as the independent auditor acceptable to the Association, shall have qualifications and experience satisfactory to the Association and shall carry out its functions under terms of reference approved by the Association.	Ongoing.	BOAD
5	Submits annual audited financial statements of BOAD	Within 6 months after the end of audit period	BOAD
6	Prepare and submit annual audited financial statements of BOAD to the Association.	Not later than June 30 of each Fiscal Year	BOAD

Financial Covenants

36. **Financial covenants.** Financial covenants are the standard ones as stated in Section 5.09 of the IDA General Conditions and Section 2.07 (b) of the Standard Conditions for trust-funded grants and specific FM aspects are included in the DFIL. The additional covenants stipulated in the above referenced FM action plans are added to the legal agreements.

Implementation Support Plan

37. FM Implementation support missions will be carried out as outlined in Table 1.3. Implementation support will also include desk reviews such as the review of the IFRs and audit reports. In-depth reviews

and forensic reviews may be done where deemed necessary. The FM implementation support will be an integrated part of the project's implementation reviews.

Table 1.3. Implementation Support Plan

FM Activity	Frequency	
Desk reviews	**ECREEE (Substantial risk)**	**BOAD (Moderate risk)**
IFR review	Quarterly	Semiannual
Audit report review of the project	Annually	Annually
Review of other relevant information such as interim internal control systems reports	Continuous as they become available	
On-site visits		
Review of overall operation of the FM system	Semiannual (Implementation Support Mission)	Annual
Monitoring of actions taken on issues highlighted in audit reports, auditors' Management Letters, internal audit, and other reports	As needed	As needed
Transaction reviews (if needed)	As part of Implementation Support Missions	
Capacity-building support		
FM training sessions	Before implementation and as and when needed	

38. **Conclusion.** The conclusion of the assessment is that the FM arrangements in place meet the World Bank's (IDA's) minimum requirements under the World Bank Policy and Directive for IPF operations and therefore are adequate to provide, with reasonable assurance, accurate and timely information on the status of the project required by the World Bank (IDA). The overall FM risk is Substantial for ECREEE and Moderate for BOAD and the proposed mitigation measures are described in the FM Action Plan.

Procurement

39. Procurement under Subcomponents 1A, 1B, 1C, and 1D will be carried out in accordance with the World Bank procedures: The World Bank Procurement Regulations for IPF Borrowers (July 2016, revised in November 2017 and August 2018); Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants, dated October 15, 2006, and revised in January 2011 and as of July 2016; and other provisions stipulated in the Financing Agreements.

40. Procurement under Subcomponents 1A and 1B shall be carried out by ECREEE. The categories of procurement to be carried out are (a) consulting services which are mainly TA and capacity-building activities, such as conducting market intelligence studies, providing policy and regulatory support,

conducting consumer education activities for institutions and end consumers, assisting in a robust QA framework for the products and services, and providing business development support to the private sector enterprises in the project; (b) selection of a fund manager to support implementation of Sub-component 1C and 1D; (c) some small contracts for the procurement of goods, which would include stand-alone solar systems for pilot electrification of public institutions, water pumps, and streetlights; and (d) works for the installation of equipment under subcomponent 1A of the project to explore new business models to promote use of stand-alone solar systems in public institutions and productive use applications). The appropriate selection method for each consulting services, goods and works contract would be established in the Procurement Plan.

41. ECREEE will identify solar entrepreneurs to benefit under Subcomponent 1C and 1D following a set of eligibility criteria to be stated in the POM. The beneficiary solar entrepreneurs will follow commercial practices as per the World Bank Procurement Regulations for IPF Borrowers.

42. The World Bank has assessed the abovementioned arrangements. This is the first World Bank-funded project that will be implemented by ECREEE. A PIU staffed with qualified staff including a procurement specialist has been set up by ECREEE for the project. The PIU is currently implementing the PPA under the project and the performance so far is satisfactory. When the project is launched, ECREEE procurement-related staff will be provided with training workshop on the World Bank's Procurement Regulations.

43. ECREEE has prepared the Project Procurement Strategy for Development (PPSD) and the World Bank has reviewed the document. ECREEE has demonstrated its procurement and contract management capacity during the preparation of the project as it received US$5 million project preparation advance. ECREEE has established a well-functioning Project Implementation Unit (PIU) with an experienced procurement specialist, responsible for the execution and monitoring of all procurement activities. During the execution of procurement activities standard documents of the World Bank were used and all draft documents were subject to review and approval by the Executive Director, ECREEE and the World Bank when required.

44. Consistent with the PPSD, an initial Procurement Plan covering the activities of the first 18 months of the project implementation has been developed and agreed for ECREEE. This document will be disclosed on the World Bank's external website. The Procurement Plan will be updated in agreement with the World Bank annually or as required to reflect the project's actual implementation needs and improvements in institutional capacity.

Environmental and Social (including safeguards)

45. The World Bank E&S standards and management system requirements applied to this project will be governed by the provisions of OP/BP 4.03 (World Bank Performance Standards for Private Sector Activities). The approach will be consistent with the policy provisions for projects involving FIs. The project is categorized FI–2 in line with OP 4.03.

46. In line with OP 4.03, the approach to E&S risk management for ROGEP is that of putting in place and implementing an ESMS that will adequately address the risks specific to the project. All key implementing entities—ECREEE, BOAD, CFIs, private sector solar companies, government agencies, specialized E&S consulting firms, and experts—will all have roles and responsibilities. Such an ESMS shall have as its basis the institutional systems of the entities involved, as well as elements that supplement the current systems to ensure adequate management of project-specific risks.

47. As part of preparing the E&S risk management approach for ROGEP, an assessment of current E&S systems and capacity of ECREEE and BOAD—as main implementing partners—has been carried out and an action plan prepared to ensure that these systems are strengthened during ROGEP implementation.

48. BOAD currently has in place institutional E&S risk management systems that cover all its operations, including those conducted through CFIs.

49. In particular, BOAD has established the following elements of an institution-wide ESMS: (a) institutional E&S policy and procedures that incorporate the approach to lending through FIs (current version dated May 2015);[31] (b) manual for assessment of financial sector operations, which further elaborates BOAD's procedures for FI lending; and (c) assessment questionnaire for FIs that BOAD lends to, which must be filled out and submitted by all CFIs that apply for BOAD's funding.

50. With regard to institutional capacity, BOAD currently has six staff and consultants dedicated to E&S issues within its Department of Operations (Directorate for the Environment and Climate Finance). The Directorate for Enterprises and Financial Institutions is situated in the same department, which makes coordination on E&S risk management for those types of operations more efficient. One environmental specialist and one social specialist will be assigned to the project, either from the existing staff or through hiring additional staff.

[31] *Politiques opérationnelles et procédures d'intervention de la banque ouest africaine de développement en matière de gestion environnementale et sociale dans le financement des projets, "Prêts d'investissement sectoriels et prêts à des intermédiaires financiers."*

51. ECREEE—as the implementing agency for Component 1 of ROGEP—is setting up an E&S team to ensure that grant applications from solar companies meet the requirements for E&S screening, risk mitigation, and monitoring, as well as supervising the E&S aspects of the grant activities. ECREEE has a part-time E&S specialist within the PIU. The specialist has taken on this role in addition to the core role of financial sector specialist. He has adequate skills and background in E&S risk management for the financial sector operations and had undergone reputable international training in this area (United Nations Environment Programme FI). However, his availability for E&S-related matters is limited and ECREEE shall strengthen its capacity for project implementation by appointing an environmental and health and safety specialist. The PIU has a gender specialist with experience in social development issues.

52. For the implementation of ROGEP, it is important to understand that to date, BOAD has not implemented any sector-specific credit lines and therefore their institutional systems for E&S are not adapted to this type of lending (as opposed to current credit lines that are cross-sectoral to MSMEs and microfinance). The risk management tools underlying the E&S institutional processes for cross-sectoral credit lines are broad and may create unnecessary burden on CFIs when they evaluate sector-specific E&S risks for stand-alone solar system companies. Therefore, to supplement the institutional E&S systems and capacity and ensure that specific risks of lending to stand-alone solar systems sector are adequately addressed the following two core documents have been prepared and disclosed on February 8, 2019. These will be integrated into BOAD's institutional systems, as well as for ECREEE in the ROGEP POM: (a)the ESRM Sector Guide for Off-Grid Solar that will be required for use by CFIs that will avail ROGEP credit line to ensure adequate and systematic screening of E&S risks and impacts specific to the stand-alone solar systems businesses and (b) the ESRM Strategy that will address issues that cannot be managed at the operational level alone.

53. As part of the ESRM Strategy, the following issues are expected to be addressed. The estimated budget will be supported from Sub-component 1A.

Table 1.4.Expected E&S Activities and Estimated Budget Implemented by ECREEE

E&I Issues	Expected Activities	Estimated Amount (US$)	Responsible Party
1. Waste management (e-waste, used batteries)	Policy dialogue at country and regional level, TA to Governments to put in place specific e-waste management measures for solar industry, raising awareness among end users about these risks; and designing a long-term solution to managing the e-waste	25,000	ECREEE
2. Gender actions under E&S (inclusion of women, addressing	Under E&S the following actions are included to prevent and mitigate GBV/sexual exploitation and abuse (SEA) risks: train and build the capacities on	25,000	ECREEE

E&I Issues	Expected Activities	Estimated Amount (US$)	Responsible Party
gender-based violence [GBV], and so on)	GBV/SEA prevention and mitigation measures, including a process for handling GBV/SEA complaints through GRMs; establish a code of conduct for beneficiary companies to prevent GBV/SEA, including termination of employees/contractors engaging in GBV/SEA; and so on.		
3. Inclusion of vulnerable groups	Engage with stakeholders to reduce any prejudice or discrimination; improve inclusion, especially for female-headed households, elderly, disabled, and internally displaced people; education of illiterate and semiliterate end users through adult education approaches programs.	10,000	ECREEE
4. Supply chain sustainability	Actions can include integrating key E&S considerations in product standards/certification (for example, fair labor practices during production), raising awareness of CFIs and solar companies of supply chain E&S risks, raising public awareness, and building trust and demand for products produced in a sustainable way.	20,000	ECREEE
5. Awareness on E&S issues among key stakeholders	Promotional program and training programs	15,000	ECREEE
6. Institutional capacity for ESRM in the financial sector (development banks, CFIs)	Support to CFIs on how to integrate ESRM tools in their operations under lines of credit; training program for CFIs (risk and credit staff)	65,000	BOAD to lead and ECREEE to support
7. Capacity of solar companies for ESMS implementation	Providing solar companies with awareness and technical training on relevant E&S issues	25,000	ECREEE to lead and BOAD to support
8. E&S operational monitoring	Commission periodic independent E&S audit for CFIs and solar companies to ensure that E&S screening and assessment are properly implemented.	10,000	BOAD and ECREEE
9. Citizen/end user engagement	Support the education and awareness under the project's key delivery areas, households, small businesses, and other stakeholders; awareness raising of end users on key E&S issues that affect them (for example, water consumption and water quality for panel washing).	50,000	ECREEE

E&I Issues	Expected Activities	Estimated Amount (US$)	Responsible Party
10. Design and implementation of a grievance mechanism	Developing a mechanism at the ECREEE level (as PIU); integrating it at various levels of the project (BOAD, CFIs, and companies); and ensuring proper functioning of the mechanism (including through independent E&S audit)	25,000	BOAD and ECREEE
11. South-South knowledge exchange	Knowledge exchange activities across project countries; learning for BOAD on ESRM systems in other development banks	25,000	ECREEE
TOTAL		**295,000**	

54. To ensure that all elements described above are adequately implemented, the following E&S action plan must be implemented by all key entities involved.

Table 1.5. Environment and Social Risk Management Action Plan

No.	Action	Due Date	Responsibility
1	BOAD to maintain, throughout Project implementation, at least one (1) dedicated environmental, health and safety specialist and one (1) dedicated specialist in social development issues, including labor as required, and adequate numbers of qualified supporting staff, to be responsible for the management of the environmental, social, labor and health and safety matters for Component 2 of the Project and for the coordination of the implementation of the Environmental and Social Instruments.	Ongoing	BOAD
	BOAD shall establish, and thereafter maintain, operate and publicize the availability of, throughout project implementation, a functional grievance redress mechanism for Component 2 of the project, with adequate staffing and processes, and in form and substance satisfactory to the Association, to register, hear and determine fairly and in good faith all complaints raised in relation to Component 2 of the project, including those related to the environmental and social matters, and take all measures necessary to implement the determinations made by such mechanism in a manner satisfactory to the Association.	Not later than three (3) months after the Effective Date and thereafter, ongoing	

No.	Action	Due Date	Responsibility
2	ECREEE and BOAD to deliver to the Association an Annual Environmental and Social Monitoring Report confirming compliance with the Performance Standards, the relevant provisions of the Environmental and Social Instruments and Applicable Environmental and Social Laws or, as the case may be, detailing any non-compliance or Project-related complaints, including but not limited any alleged Project-related violation pertaining to labor matters, Project-related incidents and accidents as well as any Project-related allegations of gender-based violence, and setting out the action being taken to ensure compliance and/or address Project-related complaints.	Within 45 days after the end of each Fiscal Year for ECREEE and within 60 days after the end of each Fiscal Year for BOAD E	ECREEE and BOAD
3	ECREEE to employ for the PIU an environmental, health and safety specialist under terms of reference and with qualifications and experience satisfactory to the Association. ECREEE to maintain, throughout Project implementation, at least one (1) environmental and health and safety specialist and at least one (1) gender specialist (with experience in social development issues) and adequate numbers of qualified supporting staff, to be responsible for the management of the environmental, social, labor and health and safety matters for Part 1 of the Project and for the coordination of the implementation of the Environmental and Social Instruments. ECREEE to maintain, operate and publicize the availability of, throughout Project implementation, a functional grievance redress mechanism for Part 1 of the Project, with adequate staffing and processes, and in form and substance satisfactory to the Association, to register, hear and determine fairly and in good faith all complaints raised in relation to Part 1 of the Project, including those related to the environmental and social matters, and take all measures necessary to implement the determinations made by such mechanism in a manner satisfactory to the Association.	Three months after the Effective Day Ongoing Ongoing	ECREEE

55. The ECREEE PIU is responsible for the overall M&E of the ROGEP results under Component 1 of the project. The PIU is staffed with an M&E expert, who will be coordinating with all PIU staff responsible for implementation of different ROGEP activities. ECREEE will also coordinate with BOAD to understand the results achieved from the access to finance component. BOAD will be responsible for the overall M&E of Component 2 of the project. BOAD and ECREEE has finalized a reporting format, which will be agreed with the CFI, when lending funds to them. A similar reporting format will have to be submitted by the private solar companies to the CFIs as part of their Financing Agreement. ECREEE will collect these information and compile in a quarterly progress report, which will be submitted to the World Bank within 45 days after the end of each quarter.

Role of Partners

56. ROGEP SOP1 will partner with CTF and use its grant and contingent recovery grant to provide adequate incentive to the private solar companies and comfort to the CFIs to promote innovative solar technologies and business models. The project may also benefit from the Government of Netherlands (DGIS) grant funding support during implementation which will be dedicated to support project stakeholders operating in challenging markets, such as Sahel countries. ROGEP will partner with IFC and MIGA to benefit from IDA PSW to provide risk mitigation facility to eligible CFIs when lending to stand-alone solar companies. A total of 16 of the 19 ROGEP countries are eligible to benefit from IDA PSW and therefore eligible under IFC SGLPL. As part of this partnership, IFC will extend its SLGP to provide 50 percent portfolio loss guarantee to eligible CFIs when extending loans to stand-alone solar companies. MIGA will be involved in subsequent ROGEP SOP to support electrification of public institutions. MIGA will develop a separate guarantee structure to mitigate the nonpayment risk of public institutions when electricity service is provided by private solar companies under a Power Purchase Agreement.

Strategy and Approach for Implementation Support

57. The ROGEP SOP task team was strengthened by active participation from the Finance Competitiveness and Innovation Global Practice (FCI GP) and the Lighting Africa Program funded by ESMAP. The same level of support and collaboration from the FCI GP and Lighting Africa Program should continue at the project implementation phase to support the implementation agencies implementing the project according to its design. Specific support would be needed from the Lighting Africa Program when finalizing the regional policy recommendations on harmonized QA framework, CET, and so on. Support from FCI GP would be needed for implementation review of the project.

Implementation Support Plan and Resource Requirements

Table 1.6. Implementation Support Plan

Activities	Frequency during the Project Period
Project Components	
Sub-component 1A: Support from Lighting Africa Program	As needed
Subcomponent 1B: Support from FCI GP	As needed
Subcomponent 1C: Support from FCI GP	As needed
Subcomponent 1D: Support from FCI GP	As needed
Subcomponent 2A: Support from FCI GP	As needed
Subcomponent 2B: Support from FCI GP	As needed
Implementation Support Mission	Biannually
Procurement	
Desk review of procurement requests	As needed
Implementation Support Mission	Annually
Disbursement	
Disbursement training sessions	As needed
FM Activity	
IFR review	Biannually
Audit report review of the project	Annually
Implementation Support Missions	Annually
E&S	
Review of implementation performance and policy documentations	As needed
Implementation support mission	Annually
Capacity-building support	
Fiduciary, safeguards, M&E, gender, GIS	As needed

58. All subcomponents of the project will complete implementation of their planned activities by June 30, 2024, except Subcomponent 2B Contingent Grant Facility. The Grant Agreement will remain opened until December 31, 2030, to compensate CFIs, if solar companies cannot generate sufficient revenues, which result in an inability to pay debt obligations. The task team will receive funding from CTF against activities required for supervising the contingent grant facility until the closing of the project.

ANNEX 2: DETAILED PROJECT DESCRIPTION

REGION: West Africa and Sahel
Regional Off Grid Electrification Project (ROGEP)

Geographic Scope

1. The project will benefit 19 countries in the West Africa and Sahel region. Of these, 15 countries belong to the ECOWAS—Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo—along with four additional countries: Cameroon, the Central African Republic, Chad, and Mauritania.

Figure 2.1. ROGEP Geographic Scope

Project Background

2. More than 50 percent of the population in the Sahel and broader West Africa region does not have access to electricity. Of the 406 million people residing in this region, 208 million inhabitants do not have access to electricity, 70 percent of whom live in rural areas. Moreover, many grid-connected customers, 67 percent of whom live in urban areas, receive less than ideal service from the grid due to power generation deficits and poor reliability. The electrification rate of public institutions including schools and health centers is very low, and efforts made to electrify them have been insufficient.

3. West African Governments need a viable strategy to electrify 208 million people or about 35 million households. On average, the cost of connecting a new consumer through grid is about US$2,000, and this cost increases significantly for geographically isolated consumers. Electricity utilities in the region do not consider grid expansion as a financially and economically viable investment to electrify consumers in many rural and dispersed geographic locations at the current electricity tariff levels. Most power utilities are also facing financing constraints to even maintain the existing grid network. Private sector participation in grid electricity distribution business had therefore been only limited within urban and in high concentrated load areas in few countries.

4. Innovations in solar PV technologies and business models have transformed electricity access potential in Sub-Saharan Africa, particularly for consumers who are far from the grid network. Private sector companies have shown keen interest to participate in developing stand-alone solar system markets in areas without grid electricity. If Governments remove policy, financing, and market development barriers, this new technology can help Governments achieve their universal electricity access targets through private sector participation and in a sustainable manner. Lessons from successful initiatives from other regions such as East Africa may help the West Africa and Sahel region benefit from these technological innovations and new business models.

5. However, the West African market is fragmented. There are many countries with small populations offering small markets. Private companies are currently focused on a few larger countries such as Nigeria, Côte d'Ivoire, Ghana, and Senegal and have not yet entered most others. The ECOWAS objective of creating a regional market and free movement of goods and people is far from realization. Unfavorable business environments, trade policies, and customs and tax regimes deter entry to these markets. Most countries are subsidizing grid electricity tariffs while taxing the stand-alone solar system products. West African countries either have no approved technical standard for solar PV technologies developing their own standards, which fragments the market further. Having regional standards on QA framework for solar products could protect consumers from low-quality products and attract more companies in West Africa.

6. Access to finance for stand-alone solar system companies is a major challenge. Commercial lenders are reluctant to lend to SMEs in general, and the solar equipment and service companies are relatively new and hence less attractive. The sector is nascent and evolving rapidly. There is a perception of high risk due to lack of sufficient operating track record. Many of the companies cannot meet lenders' collateral requirements. Local currency debt is even more challenging. Domestic interest rates are too high for solar companies in many ECOWAS countries. The companies mainly rely on donor financing, impact investors, and, in a few cases, hard currency debt. Electrifying off-grid public institutions such as schools and hospitals is further hindered by higher credit risk, nonpayment risk, and the perceived political risk of discontinuing services in the event of nonpayment.

7. In this context, ECREEE seeks to create a regional market in West Africa and in Sahel to benefit the region by overcoming the country-specific barriers to OGS investment. ECREEE will partner with BOAD to achieve its target of providing access to electricity to a market of nearly 400 million people.

8. To reach this target, ECREEE will undertake activities such as identify the market barriers to stand-alone solar systems' penetration, foster the entrepreneurial ecosystem to address the lack of local entrepreneurs, incentivize the finance sector to invest in stand-alone solar systems companies, and provide access to finance for stand-alone solar system businesses.

Project Description

9. ROGEP comprises two main components: (a) developing a regional market and (b) providing access to finance for stand-alone solar system businesses. The project will apply the Lighting Global Quality Assurance[32] (LGQA) framework and will help the project countries develop a QA framework for stand-alone solar systems for institutional applications such as health clinics, schools, and other public administration offices to ensure the long-term performance of these systems. Figure 2.2 shows the types of stand-alone solar systems supported by the project.

10. The project will inform potential end users of the many benefits of high-quality stand-alone solar systems through producing consumer awareness materials and conducting consumer awareness campaigns in project countries aimed at behavioral change toward stand-alone solar systems familiarity and adoption. Access to finance all along the supply chain requires engagement from the private sector for developing and running the stand-alone solar systems market. Distributors need working capital to hold adequate product stocks, and service providers need long-term debt to finance their capital investment. The proposed project will provide this support to the private sector in the form of working capital loans or long-term loans through an experienced and responsible FI such as BOAD that can enable the private sector distributors and service providers to provide electricity access to the unelectrified population. Finally, the project will support market intelligence studies demonstrating the opportunities and challenges presented by the stand-alone solar systems markets in the project countries. These studies will provide critical data to help manufacturers, distributors, and retailers make informed business decisions. An example of a critical area for study in the project countries includes import tax, duty, and other tax regimes on stand-alone solar systems lighting products that affect the creation and sustainability of broader stand-alone solar systems markets.

[32] The LGQA framework is designed to support the market development of modern off-grid lighting and energy systems. More information on testing methods and quality standards is available at https://www.lightingglobal.org/qa/standards.

Figure 2.2. Stand-alone Solar Systems Supported under the Project with Corresponding Usage and Price Range

11. With advancement in solar PV technologies, stand-alone solar systems have the potential to significantly transform electricity access in Sub-Saharan Africa[33] for consumers who are far from the grid network and those who are connected to the grid but do not receive reliable supply. A significant portion of the population in the region is dispersed over vast geographical areas with low population density (below 20 people per km^2) and is unlikely to benefit from grid-connected electricity in the short to medium term. However, with the dramatic reduction in costs over the past few years, solar PV technology has become a rational choice to contribute substantially to increase electricity access in Sub-Saharan Africa.[34]

[33] The Climate Is Right: Scaling Off-Grid Solar Solutions in Sub-Saharan Africa - The World Bank's New Approach for Achieving Access to Modern Energy Services.
[34] The Climate Is Right: Scaling Off-Grid Solar Solutions in Sub-Saharan Africa - The World Bank's New Approach for Achieving Access to Modern Energy Services.

Under the MTF[35] of measuring energy access, general SHS can meet the Tier 1–3 level of energy access, which is the typical consumption pattern of households in Sub-Saharan Africa. Specially designed larger PV systems can provide electricity to SMEs, public institutions, and community facilities. Stand-alone solar systems meet consumer energy needs more readily and represent an important first step on the energy access ladder.

12. Currently, the stand-alone solar systems market in Africa is largely confined to East Africa.[36] In Africa, these stand-alone solar systems have improved electricity access to about 17.3 million people. However, this market development has been asymmetric and faces many key barriers, namely, access to finance, poor regulatory framework to ensure import of quality products, lack of business models that ensure proper financing for O&M, and lack of CFIs to provide funding at scale.

13. The Western African and Sahel countries, where the access indicators are very weak, are yet to benefit from the advancements made in the stand-alone solar systems sector for various reasons, including smaller sizes of country economies, lack of appropriate policy and regulatory environments, absence of supporting ecosystem for the solar industry, poor access to finance, and moreover lack of clear information on the demand and customer segments. Solar manufacturers and importers, who presently drive the stand-alone solar systems industry, consider it a riskier proposition to enter into smaller markets and absorb all upfront-front costs of market creation. This makes the case for a regional program to help create a sustainable market for stand-alone solar systems in the broader West Africa and Sahel region. ROGEP is therefore designed as a regional program to help seed the regional market, create the necessary supporting ecosystem and enabling environment, and attract solar companies and investors into the region. This will create interests and momentum in the countries to put in place the right policy and enabling infrastructure to take full advantage of the regional developments. Riding on the interests from the industry and enticing them with the bigger regional market, ROGEP aims to create the necessary 'pull' to get the companies and investors interested in the western African region. At the subsequent phase, country-specific programs and engagements will be directed to equip countries to attract solar companies to work with sector institutions and other stakeholders to fully exploit the stand-alone solar systems potential in the countries.

14. For instance, agreement on quality standards for solar lighting products among the Sahel and West African countries can benefit the private sector solar PV product manufacturers as they get access

[35] Multi-Tier Framework for Measuring Energy Access redefines energy access from the traditional binary count to a multidimensional definition as "the ability to avail energy that is adequate, available when needed, reliable, of good quality, convenient, affordable, legal, healthy and safe for all required energy services." That is, having an electricity connection does not necessarily mean having access to electricity under the new definition, which also takes into account other aspects, for example, reliability and affordability. Energy access is measured in the tiered spectrum, from Tier 0 (no access) to Tier 5 (the highest level of access).

[36] Off-Grid Solar Market Trends Report 2016 (Bloomberg, Lighting Global program – WBG), February 2016.

to a large contiguous market, which will result in targeted research and development and manufacturing and, hence, significant cost reduction. Only a regional program can promote the concept of regional standards and support the countries to adopt similar standards to help create a common market. Regional agreement on important trade issues such as taxes and duties would facilitate easy movements of products across countries making them more accessible and affordable to consumers. This will increase trade in between the countries in Sahel and in West Africa, creating jobs and incentive structures to support a sustainable market.

15. Access to finance is a binding constraint that limits solar equipment market growth in all the ROGEP countries. This is borne out by the market studies funded by ROGEP and carried out by ECREEE through consulting firms. Globally, liquidity will be squeezed over the next few years as central banks in developed countries eliminate quantitative easing programs and money supply tightens. Dollar interest rates are set to rise further and developing countries that rely on externally financed debt will experience increasing liquidity constraints. BCEAO, the central bank of the WAEMU region, already tightened liquidity in 2016 by limiting the access of commercial banks to its CFA franc funding window. In May 2017, at a ROGEP workshop in Dakar, commercial banks and companies reported significant evidence of liquidity shortages in the Senegalese financial sector. Countries with less developed financial markets than Senegal are expected to have similar or more serious shortages of funding for SMEs. Providing access to finance to private companies in different stages of development and in countries with widely differing interest rates and currency regimes is a challenging task. By forming partnerships with suitable African banks in each country under a regional program, including a policy reform component and a risk mitigation component, necessary FI arrangements can be put in place to provide the line of credits to eligible private enterprises in the project countries. ROGEP is designed around the above considerations.

16. In addition to liquidity constraints (requiring access to capital), commercial banks also perceive the risk of providing financing to solar enterprise to be high, compared to financing of traditional businesses, where banks are already familiar with the businesses. Most of the solar enterprises, given the state of the industry, do not have an established track record, and thus, banks cannot assess the management and technology performance risk. To mitigate the risks, banks often demand significant collaterals, making it difficult for the enterprises to access commercial financing.

17. The contingent grant facility will be used to engage commercial banks in lending to ‘Stage 2’ and ‘Stage 3’ solar enterprises promoting innovative solar technologies. ROGEP will support the establishment of a contingent grant facility within BOAD to unlock commercial financing to the sector by providing support from CTF in the form of contingent recovery grant, to backstop nonpayment of loans to CFIs by the solar companies due to technology failure. The solar businesses will promote solar products that meet LGQA standards. In addition, the project will develop regional standards of solar products to serve households and businesses using component-based stand-alone solar systems. However, due to lack of track record of these new and innovative solar technologies that use mobile money-based payment

schemes, the CFIs are reluctant to extend debt financing to these businesses. Common technology risks include equipment design, manufacturing, lack of knowledge and capacity of the solar businesses to install and maintain equipment correctly, ability of the consumers to maintain the systems, and reliability of mobile network to use mobile money payments on time. Other technology-related risks could include level of solar irradiation, temperature, air quality, insect damage, and so on. The detailed terms and conditions of the facility satisfactory to the World Bank will be provided in the POM.

18. Given the strong focus of the TA on supporting regional collaboration and strengthening the regional enabling environment, TA will be delivered through ECREEE, which is a specialized technical agency under ECOWAS that supports several West African and Sahel countries. ECREEE has a harmonized regional approach and mandate to support universal electrification, access to modern cooking solutions, and system loss reduction in the distribution sector and to create instruments for financing sustainable energy projects. ECREEE has strong links with regional and international centers of excellence, with international finance and technology partners, and with bilateral and multilateral agencies and development banks. Its roles are advisory and supportive and respect the principles of subsidiarity. Its agreed mandate is to focus on activities at the regional level that can assist and add value to member states' activities in the areas of renewable energy and energy efficiency. Given ECREEE's mandate and relationship with most West African and Sahel countries, ECREEE has been carefully chosen to be the implementing agency for the proposed ROGEP. ECREEE has set up a PIU with competent professionals to implement the project.

19. The Regional Off-Grid Market Assessment has identified the barriers to market growth that were collected from key public and private sector stakeholders who responded to surveys and participated in focus group meetings in the 19 project countries. The barriers are presented in Table 2.1.

Table 2.1. Barriers to Stand-alone Solar Systems Market Growth

Market Segment	Market Barrier	Description
All market segments	Policy/regulatory barriers	• Governments are yet to develop coherent policies to support development of the off-grid sector as coordination of policy measures needs to be improved at both national and regional levels; consultations are needed for policy initiatives to be more aligned and efficiently implemented in practice. • Import duties and taxation for solar products are high—only some countries have adopted exemptions and other supportive policy measures, which are critical for private suppliers to enter a market. • Duty exemption measures exist in most countries but do not target all solar products (for example, exemption is only on solar panels but not on other solar components) or implementation lacks

Market Segment	Market Barrier	Description
		effectiveness; very often, there is little planning to coordinate this with customs authorities, the National Revenue Authority, standards bodies, and other institutions (Port Authority); in practice, duty exemptions have not been offered consistently. • Customs clearance procedures can be lengthy and expensive, which adds to retail pricing and decreases profit margins for suppliers. • While some tax exemptions for solar products exist, Governments have not done enough to disincentivize substitutes of solar (for example, diesel generators) to make solar a more attractive option. • There is a lack of consumer protection, and in general, there is a lack of a regional licensing or standards framework to regulate the products and models that are being imported and disseminated to the solar market; there is a need for some standards in the solar industry, which would improve safety of the product, the reputation of the solar products, and harmonization of the equipment for the ease of maintenance and spare parts; there is also no coordinated or standardized regional licensing framework for solar installers and technicians to ensure installation and O&M practices are in place. • Global Off-Grid Lighting Association (GOGLA) and Lighting Africa standards are not applied in most countries, and when there is a national initiative to develop standards, it does not seem to be coordinated with international standards. • In many countries, the lack of a supportive regulatory framework has contributed to growth of the informal OGS sector, which continues to import and distribute low-quality solar products (lanterns and panels) that account for more than half of the sales on average across the region.
	Currency risk	• 11 of the ROGEP countries do not face major currency risks, as 8 countries are part of WAEMU and 3 are part of the Central African Economic and Monetary Community (CEMAC). • Other countries (for example, Sierra Leone, Nigeria, and Ghana) have high currency risks; for example, in Sierra Leone, the very high currency risks of the country make investment in stock and PAYGO also risky (products in rural areas are sold in Sierra Leoneans, which is depreciating at an increasing rate against the U.S. dollar, for which the products are bought outside the country).
	Lack of local technical capacity	• There is a general skills gap/lack of local technical capacity throughout the OGS supply chain, adversely affecting all market segments and hampering the sector's growth; a common theme

Market Segment	Market Barrier	Description
		across countries (and market segments) is the overall lack of qualified technicians to support ongoing O&M, which is critical for the market's long-term sustainability.
	Limited access to finance	• Although the need for efficient solar power solutions is high, purchasing power for solar products of all varieties among consumers is low. Except for donor programs in select countries and PAYGO schemes offered by certain market actors, consumer finance is generally not available in most countries throughout the region; during focus group meetings across the 19 countries, the cost of solar systems was identified as the biggest impediment to the growth of the sector. • Local OGS businesses lack access to working capital, which is a primary constraint to their growth/ability to expand operations.
Household	Consumers are unable to afford solar systems	• Low rural incomes and lack of access to finance among households. • Relatively high costs of OGS systems with disparities between low-cost informal systems and high-quality licensed systems. • This is a significant issue for low-income countries (for example, Sierra Leone, Niger, Chad, and Central African Republic), where purchasing power for solar products of all varieties among end consumers is low—despite the demand for these products.
	Lack of understanding of and trust in solar solutions among consumers and actors impedes the development of the market	• There is still considerable lack of general awareness and familiarity with OGS technology solutions, especially in low-income and rural areas, where products are not widely available. • Lack of awareness also leads to misperceptions/a lack of trust, particularly if consumers previously had bad experiences with poor-quality solar products. • There is an inability to distinguish between solar products or product quality. • Consumers lack information and understanding about the most suitable design options, funding options, PAYGO benefits and options, points of sales and support, and so on. • Consumers need to understand the quality and value issues of quality solar products in relation to inferior over-the-counter lighting products and generators—educated consumers drive markets.
Institutional	Limited financing available for institutions	• Institutional solar solutions are often larger installations that are more expensive and require higher initial capital investment that many institutions lack (due to budgeting and so on).

Market Segment	Market Barrier	Description
	Lack of experience in procuring the right solution for the institution	• Similar to the households, any poor history/track record with OGS will deter institutions from taking expensive risks.
	Lack of data	• Clear data, figures, and so on, on the actual needs and energy usage or experience among institutional users are very limited. • Difficulties in estimating the current market size (value, number, and units sold).
Productive Use	Consumers are unable to afford solar systems	• Low rural incomes and lack of access to finance. • Higher up-front costs of OGS systems designed for productive use (for example, agricultural or milling equipment). • Although the need for efficient solar power solutions is high, purchasing power for solar products of all varieties among end consumers is low. Absence of end consumer markets for solar PV systems deters most new entrants.
	Misperceptions about value of OGS for productive use	• Educating productive sector clients that solar is robust enough to meet their needs is very important (and it is not only about small household lighting); many commercial clients only believe that solar can simply replace the generator.
	Supportive policies targeting productive use	• Lack of supportive policy for stand-alone solar systems appliances—East African markets are finding that appliances for productive use sector are driving demand and they require special policy and regulatory support.
Supplier	Financial and logistical constraints	• Devices and equipment are shipped from overseas (China, India, the United States, and Europe), which creates long delivery lead times (in some cases up to several months); this in turn creates other logistical and financial barriers for companies that must in turn manage storage to maintain inventory and meet consumer demand on time. • High transportation costs of inventory from sources deter new entrants; transport by container would reduce the costs dramatically but requires purchases in bulk, which local solar distributors are not able to make without financing. • Solar companies are geographically concentrated in the capital or in regional capitals and must allocate significant financial resources to serve rural areas.

Market Segment	Market Barrier	Description
	Lack of technical capacity/transportation and skills	• Overall lack of skilled technicians and low level of qualifications and training. • Very few companies integrate O&M into their business model,[37] which is critical to the long-term sustainability of the sector.
	Poor sales and performance history of the sector	• A lack of investment into the sector prevents growth due to the perceived high risks resulting primarily from lack of track record of sales. • Solar distributors have limited alternative financing options; while major solar companies can get a credit from their suppliers, the majority do not have access to credit and are self-financed. • Many solar suppliers do not provide trade financing/credit; international companies and distributors representing international brands are offered credit by suppliers. • Commercial financiers including banks and MFIs are largely not positioned to service the financing requirements of solar distributors.
	Lack of company finance	• Entrants into the sector require significant working capital, which is not readily available; equity investments are needed into the local distribution/sales companies. • It is easier to obtain debt financing and other loans once the solar companies have sufficiently grown and reached the 'level of interest' of the bigger funds, but until the number of customers and sales volumes are reached, they need some equity investors that would share higher risks with the original founders of the companies. • Foreign exchange risk mitigation measures are needed for the local companies, for countries where the majority of supplies are paid in U.S. dollars (not WAEMU or CEMAC zone where the euro is commonly used).
	Informal sector competition and market spoilage	• The informal market is problematic for OGS consumers and suppliers—the presence of unlicensed products results in poor-quality products for consumers and prevents licensed private players from sustainably developing market share.

[37] One notable exception is in Mali, which has an interesting example of Yeleen Kura, a company which operates in rural areas and has put in place a leasing solar pico type of contract including O&M.

Project Design

20. **The project is designed following an SOP approach.** The overall PDO supported by the SOP is to increase electricity access of households, businesses, and public institutions using modern stand-alone solar systems through a harmonized regional approach.

21. **Equitable and demand-driven support would be ensured to all 19 program countries through an SOP approach to meet their respective goals of achieving universal electricity access.** The program will build technical and financial capacity at the regional and country levels to achieve the program target. The program will remove information and knowledge barriers on stand-alone solar technology, different business models, and challenges and benefits of implementing this technology, following a regional coordinated approach. Through this approach, the countries will learn from global best practices along with experiences of their regional neighbors. The program will support the development of harmonized quality standards of stand-alone solar systems, remove cross-border trade policy barriers, support adoption of the CET, and so on. In addition to building the policy implementation capacity of the public institutions, the program will develop technical capacity and skill of the local entrepreneurs to engage in electricity service businesses in a sustainable manner. Eligible local entrepreneurs could receive financial support from the program to scale up their initiatives and to become competitive market players. The program will also provide business-to-business (B2B) support to local companies to partner with international stand-alone solar system manufacturers. This initiative will create local jobs as a byproduct of electrifying people using stand-alone solar systems. To increase the pace of electrification in West Africa and to make this initiative sustainable, the program will involve financial institutions, such as commercial banks, institutions MFI, leasing companies, specialized debt funds, and so on to finance solar companies to electrify consumers with stand-alone solar systems in program countries. A contingent grant facility to reduce risk exposure[38] of financial institutions to engage in a new sector such as stand-alone solar will be supported under the program. The program will identify and promote the suitable technology and business model to electrify public institutions, such as schools and health clinics, using stand-alone solar systems, coupled with remote monitoring technology. Under this scheme, the program will identify a suitable guarantee scheme to reduce the risk exposure of private solar electricity service providers from the nonpayment risk when serving public institutions.[39] The economies of scale offered by ROGEP would allow designing such suitable guarantee structure to mitigate the political risk of the private sector when serving public institutions.

22. **The Implementing Agencies of the ROGEP SOP1 are limited only to regional organizations.** The PDO of the ROGEP SOP1 is to increase electricity access of households and businesses using modern stand-

[38] The project will partner with IFC to benefit from its SLGP 41038 that is using IDA PSW to mitigate financial institutions risk to finance SMEs.
[39] The project will partner with MIGA to benefit from its PRI.

alone solar systems through a harmonized regional approach. The implementing agencies of the ROGEP SOP1 will be ECREEE and BOAD. The funding sources under ROGEP SOP1 are Regional IDA Grants, CTF Grants, and Grants from the Government of the Netherlands (DGIS). Each funding source will benefit ROGEP countries according to their eligibility criteria.

23. **ECREEE will use regional IDA Grants, CTF Grants, and a proposed DGIS Grant to develop a regional market for stand-alone solar products.** ECREEE will establish and maintain a PIU to undertake regional market assessment of stand-alone solar systems, develop harmonized quality standards of stand-alone solar systems, support removal of cross-border trade policy barriers, support adoption of the CET, and so on. ECREEE will also develop the technical capacity and skill of local entrepreneurs and help them refining their business models to create a pool of successful local solar companies and help them partner with international solar system manufacturers. A qualified Fund Manager will be recruited to provide matching grants, market entry grants, and performance grants to support solar entrepreneurs scale up their businesses or to provide incentive to operate in challenging markets. ECREEE will pilot test electrifying public institutions to identify suitable technology and business models under the ROGEP SOP1, with an objective to rollout public institution electrification in subsequent projects.

24. **ECREEE will ensure equitable benefit of all 19 project countries from its capacity-building interventions.** All studies, trainings, policy-level activities, and so on carried out by ECREEE will be disseminated to all project countries. This will ensure that the level of information on stand-alone solar initiatives, technologies, and business models benefits all project countries equally. However, since each country is at a different stage of readiness to embrace the stand-alone solar technologies, results or project impacts will not be equal in all the 19 countries. To ensure that ECREEE support to countries remains relevant and need based—to remove specific market scale-up challenges—ECREEE will carry out periodic review of its Results Framework and increase or decrease its level of support to a specific country to ensure equitable growth and development in all the 19 ROGEP countries.

25. **BOAD will use IDA SUF Credit for financing CFIs.** BOAD will establish a line of credit for eligible CFI, primarily operating within the eight WAEMU countries, a subset of the 19 ROGEP countries. The stand-alone solar companies could then access finance from these CFIs for their working capital needs to import stand-alone solar systems and for medium-term financing needs to offer PAYGO payment scheme to consumers. The PAYGO scheme could make the solar products affordable to consumers as it would allow paying the cost of the stand-alone solar system through installment payments over six months to several years. CTF contingent recovery grant will be used to comfort the CFIs against technological risks of promoting solar products. This intervention will benefit the CIF-eligible countries. Eligibility criteria of the CFIs and stand-alone solar companies will be stated in the POM.

26. **The ROGEP SOP1 would develop a framework/platform on which the regional stand-alone solar market would be established.** Under the ROGEP SOP1, the countries will focus on (a) internalizing the key

policies of ROGEP; (b) strengthening its national electrification plan and identifying specific areas to be supported under ROGEP; (c) developing adequate implementation capacity and leadership in the country for moving forward the specific measures/actions relevant to ROGEP; and (d) developing satisfactory M&E arrangements that will aid in providing feedback on ROGEP's performance. The ROGEP SOP1 will inform the stakeholders in each country on the impacts and benefits of supporting stand-alone solar as an effective mode of electrification. At this phase, all the 19 ROGEP countries will develop their internal capacity required to implement subsequent projects where the countries would borrow specific resources to support off-grid electrification in their respective countries.

Table 2.2. Countries Benefiting from Funding Sources under ROGEP SOP1

Country	Funding Source	Implementing Agency	Country	Funding Source	Implementing Agency
Benin	IDA and CTF	ECREEE and BOAD	Guinea-Bissau	IDA	ECREEE and BOAD
Burkina Faso	IDA, CTF, and DGIS	ECREEE and BOAD	Liberia	IDA and CTF	ECREEE
Cabo Verde	IDA	ECREEE	Mali	IDA, CTF, and DGIS	ECREEE and BOAD
Cameroon	IDA and CTF	ECREEE	Mauritania	IDA and DGIS	ECREEE
Central African Republic	IDA	ECREEE	Niger	IDA, CTF, and DGIS	ECREEE and BOAD
Chad	IDA and DGIS	ECREEE	Nigeria	IDA and CTF	ECREEE
Côte d'Ivoire	IDA and CTF	ECREEE and BOAD	Senegal	IDA	ECREEE and BOAD
Gambia, The	IDA and CTF	ECREEE	Sierra Leone	IDA and CTF	ECREEE
Ghana	IDA and CTF	ECREEE	Togo	IDA	ECREEE and BOAD
Guinea	IDA	ECREEE			

27. **Some limitations of ROGEP SOP1 include:** CTF can only be used for eleven CIF-eligible countries (presently Benin, Burkina Faso, Cameroon, Côte d'Ivoire, The Gambia, Ghana, Liberia, Mali, Niger, Nigeria, and Sierra Leone, or other countries that CTF may later declared eligible); (ii) the proposed DGIS Grant can only be used for five Sahel countries (Burkina Faso, Chad, Mali, Mauritania, and Niger); (iii) BOAD will implement component C2 only in eight WAEMU countries (Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo); and (iv) the CTF Contingent Grant Facility will benefit the five CIF-eligible countries which are members of WAEMU (Benin, Burkina Faso, Côte d'Ivoire, Mali, and Niger). To keep ROGEP demand-driven, there will be no country allocation of funds. However, to ensure equitable growth, the project will implement an effective M&E framework, with results publicly disclosed periodically to keep the stakeholders informed of the project results. This would also support the design

of the subsequent projects under the ROGEP SOP. Table 2.2 shows which ROGEP countries are benefiting from which funding sources and implementing agencies.

28. **In subsequent projects under the ROGEP SOP, in addition to the regional implementing agencies, project countries would also become Borrowers.** The countries could allocate their national and regional IDA resources in the subsequent ROGEP projects SOP. Lessons from the ROGEP SOP1 will encourage other development partners and country governments to support specific interventions of ROGEP in subsequent SOPs to achieve project objectives.

29. **The SOP approach is consistent with lessons from previous World Bank-funded projects that developed markets to promote stand-alone solar systems through private participation.** Lessons learned from implementing similar projects in Sri Lanka, Bangladesh, and Ethiopia demonstrate that these projects need to first focus on removing market development barriers. Once the market development barriers are removed, there is a gestation period where few private sector companies take the lead role to enter the market, while other private players cautiously await to see the results of engagement of those market leaders. Successful result of the market leaders is usually followed up by a surge of new entrants in the market. Hence, these types of projects are usually supported by Additional Financing and Repeater Projects. Accordingly, an SOP approach can help provide clarity on priority activities to be addressed initially and then build upon that in subsequent projects in the series.

30. **The ROGEP SOP will inform the ongoing discussions on Regional Development Policy Financings (DPF).** It will identify relevant policy reforms that would unlock the trade barriers and would open the stand-alone solar sector for the private sector. With the support from Regional DPFs, the policy reforms identified in the ROGEP SOP could be implemented and make the ROGEP SOP initiatives sustainable.

31. The proposed evolution of the ROGEP SOP is detailed in the Table 2.3.

Table 2.3. Proposed Approach of the ROGEP SOP

	ROGEP SOP1		ROGEP Subsequent Projects under SOP	
	Scope	**Beneficiary**	**Scope**	**Beneficiary**
1. Developing a Regional Market				
1A. Enabling Environment	Implemented by ECREEE in coordination with Ministry of Energy Establishment of a PIU; development of regional policy and regulatory frameworks; development of regional standards and QA framework; identification of trade barriers;	All 19 ROGEP Countries	Lessons learned from ROGEP SOP1 will determine the scope and implementation design to achieve the project objective.	All 19 ROGEP Countries

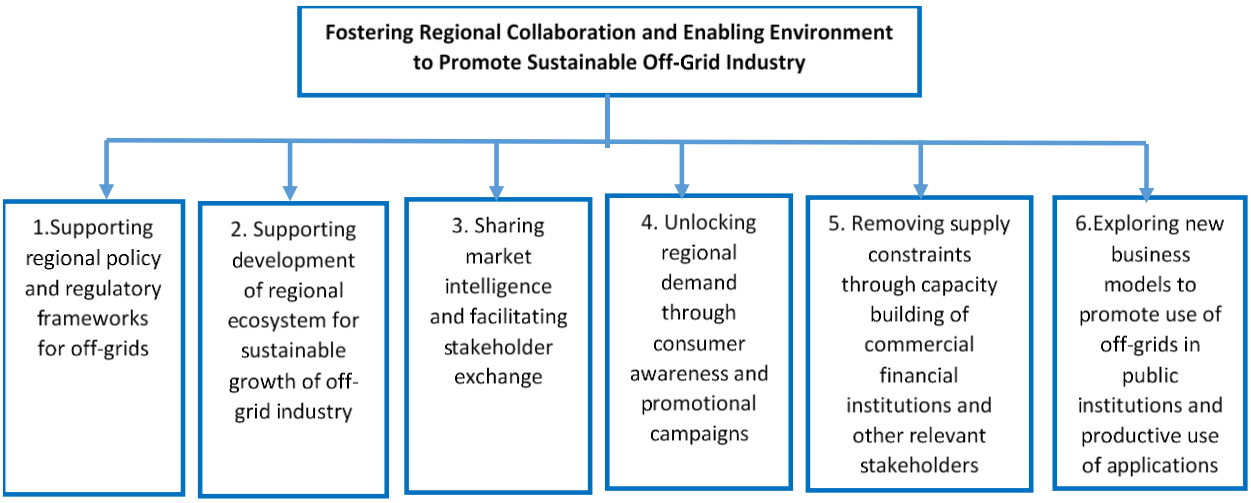
	ROGEP SOP1		ROGEP Subsequent Projects under SOP	
	Scope	**Beneficiary**	**Scope**	**Beneficiary**
	simplification of tax regime; consumer awareness and promotional campaigns, and so on			
1B. Entrepreneurship Technical Support	Entrepreneurship and business training; customized business acceleration support; and facilitation of entry to the solar industry	Stage 1 and Stage 2 solar companies in all 19 ROGEP Countries	Lessons from ROGEP SOP1 will strengthen the scope and design.	Stage 1 and Stage 2 solar companies in all 19 ROGEP Countries
1C. Entrepreneurship Financial Support	Matching Grant support to solar companies in 13 ROGEP countries eligible for CIF and DGIS funds. Implemented through a Fund Manager	Stage 1 and Stage 2 solar companies meeting eligibility criteria according to POM.	Lessons from ROGEP SOP1 will strengthen the scope and design.	Stage 1 and Stage 2 solar companies in all 19 ROGEP countries
1D. Barrier Removal for Challenging Markets	Market Entry Grants and Performance Grants to solar companies operating in challenging markets. Implemented through a Fund Manager.	Stage 2 and Stage 3 solar companies operating, eligibility criteria according to POM	Lessons from ROGEP SOP1 will strengthen the scope and design.	Stage 2 and Stage 3 solar companies operating in identified challenging markets.
2. Providing Access to Finance for Stand-alone Solar System Businesses				
2A. Line of Credit to Stand-alone Solar Businesses	Implemented by BOAD in 8 WAEMU countries	Stage 2 and Stage 3 solar companies	In addition to BOAD, support from other regional and national FIs will be included	All 19 ROGEP countries
2B. Contingent Grant Facility to CFIs	Implemented by BOAD for 5 CIF-eligible WAEMU countries	CFIs lending to solar companies promoting innovating solar technologies	In addition to BOAD, support from other regional and national FIs will be included.	All 19 ROGEP countries

Component 1: Developing a Regional Market

Subcomponent 1A: Enabling Environment

32. The various activities that would be supported by ROGEP under the subcomponent are organized into the following six themes.

Figure 2.3. Pillar of Fostering Enabling Environment



A1. Supporting Regional Policy and Regulatory Frameworks for off-grids

Strengthening Regional Energy Access Policy

33. Industrial growth is usually attributed to clearer policies in any sector. Given the stage of development of the stand-alone solar systems industry and the smaller sizes of the countries in the West Africa region, the stand-alone solar systems industry players are clearly looking for an aggregated regional market in the West Africa and Sahel region. Having regional access policy in place therefore assumes significance. The challenges that the region faces in achieving access has caught the attention at the regional level. Acknowledging the importance of access to energy services in achieving the SDGs and boosting GDP growth, ECOWAS countries and regional institutions have launched the Regional Energy Access Policy, embodied by the White Paper endorsed by ECOWAS Heads of State and Government in January 2006 in Niamey. These policies were initiated when the stand-alone solar systems industry was at its infancy. The industry has evolved significantly since then. ROGEP through its regional engagement will promote stand-alone solar systems and their potential in terms of helping the region in achieving the SDGs with the ultimate objective of integrating stand-alone solar systems into the regional access policies. In this context, ROGEP will offer TA for analytical works, regional workshops, and exchange programs, where the policy makers and regional leaders could be provided with opportunities to understand and appreciate the broad range of services that the stand-alone solar systems can provide along with various business models from the delivery point of view.

Influencing National Energy Access Policies/Strategies through Regional Engagement

34. Governments around the world are developing renewable energy policies to support broader national goals such as increasing off-grid access, rural electrification, diversifying energy supply, enhancing energy security, fostering innovation, and addressing global climate change. While these policies share key design elements across renewable energy technologies, the good practices and considerations can support policies tailored to expand solar deployment within the context of country-specific challenges and opportunities. Through the regional engagement and dialogue, ROGEP will create the necessary awareness and engage the policy makers at the regional level in exploring stand-alone solar systems as a feasible alternative to achieve their electricity access goals. Individual countries could learn from the regional exchange and put in place in-country policies that are aligned with the regional policies.

35. The top-down approach of engaging at the regional level first will create the necessary ground and momentum for country-level actions, playing complementary roles in this development space.

Developing and Adopting Regional Standards and QA Framework for Stands-alone Solar Systems

36. QA is a critical requirement for growth of the stand-alone solar systems industry. Consumers need to have confidence in the products and should have access to important information based on which they can take a decision to invest on solar products. A broader agreement on quality standards for solar lighting products among the Sahel and West African countries can benefit the private sector solar PV product manufacturers as they get access to a large contiguous market. Supported by favorable regional trade policies, this will increase trade between the countries in West Africa and the Sahel, creating jobs and incentive structures to support a sustainable market.

37. While globally acceptable QA standards are available for smaller size systems (for example, plug-and-play kits), no such standards exist for larger systems. QA standards developed by the Lighting Africa Program (and currently housed as Lighting Global Quality Standards[40]) for the smaller systems are now widely adopted by companies. As a first step, ROGEP would provide necessary TA to support adoption of the existing standards and QA framework for the smaller size systems (up to 350 W) at the regional level. Subsequently individual countries will be supported to adopt these standards. This would involve significant engagement with the technical and political establishments at both the regional (for example, ECOWAS) and national levels.

38. For the larger systems (institutional and productive use applications), including component-based systems, ROGEP will support the development of technical standards through implementation of pilots. Country-based pilots will contribute to the development of standards and QA framework, which could be

[40] https://www.lightingglobal.org/quality-assurance-program/our-standards/

agreed upon at the regional level and then adopted at each country level. For the larger institutional systems, meant for use in schools, health clinics, public administration buildings, and so on, ROGEP will support the development of service-oriented QA framework instead of product quality to move the industry in the direction of providing long-term performance and service contracts rather than product sales only.

39. ROGEP through ECREEE will engage with the relevant regional and national stakeholders related with standards and energy, including ECOWAS Standards Harmonization Model (ECOSHAM,) Regional Standards and Labelling Technical Committee, ECOSHAM Technical Harmonization Committee (THC) on Electrotechnical (THC 5), ECOSHAM technical management committee TMC, ECOWAS ministers responsible for quality management and/or energy, and ECOWAS Council of Ministers to facilitate informed decision making on technical standards for solar stand-alone systems and equipment.

Removing Trade Barrier and Moving Toward Simplified Tax Regime to Enhance Product Affordability

40. Evolution of new business models such as PAYGO have made it easy for households to pay for solar systems. However, the feasibility of such models depends upon several external factors and country conditions, and hence the PAYGO options are not available or offered everywhere. Many countries have adopted simpler tax regime, for instance, duty waiver on solar import, for the benefits of their larger population. ROGEP will provide necessary technical support to study and promote such measures to enhance the commercial attractiveness of stand-alone solar systems to the households. Moreover, taxing products at multiple entry points often makes the product too expensive for people living in smaller landlocked countries, such as those in the West Africa region included in ROGEP. Eliminating multiple taxation will facilitate easy movement of products across countries and enhance product affordability.

41. ROGEP will promote informed decision making on import duties in the framework of the CET at the regional level. In collaboration with the ECOWAS Directorate of Customs and with the participation of the relevant national and regional stakeholders related with customs/economy, industry, and energy, ROGEP through ECREEE will facilitate the informed decision making on import duties to be applied to stand-alone solar systems and equipment. This will be done by the tariff management regional committee, commerce and customs regional technical committee, and the ECOWAS Council of Ministers.

42. There is a need to develop/improve harmonized description codes for solar stand-alone systems and equipment in the context of the CET, and the ROGEP plans to support this development across the region. Combined with adoption of regional standards and QA framework described earlier, this would contribute to regional harmonization and enable the off-grid players to make long-term investment plans considering the West Africa region as a single regional market.

43. ROGEP will support countries to undertake necessary analytics to move toward rationalized energy sector subsidy policies to ensure level-playing field for on-grid and off-grid investments. This can open the sector for private investments and encourage development of new delivery models.

Enabling Mobile Money

44. Mobile money is gaining popularity across all segments and has also contributed to the growth of the stand-alone solar systems industry in many countries. Many of the ROGEP countries still do not have adequate policy and regulatory measures in place to make this work for the solar companies. ROGEP will offer TA to support initiatives to advance policy dialogue on mobile money to create necessary enabling conditions for proliferation of the stand-alone solar systems industry.

A2. Supporting Development of a Regional Ecosystem for Sustainable Growth of the off-grid Industry

45. The stand-alone solar systems industry, like any other industry, requires the supporting ecosystem for its survival and growth. The ecosystem includes manufacturing, assembling, distribution, repair and maintenance, after-sales services, and lending and microcredit businesses. In addition to supporting the industry, the ecosystem would result in creation of business and employment opportunities and contribute to the overall socioeconomic development of the region. To fully exploit the potential, ROGEP through ECREEE will support establishment of regional entrepreneurship development centers targeting the entire value chain of the stand-alone solar systems industry. These strategically located regional centers would develop standard materials and modules for Entrepreneurship and Business Training, Customized Business Acceleration Support, Facilitation of Entry into Solar Business, and so on for the benefit of the entrepreneurs in the region. Entrepreneurs would benefit in several areas including understanding of the technology and its risks, initial business support, permits and licenses, taxes, small business administration, product logistics and inventory management, product quality and standards, financing, environmental requirements, and so on.

46. ROGEP will also support TA and tailor-made interventions to enable the less privileged categories of stakeholders, for example, women entrepreneurs to participate and take advantage of the opportunities offered through the stand-alone solar systems value chain. The overarching theme here is twofold: (a) to improve the supply side of the value chain through entrepreneurship support and development and (b) to improve the livelihoods of the poor and marginalized communities through private sector initiatives. This is done by offering disadvantaged groups equal opportunities such as access to markets and finance, by building capacity and improving public policy.

47. ROGEP will support the establishment and implementation of regional certification scheme for PV installers at the regional level. Such schemes would produce the much-needed skills and workforce to support the growth of the industry.

A3. Sharing Market Intelligence and Facilitating Stakeholder Exchanges

48. The stand-alone solar systems industry is rapidly evolving both in terms of technology and business models. It is therefore important to have continuous stakeholder exchange to stay relevant and take maximum advantage of the innovations that the industry offers and be aware of the new challenges that the industry might face. ROGEP will support initiatives and activities that would foster industry collaboration with key stakeholders and promote meaningful dialogue for scaling up electrification through stand-alone solar systems solutions.

49. As mentioned earlier, the stand-alone solar systems industry largely remains a supply-driven industry and the private solar companies are engaged in promoting their products in specific customer segments. All the heavy lifting and market entry costs are borne by the companies themselves, resulting in increased cost of doing business. This is largely due to lack of data and intelligence on the market, especially on the demand in different customer segments. Availability of such intelligence and data on the demand side, as well as information on the supporting ecosystem including policy and regulatory provisions, would go a long way in bringing scale and predictability in the stand-alone solar systems space. ROGEP will offer TA to gather relevant data and market intelligence and disseminate the same regionally and nationally for the benefit of all companies. These studies will provide critical data to help manufacturers, distributors, and retailers to make informed business decisions. ROGEP has already supported a series of off-grid market intelligence/assessment studies in the ROGEP countries as part of the project preparation. These studies have assembled a wealth of data and information for the sector stakeholders, especially the private companies that have acknowledged the profound contribution made by these studies. ROGEP recognizes that gathering such market intelligence is not a one-time activity and would need to be carried out on an ongoing basis with targeted coverage to further guide investments in the sector and contribute to the overall development of the stand-alone solar systems industry.

50. In addition to supporting regional and national workshops as forums for stakeholder exchange, ROGEP will support industry coalitions and other platforms to engage the stakeholders in meaningful dialogue to promote the stand-alone solar systems industry.

A4. Unlocking Regional Demand through Consumer Awareness and Promotional Campaigns

51. Although the stand-alone solar systems industry has seen significant transformation globally in the last few years, the potential it offers in terms of addressing the energy access needs of households, businesses, and public institutions/facilities remains underexploited. This is largely due to lack of awareness among the key stakeholders, especially the potential beneficiaries, the policy makers, and the funding agencies about the innovations made on technology and business model fronts. So far, the solar businesses are largely supply driven. Creating demand through awareness and promotional campaigns,

as well as policy actions such as link to national energy access strategies, can bridge the gap and complement the ongoing efforts of the players in the stand-alone solar systems industry.

52. ROGEP will support country-level initiatives to address the awareness barrier with the objective of enhancing demand and creating vibrant market for stand-alone solar systems. Based on experience from East African engagements through Lighting Africa and based on stakeholder consultations carried out in the West Africa region as part of ROGEP preparation, the following elements are determined to be needed for a successful campaign: face-to-face, experiential events such as forums, training of trainers (TOT) sessions, roadshows and mass media, print, mass distribution activities such as local vernacular radio, and educational material/posters. Actions to be undertaken could include market research on awareness levels in the underserved countries to determine appropriate messaging, determine specific channels (which radio stations, which county officials are best placed to carry the messaging, and so on) to utilize, develop a preliminary plan (including timing and human and financial resource allocation), identify TOT beneficiaries, pilot campaign and identify improvements, develop full-scale rollout plan. Consumer awareness activities will extend to education, health, and water sectors both for the benefit of Government agencies and beneficiaries to facilitate electrification of public facilities.

53. The proposed project will inform the potential end users on the many benefits of high-quality stand-alone solar systems through producing consumer awareness materials and conducting consumer awareness campaigns in project countries aimed at behavioral change toward stand-alone solar systems familiarity and adoption.

54. Given the nature of the solar industry and its early stage of entry into the West Africa region, ROGEP will adopt a flexible approach to identify the capacity-building needs of the various stakeholders including the policy regulatory bodies, utilities, REAs, and other line ministries, which could potentially benefit from the stand-alone solar systems and support them on an ongoing basis, based on discussion with its implementation partners.

A5. Removing Supply Constraints through Capacity Building of CFIs and Other Relevant Stakeholders

55. The stand-alone solar systems market in West Africa is less developed than those in East Africa and elsewhere. Furthermore, the 19 countries covered by ROGEP vary widely in terms of country risk and the level of financial sector development. The CFIs such as banks, institutions MFI, leasing companies, and so on are often reluctant to lend to SMEs in the stand-alone solar systems market due to several factors including perceived borrower credit risk, insufficient track record, insufficient collateral to secure loans, and smaller ticket sizes for transactions. At the same time, the CFIs also lack capacity in terms of understanding the solar industry, its supply chain, and its evolving nature and accompanying innovations. ROGEP through its subcomponent 1B would offer capacity-building support to the CFIs to enable them to understand the nuances of the solar industry and its structure. More targeted capacity-building programs

focusing on different stages of solar companies, their capital structure, funding needs, and risk profiles would be offered with the objective of crowding in commercial financing to the sector. Based on the regional and national workshops and initial rounds of consultations carried out with the CFIs as part of the market assessments, the following capacity-building needs have been identified to be supported by ROGEP: (a) stand-alone solar systems energy project due diligence; (b) meeting environmental requirements; (c) portfolio supervision; and (d) hedging. ECREEE will fund activities that will inform the CFIs on the new opportunities in the stand-alone solar systems market and attract potential stand-alone solar systems investors in the region.

A6. Exploring New Business Models to Promote use of off-grids in Public Institutions and Productive Use Applications

56. The solar industry has evolved significantly over the last decade. Larger stand-alone systems are now available that can fulfill the electricity needs of public institutions and facilities, as well as other productive applications. Unlike households and SMEs, public institutions and facilities however pose higher payment risks to the private companies, given their public nature. Consultations with the solar companies indicate that if adequate payment risk mitigation arrangements are put in place, the companies could be interested in making investments to electrify public institutions and facilities. Moreover, given the lack of capacity of the public institutions to maintain the systems, it is desirable that private companies are engaged in long-term service contracts rather than just installation of systems. Given the huge potential in this space, ROGEP will support development of service-oriented standards and QA framework as well as new delivery models supported through appropriate payment risk mitigation arrangements to attract private investments. In this context, ROGEP will support several pilot activities and, based on the pilot experience, develop standard models that would benefit all countries in the West Africa region and as required, carry out works for the installation of equipment.

Sub-component 1B, 1C, 1D: Entrepreneurship Development Support

57. ROGEP support will be designed to remove market barriers and to attract new players to the stand-alone solar system market. The project design will avoid subsidization of what large businesses can do on their own. The objectives of subcomponents *1B, 1C and 1D* are to attract reputable solar companies to the West African market, attract existing and established businesses operating in the non-solar space to engage in providing electricity service through stand-alone solar systems, and support local entrepreneurs to set up energy service companies to provide electricity services to make available universal electricity access in ROGEP countries, thus tackling the electricity access challenge and creating employment opportunities in the process.

58. Subcomponents *1C* and *1D* are funded by CTF Grants and are also expecting funds from the Government of the Netherlands (DGIS) through ESMAP. These subcomponents will ensure equitable

development of local entrepreneurs by providing matching grant support to stage 1 companies and by providing market entry and performance-based grants for solar entrepreneurs operating in countries with challenging business environments, such as Sahel countries.

59. These subcomponents will offer (a) TA to enhance the capacity, skills, and expertise of the businesses and (b) financial incentives to contribute to the businesses' growth and facilitate the creation of their track record, thus increasing their bankability and eventually sustainability. The entrepreneurship support will be coordinated with the ECOWAS certification scheme for PV installers/technicians and will be framed within the ECREEE private sector support facility that ECREEE has successfully operated since 2015.

60. These subcomponents will provide differentiated support to entrepreneurial businesses across the enterprise development life cycle (startup-up, early stage, growth, and maturity). This support will be targeted based on general categories of businesses outlined in Table 2.4. Entrepreneurship support will include both technical and financing assistance to the businesses as outlined in Table 2.5.

Table 2.4. Categorization of Businesses

Stages	Growth Stage	General Description
Stage 1	Start-up	<3 Full-time employees (FT Equivalents) <300 SHS or <1,500 lanterns sold <US$100,000 annual revenues Has not accessed outside finance (except personal loans), may have a business bank account
Stage 2	Early stage	3–25 FTEs 300–30,000 SHS or 1,500–50,000 lanterns sold US$100K,000–US$3M million annual revenues Has a business bank account, maybe some outside funding (for example, crowdfunding)
Stage 3	Growth/mature	>25 FTEs >30,000 SHS or >50,000 lanterns sold >US$3 million annual revenues Has a credit line at a bank and financial statements (possibly audited), likely raising equity or other outside financing

Note: Existing businesses operating in sectors other than solar would be categorized based on FTE employees and revenues, rather than solar products sold.

Table 2.5. Technical and Financing Intervention to Businesses

Business Type (Stage)	Technical Intervention	Financing Intervention
Stage 1 (Start-up)	Entrepreneurship and business training	Matching Grants (Subcomponent 1C)
Stage 2 (Early stage)	Customized business acceleration support	Market Entry Grants for challenging markets (Subcomponent 1D) Performance Grants for challenging markets (Subcomponent 1D) Line of Credit (Subcomponent 2A) Contingent Recovery Grants to CFI (Subcomponent 2B)
Stage 3 (Growth/mature)	Facilitation for businesses to expand into the solar industry or into challenging markets	Market Entry Grants for challenging markets (Subcomponent 1D) Performance Grants for challenging markets (Subcomponent 1D) Line of Credit (Subcomponent 2A) Contingent Recovery Grants to CFI (Subcomponent 2B)

61. ECREEE has strengthened its in-house team with a private sector coordinator to oversee the entrepreneurship technical support program. It will also draw upon an external consulting firm to implement various TA activities including the ongoing capacity development of national partners. The main activities of this consulting firm would include the following:

- Developing training materials for solar industry training programs
- Providing TOT on solar industry training programs
- Ongoing capacity building of national incubators to implement solar intro courses and incubation of local businesses
- Organizing regional training workshop/boot camp annually
- Managing call for business plan competition and review of applicants
- Organizing investment day during the annual ECOWAS Sustainable Energy Forum (ESEF)
- Scouting for Stage 2 businesses for customized business acceleration support program
- Ongoing engagement and management of network of business incubators

62. ECREEE has appointed a financial sector expert to oversee the financing activities of the component. Under this person's oversight, a consulting firm will be hired to implement the entrepreneurship financing support program. The consulting firm will need to have the financial expertise to manage the program and will also need to understand the stand-alone solar business models in the region to evaluate the viability of the businesses applying for support. In addition, the firm will be required to conduct outreach to early-stage investors active in the solar sector that are already present or looking

to enter the ROGEP countries as investors. The main activities of this consulting firm would include the following:

- Marketing and outreach of financing programs
- Engagement with private investors
- Scouting for potential interested businesses
- Management of calls for applications
- Review of applications
- Structuring of grant agreements and accounting and management of disbursements and assessing achievements against agreed milestones by grant recipients

63. The following activities have been conducted at the preparation phase of the project:

- Identification of a network of organizations with existing capacity to support entrepreneurs and deliver managerial training programs
- Extensive engagement with the business incubators, accelerators, and training providers to assess the capacity of these organizations and develop collaboration modalities. This assessment will review the various models of incubation used by each organization that can inform the level of funding from ROGEP for training and incubation activities.
- Identification of qualified institutional investors (registered fund or investment business) to partner with in the provision of co-investment grants
- Identification of Stage 2 firms to make use of the TA and financing instruments as soon as the implementation phase begins, and they become available

Subcomponent 1B: Entrepreneurship Technical Support

64. **Entrepreneurship and business training.** Entrepreneurship and business training will be offered to startup-up and early-stage ('Stage 1' and 'Stage 2') stand-alone solar businesses across the ROGEP countries. This will build on the existing training programs that were provided by ECREEE to over 100 such businesses across the region from 2015 to 2018. The training program under ROGEP is expected to support already operational national service providers to enhance their portfolio by including the delivery of training programs on stand-alone solar businesses. Additionally, an annual regional business plan competition and workshop will be carried out.

65. The activities at the national level will begin with identification of a network of organizations with existing capacity to support entrepreneurs and deliver managerial training programs. This network will include existing business incubators, accelerators, and entrepreneurial support organizations, such as 2iE in Burkina Faso, CTIC Dakar in Senegal, and the Ghana Climate Innovation Center. ECREEE will oversee a focused TOT programs for the partner organizations to be able to deliver solar industry-specific content,

the establishment of a regional network of organizations to promote continuous knowledge and experience exchange, development of training materials needed to deliver the courses, and ongoing TA and capacity-building support for the organizations throughout the ROGEP implementation period. An expert firm is likely to be hired to deliver this support. Given that capacity in the existing incubators and training providers is mixed, in some cases, financial support could be required to supplement the partners' own resources. The entrepreneurship and business training activities are as follows: (a) training courses; (b) incubation; and (c) annual regional business plan competition and workshop.

66. Each training partner will deliver trainings on a regular (for example, semiannual) basis over two to three days and will be open to the broad community of entrepreneurs and businesses in each country that are interested in the trainings. The training will cover topics such as doing business in the solar industry, technical aspects of household and productive use of solar products, marketing and financing of solar businesses, and legal and regulatory aspects of the solar industry.

67. In addition, the trainings may incorporate personal initiative training that focuses on the soft skills necessary for entrepreneurs to succeed in challenging frontier and developing markets. This type of training has shown success in a recently evaluated program in Togo.[41]

68. Each training partner will maintain an ongoing outreach campaign to build the community of solar entrepreneurs and businesses that would make up the participants in the training programs. It is expected that each training partner would deliver training to approximately 25 businesses each year. The training partners will be selected from the ROGEP countries and will include businesses from all ROGEP countries following an application process. This will establish a regional network of stand-alone solar companies and will help entrepreneurs identify business opportunities within a regional market.

69. Further, the training partners will be encouraged to take on some of the most promising entrepreneurs and early-stage businesses as incubation clients. ROGEP would provide some partial financing to the training partners to provide incubation support that would be supplemented by the partner's own resources. Each training partner would work to grow these clients into viable businesses and assist the businesses in eventually accessing financing—from ROGEP and/or other sources. It is expected that each training partner would incubate approximately 10 businesses each year providing legal, entrepreneurial, and business advice while the provision of support on technical issues will be coordinated with the ECOWAS certification scheme for PV installers/technicians.

70. ROGEP's approach of partnering with already operational training and incubation service providers to include solar industry-specific content in their portfolio should result in a cost-effective way

[41] https://blogs.worldbank.org/africacan/a-better-way-to-train-small-business-owners-using-psychology-to-teach-personal-initiative.

to reach a significant number of firms while also promoting the sustainability of the intervention even after ROGEP's implementation phase.

71. The subcomponent will also support an annual regional stand-alone solar business plan competition and workshop. This will include the following elements: regional outreach and awareness campaign, call for applications and selection process, one-week regional workshop and boot camp for 60 selected businesses (broken up into three sub-regional workshops to facilitate the interaction and discussion), follow-up technical support for 20 of the top boot camp participating businesses, and a pitch event for the top 10 at the ESEF with small (less than US$5,000) awards for the top 3 businesses. The eligibility criteria for the different entrepreneurship and business training activities are as follows:

- Training courses: open to all, free for all, covered costs for some rural/poor participants
- Incubation: registered companies, application/review process managed by the incubators with the support of the ROGEP PIU
- Annual regional business plan competition and workshop: selection based on a business or project plan, and each entrepreneur/business owner must be a citizen of a ROGEP country or have a locally registered business

72. **Customized business acceleration support.** Early-stage ("Stage 2") businesses—those that have advanced beyond the startup stage but are still developing and iterating their business model, adapting technology, and finalizing product marketing strategies—will be offered customized business acceleration support under ROGEP. This will be highly specialized and customized support provided through a network of business incubators and accelerators in the ROGEP countries. Content will include 'high-touch' assistance to refine business strategies and business models, mentoring from seasoned entrepreneurs and investors, transaction advice and investment facilitation, and technology and product development support. Support is envisioned to last about 9–12 months for each participating business. Businesses will apply for this support on a rolling basis through an online application managed by ECREEE, which will then identify the partner organization capable of delivering the appropriate support.

73. Businesses that receive the acceleration support will be invited to an investment forum organized during the annual ESEF. This will include a B2B activity that introduces businesses from different countries to each other. The participating businesses will be invited to pitch their businesses to potential investors and make B2B connections. ROGEP will finance the costs of providing this customized business acceleration support.

74. **Facilitation of entry to the solar industry.** Successful local businesses that are operating in non-solar industries represent important potential new entrants into the stand-alone solar industry. These

businesses might be operating in industries such as agricultural supply, agribusiness, retailing, or other areas that require strong, local distribution chains and similar operational capabilities that might be transferred to the solar industry. In most cases, these will be larger existing businesses (Stage 2 or Stage 3) that can access financing but may not have the know-how or awareness of the opportunity to expand into stand-alone solar products. ROGEP will undertake awareness raising and provision of specialized TA for such firms on how to undertake expansion into the solar industry. ECREEE will take a proactive approach to attracting such firms. A scout will be appointed to find and attract such Stage 2 and Stage 3 businesses in select cases where ROGEP can offer them some additionality (that is, not subsidization of what large businesses can do on their own).

Subcomponent 1C: Entrepreneurship Financing Support

75. **Matching grants.** To support the entry of new solar businesses and the business model development needed by startups-ups, matching grants will be offered to startup-up ('Stage 1') businesses. This funding would be up to US$25,000 to assist these entrepreneurs to developing their ideas into viable businesses or developing and test marketing their products. Each business receiving a grant would be required to provide some level of matching cash contribution to demonstrate their own commitment to the business. Grants would be provided on a milestone basis to eligible, competitively selected businesses and would be limited to use on specific eligible activities defined during project implementation. Stage 2 businesses that are operational in the region and interested in expanding their activities to another ROGEP country—particularly CTF-eligible and Sahel countries—might receive matching grant support as well.

76. This subcomponent is funded by CTF Grant and DGIS Grant and accordingly solar entrepreneurs of 13 ROGEP countries will benefit from this subcomponent. A qualified Fund Manager will be recruited by ECREEE to implement this subcomponent as per the Financial Intermediary Financing guidelines of the World Bank. Detailed scope of the Fund Manager and the application and approval process will be detailed in the POM. Table 2.6 provides indicative implementation guidelines of the matching grants, including targeting, eligibility, and required matching criteria.

Table 2.6. Implementation Guidelines for Entrepreneurship Financing Support

Topics	Guidelines
Objective	• Support business model development and product-market fit • Facilitate access to follow-on investment
Eligibility criteria	• Locally registered Stage 1 or Stage 2
Selection filters	• Intra-country (Stage 1) or intercountry (Stage 1 or 2) expansion and business expansion • Additionality (requires ROGEP funding to happen)
Eligible use of funds	• Milestone based on agreed budget and expenses (not just inventory), paid directly by the PIU

Topics	Guidelines
	• Certified products and installers (where applicable) • Solar entrepreneurs follow commercial practices as per the World Bank Procurement Guidelines
Size of grant	• Up to US$25,000
Matching ratio	• 25% cash match required from the business
Selection of service providers	• Beneficiary selects, with assistance from the grant's manager
Connection with provision of TA	• Assistance with refining application, budget, milestones, and reaching the milestones
How to promote a sustainable impact?	• Combined with TA support and enabling environment • Facilitate access to follow-on investment
Application and disbursement procedures	• Rolling basis (FIFO)
Marketing and communication campaign	• Proactive outreach campaign
Flexibility of Schemes	• Allowed to iterate and improve the offering based on demand analysis
Synergies with the rest of ROGEP	• Facilitate interaction across ROGEP through implementation arrangements
M&E indicators	• Revenue growth • Unit sales • Affordability of product offerings • Access to follow-on financing • Household impacts (for example, access to energy) • Jobs created • Increased market competition
• Multiple awards possible?	• Yes, but clear additionality or lack of follow-on financing options

Note: FIFO = First-in, First-out.

77. In subsequent projects under the SOP approach, this subcomponent could provide matching grants to 'Stage 2' companies for expansion into any new markets. The subcomponent could also be expanded to 'Stage 3' companies to help them raise matching equity from capital markets.

Subcomponent 1D: Barrier Removal for Challenging Markets

78. The market assessment carried out during the project preparation identified that private solar businesses prefer to operate in countries with larger and vibrant economies. Hence, if left alone to commercial incentives, solar companies will tend to operate in a few select countries of West Africa and the Sahel region. To ensure equitable geographical reach of solar businesses, there is a need for targeted financial incentive to solar businesses operating in challenging markets, such as countries in the Sahel region. This financial incentive would be divided into upfront-front capital support to remove market entry barriers and performance-based financing support to help make the solar products affordable to consumers of the Sahel countries. Solar businesses operating in challenging markets and business environments will receive grant funding support upon submission of a satisfactory 'market entry' business plan to facilitate their move into the challenging market. At the operations stage, following a successful market entry, the solar businesses will be eligible for performance-based grants, which will help in keeping the solar products affordable to the end consumers. These performance-based grants would encourage blending with commercial financing that reduces the business's cost of capital. The level of grant financing to be allocated to businesses will be determined at the implementation phase and based on specific barriers each business would face in operating a solar business in a specific country.

79. This subcomponent will be implemented by the same Fund Manager who will implement subcomponent 1C. The solar entrepreneurs of the 13 ROGEP countries eligible to receive CTF Grants and DGIS Grants will benefit from this subcomponent. This subcomponent is critical to ensure that investment is not crowding in only in vibrant economies in the West Africa Region. Weaker economies will require these targeted incentives to attract solar entrepreneurs to operate in those countries.

Component 2: Access to Finance for Stand-alone Solar System Businesses

Subcomponent 2A: Line of Credit to Stand-alone Solar Businesses

80. This subcomponent will facilitate access to debt financing in support of the stand-alone solar systems market. Through a combination of credit lines and risk-sharing instruments, it will channel short- to medium-term loans to the following three main categories of borrowers: (a) solar equipment distributors supplying products[42] to households and productive end users and (b) households and productive end users of solar equipment This will help solar equipment distributors and energy service companies active in this market to scale up their operations as they become bankable and graduate from reliance on donor support and equity funding. Also, debt financing for this type of beneficiaries may be a

[42] Solar equipment distributors sell products that meet standards set by Lighting Africa. Energy Service Companies sell products, systems, and services that meet contractually defined KPIs.

better instrument than grant and equity financing, given the nature and the scope of financing needed to grow and make their business sustainable. This will also crowd in CFIs to the solar equipment sector.

81. Solar equipment distributors form a key part of the value chain. These companies need working capital to finance equipment purchases and receivables resulting mainly from PAYGO schemes. As such, they may need to borrow international currencies such as U.S. dollars or euros or, if feasible, the local currency to match their local currency cash streams. Loan tenors may vary from under one year for equipment importation through two or three years to cover PAYGO receivables to five to seven or more years to cover productive end users. Because equity/grant financing is not an adequate instrument to finance working capital, the line of credit will allow solar equipment distributors to rely on sustainable financing sources.

82. Productive end users of stand-alone solar systems are part of the scope for ROGEP because they contribute strongly to economic growth and generate employment. Productive uses of solar power may be found in the agriculture sector, for example, farms using solar water pumps and mills, in a variety of commercial and industrial SMEs that require a reliable source of power for machinery, and in the tourism sector. Productive end users might be key beneficiaries of commercial lenders as they may offer a superior established track record and have the capability to provide collateral as security for loans. They may also produce commodities priced in U.S. dollars or export products, giving them the capacity to borrow in U.S. dollars or euros.

83. Through this subcomponent, the World Bank will lend IDA SUF funds to BOAD. This will serve the eight countries in the WAEMU region. BOAD will lend the funds on sustainable terms covering funding costs, operating costs including hedging if required, and a profit element. The interest rates will be determined by BOAD in line with its other lending operations to CFIs and will use one or more of the following financing channels: (a) commercial banks; (b) leasing companies; (c) MFIs; (d) solar energy debt funds. ROGEP will fund a feasibility study of a specialized debt fund to issue bonds in the WAEMU capital market to securitize solar equipment receivables. A decision whether to support a debt fund under the project could be taken at a later date, based on the outcome of the feasibility study and, if warranted, it could be incorporated into the project as part of a restructuring.

Subcomponent 2B: Contingent Grant Facility for CFIs

84. The stand-alone solar systems market is still quite new and rapidly evolving. On the technical side, new products are being developed with higher efficiency, more battery storage, increased reliability, and longer product life. This reduces the payback period to the customer, relative to using kerosene lamps, for example. Commercial business models, PAYGO technology, and mobile payment systems are also evolving, and more consumers are using this technology. The stand-alone solar systems market in West Africa are less developed than those in East Africa and elsewhere. There is less information about market

demand and customer credit history, and solar companies also have less track record than in other regions. Furthermore, the 19 countries covered by ROGEP vary widely in terms of country risk and the level of financial sector development.

85. Commercial banks, and other prospective lenders, are often reluctant to lend to SMEs in general and even more so for SMEs in the stand-alone solar systems market, which they may not be familiar with. Negative factors include perceived borrower credit risk, insufficient track record of the underlying technology and products, and insufficient collateral to secure loans. Banks prefer hard assets as collateral and find it hard to assess the value of receivables, especially when these are PAYGO receivables from many small customers. Moreover, it is not generally feasible for lenders to price this extra risk into their interest rates. The rates are already as high as borrowers in this market can bear, given the fundamental payback characteristics of solar equipment. Imposing higher rates on borrowers in such a business would increase the probability of default and thus be self-defeating. Commercial banks will simply not lend to borrowers with these negative factors, without a contingent grant facility.

86. Due to lack of a track record of these new and innovative solar technologies implemented using mobile money-based payment schemes, the CFIs are reluctant to extend debt financing to these businesses without appropriate technology risk cover. Common technology risks, after using LGQA products adopted by the International Electrotechnical Commission (IEC,) could include for instance equipment design and manufacturing. As the FI, BOAD will administer the contingent grant facility and will benefit five CIF-eligible WAEMU member countries. The line of credit agreement between BOAD and the CFIs will stipulate the events covered by the contingent grant facility if the solar companies cannot generate sufficient revenues, resulting in an inability to pay debt obligations.

87. The contingent grant facility will provide comfort to the CFIs to lend to companies providing solar technologies in innovative ways in Africa. By offering a contingent grant facility to cover technology risk, CFIs will be able to take on the risk of companies that employ innovative technologies with higher efficiency, and increased reliability, and innovative business models that will ultimately support end consumers with access to electricity through stand-alone solar systems.

88. The use of proceeds for the contingent recovery grant is to incentivize CFIs to lend to Stage 2 and Stage 3 Solar Companies that employ innovative technologies with higher efficiency by providing partial risk coverage for any financial losses incurring as a result of performance failure of the underlying technology. The facility will cover up to 50 percent of the loan principal of Stage 3 companies and 80 percent of the loan principal of Stage 2 companies in case of a default resulting from the non- or underperformance of the underlying technology. The higher level of cover for Stage 2 companies reflects the increased challenges they face to meet lender requirements for sufficient business track record and loan collateral.

89. Before any payouts from the Facility, CFIs will need to provide sufficient documentation to prove the financial losses incurred to meet the eligibility criteria as stipulated in the downstream contingent recovery grant agreement between BOAD and the CFIs. The POM will specify that an independent third-party verification agent will review the claims made by the CFIs to benefit from the contingent recovery grant. The CFIs will be responsible to submit all evidence to determine whether the loan default was due to underperformance of technology. BOAD will be responsible for manage the Contingent Grant Facility and ensuring that the claims of the CFIs are reviewed by an independent third-party verification agent. BOAD will be required to provide evidence to the World Bank showing that claims of the CFIs are eligible for payouts. The underperformance of technology, along with the procedure for managing the facility, will be defined in the POM.

90. Table 2.7 provides additional details on the expected design of the contingent grant facility under subcomponent 2B, including targeting, eligibility, and required matching criteria.

Table 2.7. Implementation Guidelines for Contingent Grant Facility

Topics	Guidelines
Objective	• Demonstrate viability of business model • Facilitate access to follow-on investment
Eligibility criteria	• Locally registered 'Stage 2' or 'Stage 3'
Selection filters	• Scaling up • Additionality (requires ROGEP funding to happen)
Eligible use of funds	• Certified products and installers (where applicable)
Size of Collateral Support	• Up to 80% of loan principal for 'Stage 2' • Maximum support up to US$500,000 for 'Stage 2' • Up to 50% of loan principal for 'Stage 3'
Matching ratio	• Company equity required by the CFI
Connection with provision of TA	• Assistance with refining application, budget, and milestones and reaching the milestones in collaboration with ECREEE
How to promote a sustainable impact?	• Combined with TA support and enabling environment • Facilitate access to follow-on investment
M&E indicators	• Revenue growth • Unit sales • Affordability of product offerings • Access to follow-on financing/bankability • Household impacts (for example, access to energy) • Jobs created • Increased market competition
• Multiple awards possible?	• Yes, but clear additionality or lack of follow-on financing options

Roles and Responsibilities of Implementing Agencies and Stakeholders

91. The project will be implemented by the PIU in ECREEE and in BOAD by the Project Team set under the coordination of the Recipient's Enterprise and Financial Institutions Department (*Direction des Enterprises and des Institutions Financières*). Both organizations bring in their respective comparative advantages and will coordinate to ensure effective implementation. A POM detailing the implementation process of each implementing agency will be prepared and adopted. In general, ECREEE will undertake activities to develop a regional market for stand-alone solar products. This will include project management and monitoring, TA and analytical activities, capacity building and training, knowledge management and information dissemination, financial incentives, and removal of business start-up barriers in challenging markets. BOAD will implement FI activities, which will include providing a line of credit to CFIs, the contingent grant facility, collateral support to early-stage solar entrepreneurs, and so on.

92. A feasibility study to establish a specialized debt fund with the objective of tapping the WAEMU capital market to finance solar equipment receivables will be conducted in coordination with ECREEE. The feasibility study will be further coordinated with the World Bank Group's Joint Capital Markets Program, designed to deliver on the World Bank Group's commitment to expanding domestic capital markets. Depending on the study finding, a specialized debt fund could be established at a later date.

Structure of the Credit Lines

93. For the credit lines to become operational, the financial institutions must meet the requirements set out in the Guidelines for Financial Intermediary Financing.[43] If any financial institution does not initially meet all the requirements, TA under an Institutional Development Plan will be required as a first step, before launching the credit line. An assessment of BOAD's performance confirmed its eligibility to borrow from the World Bank. The detailed assessment is provided in Annex 6. The World Bank will lend euros to BOAD on IDA SUF terms. These are the same as IBRD terms for middle-income countries.

94. BOAD will lend the funds to CFIs in euros, CFA francs, or other local currencies at interest rates sufficient to cover funding costs, administrative costs, currency and interest rate hedging costs, and an adequate return on capital. The CFIs will provide loans in euros or the local currency to the three categories of borrowers. The CFIs will set the interest rates and other terms depending on credit quality and degree of risk mitigation. BOAD will select CFIs conditional on World Bank 'no objection' in each case. The World Bank will determine whether each CFI meets its Financial Intermediary Financing policy requirements relating to operating capability including safeguards and financial strength. BOAD will prioritize CFIs that have a strong pipeline of solar equipment lending. There will be no fixed funding quota by country. Funding channeled to each country will depend on the demand for debt financing and readiness of commercial lenders operating in each country.

[43] http://intresources.worldbank.org/INTOPCS/Resources/380831-1360104418611/Guidance_Note_FIF.pdf.

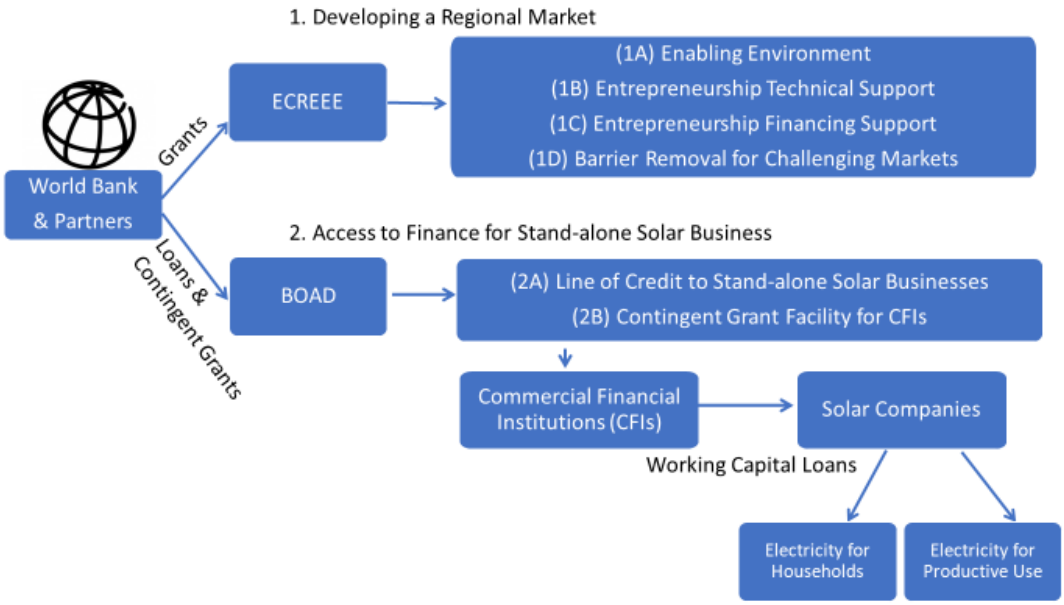
95. The ROGEP SOP1 will partner with IFC's SLGP 41038, an existing programmatic approach to risk sharing with CFIs. Under the SLGP, IFC will share the stand-alone solar companies' portfolio risk with local CFIs and provide comprehensive advisory services to enhance and strengthen the CFIs' capacity for risk taking and financing for stand-alone solar companies. The SLGP will tailor the offered percentage cover to the needs of the CFI in its specific markets but typically provides cover of about 50 percent of loan principal on a pari passu sharing basis. The SLGP is backed by a pooled first loss structure provided by the IDA18 IFC-MIGA PSW (IDA-PSW) Blended Finance Facility, which allows the SLGP to provide cover at rates affordable to CFIs. BOAD has identified potential CFI partners in all eight WAEMU countries. Five of these CFIs are eligible for cover under IFC's SLGP, as shown in Table 2.8.

Table 2.8. ROGEP-BOAD Proposed CFI Partners

Country	BOAD List of CFIs
Benin	Orabank (IFC SLGP eligible) SGB Coris Bank International (IFC SLGP eligible) NSIA Banque (IFC SLGP eligible)
Burkina Faso	Orabank (IFC SLGP eligible) Fidelis Finance (Leasing) (IFC SLGP eligible) BDU Coris Bank International (IFC SLGP eligible)
Côte D' Ivoire	Orabank (IFC SLGP eligible) Fidelis Finance (Leasing) (IFC SLGP eligible) BDU NSIA Banque (IFC SLGP eligible)
Guinea-Bissau	Orabank (IFC SLGP eligible) BDU
Mali	Orabank (IFC SLGP eligible) BDM BMS Kafo (Microfinance)
Niger	Orabank (IFC SLGP eligible) Sonibank (IFC SLGP eligible)
Togo	Orabank (IFC SLGP eligible) NSIA Banque (IFC SLGP eligible) Coris Bank International (IFC SLGP eligible)
Senegal	Orabank (IFC SLGP eligible) BNDE CNCAS

96. Interest rate and currency risks will be hedged by BOAD or the CFIs depending on their relative capability, to achieve maximum cost-effectiveness. Most borrowers, being SMEs, will typically require fixed interest rate loans, as they lack the capacity to manage the interest rate risk associated with variable rate loans. The World Bank will provide loans to BOAD in euros under the SUF, as euros are more appropriate for BOAD and the WAEMU region. The foreign exchange exposure of lending in local currencies will be managed by BOAD and/or the CFIs that will arrange suitable hedges. The cost of currency hedging may potentially preclude local currency financing in some countries. The interest rates that solar equipment companies can bear are limited by the intrinsic payback period of such solar equipment, which is typically two to three years for smaller equipment but could be longer for larger items.

Figure 2.4. Outline of Implementation and Financing Arrangement of the ROGEP SOP1



ANNEX 3: ECONOMIC AND FINANCIAL ANALYSIS

REGION: Western Africa
Regional Off Grid Electrification Project

1 The project aims to provide electricity access to households, businesses, and public institutions that are either not currently connected to the grid or mini-grid solutions or do not have reliable electricity supply. The economic benefits to the project beneficiaries are assumed based on avoided costs and are therefore defined by the amount that they pay for energy services, such as fuel-based lighting options, which can be substituted by electricity.

2 The ECOWAS region, with a population of around 335 million, has one of the lowest modern energy consumption rates in the world. The average consumer tariff per kWh is relatively high in the ECOWAS area. Moreover, significant energy access and energy pricing inequalities exist between urban and rural areas. Whereas people in urban areas tend to use energy in the form of electricity, charcoal, kerosene, and other fuels, people in rural areas continue to rely largely on traditional biomass for meeting their energy requirements for cooking, lighting, and space heating.[44]

3 A conservative calculation of households' return on investment in a solar system indicates that it is an economically feasible investment for such households. Current energy spending on alternative fuels such as kerosene and dry cell batteries compared with quality solar product, whether pico solar systems, SHS, or solar water pump, can help households meet their current energy needs at each tier of service in a more cost-effective way. On the other hand, the financial analysis revealed that the added burden of import duties and value added taxes (VATs) of solar products falls on the households, making the products more expensive to purchase. The drop in the internal rates of return (IRRs) strengthen the case for harmonizing tax regimes and alleviating the tax burden for OGS products within the west Africa and Sahel region.

Economic Analysis

4 **Pico PV products.** The economic analysis showed that it makes sense economically for a household to invest in a pico product instead of spending in dry cells and cellphone charging services. The analysis uses data from the Liberian market,[45] which in the ECOWAS region counts among the small markets. The Liberian Willingness to Pay (WTP) for lighting products is somewhere in between that of

[44] Baseline *Report for the ECOWAS Renewable Energy Policy (EREP)*. ECREEE. October 2012.
[45] GreenMax Market Assessment 2018, ECREEE.

Sierra Leone where end users' WTP is very low and Ghana that has a WTP at the high end of the spectrum.[46] Table 3.1 shows the assumptions reflecting Liberian household current spending for lighting while Table 3.2 shows the results from the economic analysis.

Table 3.1. Household Monthly Spending in Liberia (for MTF Tier 1 level)

*Access to one torch **(OT)** and one lantern each powered **(OLEP)** by dry cell batteries (**DCB**) along with one cellphone charging services (**OCPCS**)*	
Dry cell average unit cost (USD$)	0.255
Minimum units of dry cell bought per month	4
Minimum spending on dry cells (USD$)	1.020
Unit cost of cellphone charging (USD$)	0.155
Minimum number of charging	16
Minimum spending on phone charging (USD$)	2.480
Minimum household spending on batteries replacement and phone charging (USD$)	3.500
Conservative estimate of saving (50% of spending) (USD$)	1.750

5 Assuming that rural households in Liberia are willing to disburse only 50 percent of the market assessment findings, that is US$1.75 per month instead of US$3.5 per month, the EIRR of 3Wa pico solar system with a price of USD$40 is about 44 percent. Table 3.2 illustrates the EIRR results for pico solar products.

[46] ibid

Table 3.2: EIRR – 3W pico solar lamp- PSL (Liberia case)- conservative approach

MTF Tier 1. 3W– Pico Solar System						
Costs, USD ($)	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Current monthly energy spending including two battery-powered lights requiring dry cell batteries replacement on a weekly basis and one cell phone charge	—	1.75	1.75	1.75	1.75	1.75
Annualized energy spending (saving)	—	21.00	21.00	21.00	21.00	21.00
Price of Pico Solar product	40.00	—	—	—	—	—
Household cash flow	-40.00	21.00	21.00	21.00	21.00	21.00
EIRR of 3W Pico Solar Systems	**44%**	—	—	—	—	—

6 **SHS.** A similar approach was used to calculate SHS EIRR. Table 3.3 summarizes the breakdown of current off-grid household spending for lighting for MTF Tier 2-level electricity access.

Table 3.3: EIRR - Household Monthly Spending in Liberia (for MTF Tier 2 Level)

Access to torches **Five T** *and lanterns powered* **Three LP** *by dry cells; two cell phones powered* **DCTCPP** *by charge service; radio* **CS, R,** *DC TV*	
Dry cell average unit cost (USD$)	0.255
Minimum units of dry cell bought per month	30
Minimum spending on dry cells (USD$)	7.650
Unit cost of cellphone charging (USD$)	0.155
Minimum number of charging	32
Minimum spending on cell phone charging (USD$)	4.960
Minimum units of radio dry cells bought per month	4
Minimum spending on radio dry cells	2.040
Cost of small generation or lead Acid battery charging for TV (USD$)	14.475
Minimum household spending for MTF Tier 2-level electricity access (USD$)	28.105
Conservative estimate of saving (66% of spending) (USD$)	18.55

7 Based on conservative estimate of current Liberian energy spending, the economic analysis indicates that it makes sense economically for a household to invest in an SHS.[47] The EIRR for SHS in Liberia

[47] Assumptions and parameters used are those from the GreenMax market assessment (2018) carried out by ECREEE.

is 35 percent. This level of return justifies investment in SHS as a sound economic choice for households. Table 3.4 shows the EIRR calculation of households using 50Wa SHS.

Table 3.4: EIRR – 50W- SHS (Liberia case)

MTF Tier 2. 50W– Small SHS						
Costs, USD ($)	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Current monthly energy spending including five battery light points requiring dry cell replacement on a weekly basis, two phone charges 16 times per week, radio dry cells replaced twice per month, and TV powered by small generator once per week	—	18.55	18.55	18.55	18.55	18.55
Annualized energy spending (saving)	—	222.59	222.59	222.59	222.59	222.59
Price of product	495.00	—	—	—	—	—
Household cash flow	-495.00	222.59	222.59	222.59	222.59	222.59
EIRR of 50W Small s SHS	**35%**	**—**	—	—	—	—

8 **Solar Water Pump.** household data and market data from Côte d'Ivoire were used to assess the economic profitability of solar water pumps for households. Table 3.5 captures the information related to rural household current spending for water.

Table 3.5: Water consumption – example of rural household – Côte d'Ivoire

Description	Data/metrics
Estimated daily water consumption (in cubic meter)	10
Estimated performance of the diesel motor water pump (m^3/h)	1
Pump fuel consumption per hour (in liter)	0.5
Number of hours of operation per day	10
Pump fuel consumption per day (in liter)	5
Price of fuel (USD$ per liter)	1.02
Daily spending on fuel to operate the pump (USD$)	5.1
Monthly spending on fuel to operate the pump (USD$)	153
Size of Solar Water Pump for same level of service (kW)	1.4

9 The economic analysis shows a 33 percent EIRR for a household that will transition from a diesel motor pump to a solar water pump (see Table 3.6).

Table 3.6: EIRR - 1.4 kW Solar Water Pump (Côte d'Ivoire case)

1.4 kW Solar Water Pump						
Costs USD ($)	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Current monthly spending with diesel motor pump	—	153	153	153	153	153
Annualized spending using diesel motor pump (saving)	—	1836,	1836,	1836,	1836,	1836,
Price of Solar Water Pump including associated equipment	3448,	—	—	—	—	—
Price of installation	800	—	—	—	—	—
Total cost including product and installation	4248,	—	—	—	—	—
SME cashflow	-4248,	1836,	1836,	1836,	1836,	1836,
EIRR for 1.4 kW Solar Water Pump	**33%**	—	—	—	—	—

Financial Analysis

10 Import duties and VAT in Liberia are estimated at 30 percent,[48] which is particularly high when compared to the tax regime applied on solar products in other ECOWAS countries. Products benefiting from the tax exemption in Liberia are those imported under the Lighting Lives Liberia program. The present financial analysis therefore highlights the tax burden impact on end users investing in OGS products that are not benefiting from any tax exemptions.

11 **Pico Solar Systems.** By adding a 30 percent tax on the price of a pico solar system, the price augments from US$40 to US$52. This has a direct implication on the IRR. When comparing the EIRR to the FIRR using the exact same set of assumptions but adding the tax parameter, the IRR dropped from 44 percent to 29 percent as shown in Table 3.7. This drop in the IRR strengthens the rationale for harmonizing tax regimes and alleviating the tax burden for OGS products within the west Africa and Sahel region.

[48] Liberia Revenue Authority H.S. Code: 9405.40.00.00 stipulates that for Other electric lamps and lighting fittings, import duty tariff is 20 percent and goods and service tax/VAT is 10%.

percent

Table 3.7: FIRR – 3W pico solar lamp- PSL (Liberia case)

MTF Tier 1- 3W– Pico Solar System						
Costs USD ($)	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Current monthly energy spending including two battery-powered lights requiring dry cell batteries replacement on a weekly basis and one cell phone charge	—	1.75	1.75	1.75	1.75	1.75
Annualized energy spending (saving)	—	21.00	21.00	21.00	21.00	21.00
Price of product before tax	40.00	—	—	—	—	—
Price of product after tax	52.00	—	—	—	—	—
Household cash flow	-52.00	21.00	21.00	21.00	21.00	21.00
FIRR of 3W Pico Solar System	**29%**	—	—	—	—	—

12 **SHS.** The 30 percent tax amount applied on the SHS market price translates into a price increase of US$148.5. The price rise has a direct impact on the FIRR, which—when compared to the calculated EIRR under a similar set of assumptions—drops from 35 percent to 22 percent (Table 3.8).

Table 3.8: FIRR - 50W-SHS (Liberia case)

MTF Tier 2. 50W–Small SHS						
Costs USD ($)	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Current monthly energy spending including five battery light points requiring dry cell replacement on a weekly basis, two phone charges 16 times per week, radio dry cells replaced twice per month, and TV powered by small generator recharged once per week	—	18.55	18.55	18.55	18.55	18.55
Annualized energy spending (saving)	—	222.59	222.59	222.59	222.59	222.59
Price of product before tax	495.00	—	—	—	—	—
Price of product after tax	643.50	—	—	—	—	—
Household cash flow	-643.50	222.59	222.59	222.59	222.59	222.59
FIRR of 50W Small s SHS	**22%**	—	—	—	—	—

13 **Solar Water Pump** – Solar water pump FIRRs are calculated using an average market price from Côte d'Ivoire with an overall tax of 18 percent—as only solar panels benefit from a tax exemption. The tax impact translates into an increase of approximately USD$765 on the overall market price of the product. The FIRR obtained is 24 percent, showing the exacerbated impact on disadvantaged households.

Table 3.9: FIRR - 1.4 kW Solar Water Pump (Côte d'Ivoire case)

1.4 kW Solar Water Pump						
Costs, USD ($)	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Current monthly spending with diesel motor pump	—	153	153	153	153	153
Annualized spending using diesel motor pump (saving)	—	1836,	1836,	1836,	1836,	1836,
Price of Solar Water Pump including associated equipment	3448,	—	—	—	—	—
Price of installation	800	—	—	—	—	—
Cost including product and installation before tax	4248,	—	—	—	—	—
Cost including product and installation after tax	5013,	—	—	—	—	—
SME cashflow	-5013,	1836,	1836,	1836,	1836,	1836,
FIRR for 1.4 kW Solar Water Pump	**24%**	—	—	—	—	—

14 **Financial Intermediary Approach**. A Financial Model has been prepared to analyze the rate of return for the financial intermediary portion of the project, funded by the World Bank. The model assesses the performance of the project based on financial intermediation intervention. About US$140 million is used to provide a line of credit to commercial financial institutions (CFIs) and then the CFIs use the available funds to provide working capital loans to solar entrepreneurs.

15 The World Bank extend IDA SUF loans to BOAD at IBRD terms for about 15 years. BOAD extends a line of credit to eligible CFIs for 12 years at market driven interest rates. On an average the CFIs will use the line of credit to provide working capital loans for about 3 years. Given the short tenure, the CFIs can recycle the funds for additional loans till the repayment is due.

16 The financial model assumes a front-end fee of 0.25 percent and a commitment fee of 0.25 percent on undisbursed amount. It is further assumed that BOAD will extend its line of credit to the CFIs at an average interest rate of 8.7 percent. The average spread that the CFIs will add to their working capital loans to solar entrepreneurs is assumed to be about 6 percent and accordingly the interest rate that the solar entrepreneurs will have to pay is expected to be about 14.7 percent.

17 Considering the above assumptions, the FIRR of the financial intermediation operation is about 14 percent. However, given the nascent nature of the solar market in West Africa, the project will benefit from technical assistance support. To promote local entrepreneurs to operate at scale, and to attract solar entrepreneurs to operate in challenging markets, grant funds would be used to provide matching grants, market entry grants, and performance grants. If these grant funds are included as project cost, then the project FIRR reduces to about 10 percent. The project also benefits from a contingent recovery facility to mitigate technology risk of promoting innovative and efficient solar projects, which lacks long term track record. As this contingent recovery facility will only be considered as a grant if the risk materializes and otherwise will not be included in the project cost, this has not been considered in the financial analysis calculation.

Table 3.10: FIRR of Financial Intermediary Approach

(In US$ million)	YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 18	YR 19	YR 20
Total Project Disbursement	13	22	34	57	71.5				
Project Development Costs (Grants from WB/CTF/DGIS)	(3.78)	(6.41)	(9.90)	(16.59)	(20.82)				
Line of Credit Disbursed from World Bank	(9.22)	(15.59)	(24.10)	(40.41)	(50.68)				
Front End Fee	(0.02)	(0.04)	(0.06)	(0.10)	(0.13)				
Commitment Fee	(0.33)	(0.29)	(0.23)	(0.13)	0.00				
Repayment Terms 12 years, Interest 8.7%									
Year 1 Loan Repayment		(1.27)	(1.27)	(1.27)	(1.27)	(1.27)			
Year 2 Loan Repayment			(2.15)	(2.15)	(2.15)	(2.15)			
Year 3 Loan Repayment				(3.32)	(3.32)	(3.32)			
Year 4 Loan Repayment					(5.56)	(5.56)			
Year 5 Loan Repayment						(6.97)			
Cash Outflow of CFIs	(0.35)	(1.59)	(3.70)	(6.96)	(12.41)	(19.26)			
Year 1 Fund Available for Working Capital Loans	8.87	14.00	20.40	33.45	38.27	(19.26)			
Year 2 Fund Available for Working Capital Loans		17.86	24.26	37.31	38.27	(19.26)			
Year 3 Fund Available for Working Capital Loans			32.05	45.10	46.06	(19.26)			
Year 19 Fund Available for Working Capital Loans								140.26	99.77
Year 20 Fund Available for Working Capital Loans									160.89
Working Capital Terms 3 years Interest 14.7%									
Year 1 Working Capital Repayment		3.86	3.86	3.86					
Year 2 Working Capital Repayment			7.79	7.79	7.79				
Year 3 Working Capital Repayment				13.97	13.97	13.97			
Year 19 Working Capital Repayment									61.13
Year 20 Working Capital Repayment									
Cash Inflow	0	3.86	7.79	13.97	25.74	37.38	45.96	53.81	61.13
Net Cash Flow of the Project without Grant Support	(13.35)	(19.73)	(29.92)	(49.99)	(58.17)	18.12	45.96	53.81	271.48
IRR	10%								
Net Cash Flow of the Project with Grant Support	(9.57)	(13.33)	(20.02)	(33.39)	(37.35)	18.12	45.96	53.81	271.48
IRR	14%								

ANNEX 4: GENDER ANALYSIS

REGION: Western Africa
Regional Off Grid Electrification Project

Gender Analysis

1. **Project countries face significant challenges in closing gender gaps in the domain of economic opportunities, in particular gender gaps in access to more and better jobs.** Women have lower rates of labor force participation in most of the project countries.[49] Women are more likely to work in low-productivity sectors and often engage in less-profitable areas due to market segregation.[50] For example, 9–14 percent of the differential in gender earnings for the self-employed is found in the industry that they are operating in.[51] In the agricultural sector, female farmers are less productive than male farmers, because they have less access to inputs and manage smaller land plots.[52] When economic activities that women are involved in reach a certain level of profitability, men tend to enter in increasing numbers such as the case in Shea butter production in Mali. Women in project countries are often concentrated in small and informal enterprises and are more likely to operate in retail and service sectors.[53]

2. **Women entrepreneurs have to overcome greater bottlenecks than their male peers for growing their businesses.** Some of the structural barriers women-led businesses face include (a) lower levels of financial literacy and knowledge on the financial products than men; (b) female entrepreneurs' feeling of being less equipped to maneuver complex procedures to access available financial products; (c) less ownership of tangible assets (for example, land and property) limiting collateral for credit; (d) lower education and less business experience and skills; (e) less access to local and international business networks; (f) lack of access to formal and informal mentors; and (g) underrepresentation of women in education in high-productivity sectors such as science, technology, engineering, and math.[54] Due to these

[49] IFC (International Finance Corporation). 2007. *Gender and Economic Growth Assessment for Ghana*; McFerson, H. 2012. "Women and Post-Conflict Society in Sierra Leone." *Journal of International Women's Studies* 13 (1); World Bank. 2015.*Republic of Mali Systematic Country Diagnostics*; World Bank. 2015. *Côte D'Ivoire Systematic Country Diagnostics*; World Bank. 2017. *Burkina Faso Systematic Country Diagnostics*; World Bank. 2016. *Togo Systematic Country Diagnostics - Decision Draft*; World Bank. 2015. *Improving Gender Equality and Rural Livelihoods in Senegal*; World Bank. 2002. *Benin Strategic Country Gender Assessment*.
[50] World Bank. *Africa Gender Action Plan 2013–2017*.
[51] World Bank. *Africa Gender Action Plan 2013–2017*.
[52] World Bank. *Africa Gender Action Plan 2013–2017*.
[53] IFC and World Bank. 2011. Expanding Women's Role in Africa's Modern Off-Grid Lighting Market.
[54] Value for Women. 2018. Understanding Structural Barriers and Hidden Bias in Access to Credit for Women-Led Businesses.

challenges, women-led businesses face challenges in increasing their profitability and growing their businesses compared to their male counterparts. For instance, in Togo, profits of female-operated firms are 62 percent lower than those of their male counterparts. For women-led firms in Africa, labor productivity is 6–8 percent lower than for firms managed by men.

3. **Women entrepreneurs in the region lag behind their male counterparts in access to finance.** In Africa, more than 70 percent of women are financially excluded.[55] Women in the region face discrimination in credit markets. Women entrepreneurs continue to receive a small fraction of the total capital available for SME investment across Africa. Women also access less than 10 percent of the credit to small farmers and less than 1 percent of the total credit to agriculture in Africa.[56] In Ghana, an enterprise survey of women-owned businesses identified lack of access to finance as a critical constraint for these businesses. Lack of access to finance prevents women entrepreneurs from entering into new local and international markets, including stand-alone solar systems markets. As also indicated previously, women-led businesses face various challenges in access to finance including lack of information about the available range of financial products and services, lack of tangible assets or collateral, lower levels of financial literacy, time and mobility constraints, and sociocultural constraints.

4. **Women are often not engaged in the off-grid space and have limited awareness of and information about opportunities of the market in the region.** Engagements across the region illustrate that when women are provided information about the opportunities available in the off-grid sector, they take advantages of such opportunities. In Ethiopia, information sessions were conducted with women business associations and female entrepreneurs about the opportunities available in the off-grid sector under the US$45 million Development Bank of Ethiopia's Market Development for Renewable Energy and Energy Efficient Product Credit Line, together with IFC and the Ethiopia Climate Innovation Center. After the implementation of information sessions, Ethiopian female entrepreneurs have come forward to apply for financial products to import stand-alone solar systems. In Togo, women villagers were informed about the opportunities in the solar market and received training in solar electrification in India.[57] These women successfully installed solar electricity in the entire village and generated income for installation and maintenance of solar systems.

5. **Even when women entrepreneurs are provided information about the opportunities in the off-grid market, limited capacity and skills, in particular business management skills, could prevent women from taking up such opportunities**. In Kenya, under the Lighting Africa program launched by the World Bank and IFC, in addition to women's lack of access to finance, women entrepreneurs' limited businesses

[55] Equal Footing. 2014. Women's Financial Inclusion in Africa.
[56] Narain, Sushma. 2009. "Gender and Access to Finance." Analytical Paper. World Bank.
[57] "Female Solar Engineers Bring Hope to Farmers in Togo." https://cleantechnica.com/2018/08/13/female-solar-engineers-bring-hope-to-farmers-in-togo/.

management skills were identified as a challenge for them to enter into the off-grid energy value chain. The Lighting Africa program in Kenya implemented tailored trainings and capacity-building activities responding to the needs of women entrepreneurs. Trainings to women focused on capacity building on business management skills (for example, modules on sales and marketing, communications, and record keeping) and implemented a mentorship program for women, where women entrepreneurs were paired up with business mentors.

6. **Female-headed households in project countries tend to be poorer and particularly vulnerable.**[58] In Burkina Faso, female-headed households were found to be poorer. In rural areas of Togo, female-headed households, on average, have farm sizes half of those of male-headed households. In Mali, households headed by widows are especially poor among female-headed households, and widows have lower levels of nutritional status than women of other marital statuses.[59] An analysis of household expenditure surveys in Sub-Saharan African countries looking at use of electricity argued that as female-headed households tend to be poorer, it is important to focus on helping these households for the goal of achieving universal access. [60]

7. **Lack of access to electricity, in general, worsens the existing gender gaps in the project countries.** Lack of access to electricity service disproportionately affects women, in particular, because of their reliance on electricity to fulfill household chores, which in many contexts are seen primarily as the responsibility of women. In project countries, in the absence of electricity access, there is high reliance on solid fuels for cooking, which can negatively affect the health of women and girls because they spend more time in proximity to such energy sources.[61] As women and girls are often assigned the responsibility of collecting fuel such as firewood and charcoal, they experience time loss as well as safety and health risks because they travel areas further from their homes. Time use surveys in Benin show that women spend four times as much time as men for firewood collection, and when it comes to time spent preparing

[58] The analysis acknowledges heterogeneity among female-headed households in project countries. Female-headed households primarily refers to the worst-off segments of the population and includes widow, and/or divorcee-headed households with no labor endowments or productive assets and single mothers living with their children outside of marriage (for example, women who are victims of GBV).
[59] van de Walle, Dominique. 2017. “Invisible and Excluded: The Fate of Widows and Divorcees in Africa”. Policy Research Talk, World Bank.
[60] Kojima, M., et. al. 2016. “Who Uses Electricity in Sub-Saharan Africa? Findings from Household Surveys.” World Bank: Washington, DC.
[61] Clacy, Joy, et al. 2012. “Social Influences on Gender Equity in Access to and Benefits from Energy”. World Bank: Washington, DC; Ekouevi, Koffi, and Tuntivate Voravate.2012. *Household Energy Access for Cooking and Heating: Lessons Learned and the Way Forward*. Washington, D.C.: World Bank; WHO. 2016. “Burning Opportunity: Clean Household Energy for Health, Sustainable Development, and Wellbeing of Women and Children.”

meals, women completely dominate men.[62] Girls also could be kept out of school to assist with fuel collection. As the household is often the center of small-scale enterprises for women, unavailability of electricity also negatively affects women's ability to generate income through such enterprises. Lack of electrification of health care facilities can result in unsafe deliveries and obstacles in dealing with maternal and childbirth emergencies due to lack of refrigeration of vaccines and medicines.[63]

Gender Actions

8. Proposed gender actions under the project will contribute to closing gender gaps identified in the domain of economic opportunities and access to credit by (a) engaging with women-led companies in the solar sector and providing them training and capacity-building support; (b) improving access to credit of women-led companies in the solar and non-solar sectors; and (c) increasing awareness of women-led companies in non-solar sectors on opportunities in the stand-alone solar systems market. All these actions will aim to enable women-led companies to enter into the stand-alone solar systems market and enhance technical capacity of those who are already operating in the solar sector. More details on these specific gender actions are provided .in the following paragraphs The PIU has appointed a Gender Expert whose primary responsibility is to implement identified gender actions and monitor gender impacts of these actions.

Under Subcomponent 1B: Entrepreneurship Technical Support

Information and Awareness-Raising Activities

9. Activities under this subcomponent that aims to provide support to entrepreneurial businesses across the enterprise development life cycle (startup-up, early stage, growth, and maturity) will target and include women-led companies.

- Women-led non-solar companies (Stage 3) will be engaged and their awareness of and information about opportunities provided in the stand-alone solar systems market and financial products offered under the project will be increased. The project aims to gradually increase the percentage of women-led non-solar companies engaged, and their awareness of and information about opportunities, in solar business from 0 to 10 percent.

[62] Energy, Gender and Development: Linkages.
[63] Household Energy Network. 2015. "Boiling Point: A Practitioner's Journal on Household Energy, Stoves and Poverty Reduction."

- Women entrepreneurs will be targeted and equally represented in regional and national events that are organized throughout the project as part of the stakeholder engagement strategy.

TA Intervention

- The project with the help of a gender expert based in ECREEE will make sure that women-led companies will have equal opportunity to benefit from relevant training and capacity-building activities. Women-led companies that will benefit from technical support will be those already operating in the solar sector at different stages (early and startup-up stage and mature companies operating in the solar sector - Stage— 1 and 2, respectively). The project will gradually increase the number of women-led companies benefiting from the technical support from the project from six companies, which have already participated in a training during project design, to 35, which is 35 percent of the total number of companies that will benefit from the technical support from the project. The project will also monitor the impact of technical support on income levels of women-led companies that received technical support from the project.

- The gender expert will tailor training and capacity-building activities to meet the specific needs of women-led companies at different stages (Stages 1 and 2). Tailored entrepreneurship and business trainings will be provided to women leaders of companies engaged in the solar sector to close their skills gap in business management (sales and marketing, communications, record keeping, employee productivity management, and so on) compared to their male counterparts. It is estimated that gradually women-heads of companies will report increased capacity and skills from 5 to 20 women, which is around 57 percent of women heads of companies benefiting from the technical support from the project.

- Under the TA activities, the gender expert will design and implement a mentorship program specific for women leaders of Stages 1 and 2 companies. The mentorship program will pair women entrepreneurs with seasoned business mentors who will work with women entrepreneurs throughout the business acceleration cycle.

Under Subcomponent 2A: Line of Credit for Stand-alone Solar System Businesses

Improving women entrepreneurs' access WEA to finance

10. Activities under this subcomponent that aims to facilitate access to debt financing in support of the stand-alone solar systems market by channeling short- to medium-term loans will target women-led

companies operating in both solar and non-solar sectors and provide them access to credit. Women-led companies that will receive financial support include women-led Stage 2 mature companies operating in the solar sector and Stage 3 women-led companies operating in non-solar sectors.

- The project will provide and monitor women-led companies receiving credit under the project. In collaboration with the PIU M&E Expert, an indicator measuring the number of women-led companies receiving credit is included under the M&E Plan. The PIU Gender Expert will ensure proper reporting on this indicator. The project will gradually increase women-led companies benefiting from the credit line to 1–6 from a zero baseline.

11. **The project will contribute to improving women's employment through tracking women hired for full-time jobs created by Stage 1, 2, and 3 companies as a result of participation in ROGEP.** It is expected that the companies participating in ROGEP activities will create new employment opportunities. The project will encourage companies to hire women for at least 10 percent of these new full-time positions. The project will gradually increase the number of women hired for full-time positions by participating companies to 5–30 from a zero baseline.

12. **The project will have general positive development impacts such as providing electricity to female-headed households, and public institutions providing services to women (that is, maternal health clinics).** This will be in addition to the proposed gender actions in the domain of economic opportunities that are linked to particular gender gaps and have a specific result chain.

Gender-responsive M&E

13. Gender indicators measuring the outcomes of the proposed gender actions are included in the project's Results Framework. Target values of gender indicators are determined in dialogue with the M&E and Gender Experts at the PIU. Since the project includes 19 countries, and there is lack of regional data points on gender issues that the project focuses on, setting target values for the gender indicators posed a unique challenge. The project team addressed this challenge by closely collaborating with the PIU's M&E and Gender Specialists and determined target values largely based on the results of the PIU's initial rounds of engagement (for example, trainings) with potential beneficiary groups such as women-led companies operating in the solar sector in the region. The gender indicator target values are subject to change based on the results of ongoing assessments (that is, market assessment and post-training survey for entrepreneurs). The gender indicators included in the Results Framework will be monitored under the PIU's M&E plan with the close assistance of the Gender Expert and the associated costs for monitoring are included in the PIU's M&E budget.

ANNEX 5: KEY RISKS AND PROPOSED MITIGATION MEASURES

REGION: Western Africa
Regional Off Grid Electrification Project

Areas of Intervention	Key Risks	Mitigation
Policy Environment	• Limited political commitment regarding off-grid electrification, ineffective institutional arrangements, and limited inter-ministerial and cross-sectorial coordination • Essential role of stand-alone solar systems not explicit in policy • Insufficient conditions for private sector involvement • Lack of suitable regulation and standards • Gender aspects often neglected • Lack of systems for monitoring impact and progress • Tax and import duty concessions not available	• Client dialogue on policy and regulatory aspects • ECREEE role as a regional body to influence member countries • TA component to bring QA and service standards • Capacity building under the TA component (including issues related to gender aspects) • World Bank involvement to bring in private sector financing
Capacity	• Lack of knowledge and practical experience of the business model, financing and management options for mini-grids and stand-alone systems • Limited capacity of households to pay up-front for either solar products or electrification services • Limited capacity of ECREEE (implementing agency) to implement a large program	• Support in the TA component for business development support • PAYGO modality can be used to address affordability of population by allowing them to pay in small installments over time and accommodate seasonal use and payments • Grant funding support to carry out TA activities as well as setting up a PIU to take care of resource constraints that the implementing agency may have
Information and Knowledge	• Limited knowledge by promoters and developers of the current regulation environment, policy framework, and available incentive schemes • Lessons from previous successes and failures are not embraced	• Market intelligence studies to inform about current situation • Lighting Africa past experiences and off-grid strategy • World Bank risk mitigation instruments information

Areas of Intervention	Key Risks	Mitigation
	• Limited knowledge of financing options (by both energy suppliers and energy consumers)	
Project Development and Financing	• Lack of adequate data and tools to assess demand and guide investment decisions • Low-quality project proposals • Demand constrained by lack of affordability and WTP for energy products and/or services • Limited access to finance for private sector service providers • Local finance institutions lack knowledge of stand-alone solar systems services and products, reluctant to provide long-term loans • Capacity of project countries and implementing agencies to implement project activities • Common FI acceptable to all project countries • Varied pace of success in different countries and procedure for addition of new countries	• Market intelligence studies to generate data and tools to guide investments • Robust eligibility and selection criteria • Financial instruments to alleviate affordability burden on end consumers and private sector enterprises • TA component to provide training to stakeholders • ECREEE experience in implementing regional TA activities and selecting capable FI • Fast-moving countries to get bigger share of the project allocation

ANNEX 6: FINANCIAL INTERMEDIARY REVIEW OF BOAD

REGION: Western Africa
Regional Off Grid Electrification Project

1. BOAD will be the sole recipient of the IDA SUF Loan and act as the apex FI for the ROGEP SOP1. The ROGEP Team has carried out due diligence on BOAD and found that BOAD satisfies all the requirements of Investment Project Financing Policy and Directive.

2. The risks associated with lending to BOAD are relatively low. BOAD has a strong financial position to be the recipient of the IDA SUF credit. It never had any default since its creation in 1973. BOAD is rated investment grade stable by Moody's (Baa1, May 2018) and Fitch (BBB, affirmed May 2018), which is much higher than any individual sovereign in WAEMU (Senegal is rated Ba3 by Moody's and B+ by S&P). The rating is underpinned by its strong liquidity, access to the refinancing window of BCEAO, the Central Bank of the WAEMU region, and the strength of member shareholders' support. BCEAO owns 47 percent of BOAD's capital and the eight WAEMU countries another 47 percent, while non-regional shareholders led by France hold 6 percent. In the event of a default, the shareholders of BOAD would be liable. There is a robust mechanism to ensure that capital payments from shareholders remain timely: BCEAO collects a tax on financial transactions on behalf of member countries, which is placed in their accounts and is used to make payments to BOAD in priority before the country can even access these funds. According to Moody's, the amount of tax collected by BCEAO every year more than covers the yearly capital payments to BOAD. BOAD has a professional management team and strong governance.[64]

3. BOAD has a prior track record of involvement in World Bank-financed projects. The World Bank-financed project (Affordable Housing Finance for WAEMU, P161658) approved by the Board in September 2017 was financed by an IDA SUF credit of EUR 116 million (US$130 million equivalent) to BOAD. BOAD also manages a number of environmental projects and is accredited by the GCF as an implementing agency for GCF projects of up to US$250 million.

4. The World Bank will lend IDA SUF funds to BOAD, which may lend the funds through the following four financing channels: (a) commercial banks; (b) leasing companies; (c) MFIs; and (d) debt funds. Consistent with IPF Policy and Directive requirements for solar power projects, the on lending would be at or near market terms that cover the cost of funds, operating costs, hedging costs if any, and a profit element to be determined by BOAD in line with its other lending operations to eligible CFIs. BOAD will identify CFIs based on eligibility criteria set in its ROGEP POM. In summary, these criteria include financial

[64] The non-regional shareholders have a much greater representation at the Board (1/3) than their capital stake, which provides checks and balances and broaden the technical knowledge of the Board.

sustainability, ability to operate according to the Equator Principles including satisfying all safeguards policies, having a prior satisfactory relationship with BOAD, and sufficient interest in the solar energy market. As shown in Table 2.8, BOAD has already identified commercial banks to cover all the WAEMU countries. Moreover, five of these banks are already eligible for IFC risk cover under IFC's SLGP. This provides comfort that BOAD will select strong CFI partners for ROGEP that will also satisfy OP 10 requirements. The CFIs would indicate the number, size, and type of deals they expect to support using the line of credit from BOAD. Requests from CFIs interested in extending financing support to solar companies operating in a ROGEP country but outside of the WAEMU region will be reviewed by BOAD on a case-by-case basis.

5. BOAD will be responsible for maintaining satisfactory FM arrangements throughout the life of the lines of credit. This institution will constitute the operational link with the World Bank (IDA) on matters related to the implementation of the line of credit. The Head of Finance of BOAD will oversee FM for the project's component C 2. The fiduciary staff will be trained on the World Bank's FM and disbursement guidelines.

6. The overall FM risk of the financing to be managed by BOAD is assessed as Moderate and the proposed mitigation measures are (a) configuration of BOAD's existing accounting software to accommodate the accounts of the new financing and meet the line of credit business accountability requirements; (b) induction training of BOAD's FM staff and internal auditors on the World Bank's FM and disbursement guidelines and procedures; (c) incorporation of a specific annex to the POM related to the FM arrangements applicable to the line of credit to be managed by BOAD that are acceptable to the World Bank; (d) preparation and submission to the World Bank of the external audit TOR and the appointment of an external auditor within six months after effectiveness; and (e) preparation and submission to the World Bank of semiannual internal audit reports within 45 days after the end of each internal audit period.

7. BOAD has an adequately staffed Internal Audit Unit that should effectively conduct the internal audits of the project. However, BOAD's Internal Audit Unit needs to include the project within its work plan to ensure that the audits are done semiannually using a risk-based approach. These semiannual internal audit reports need to be submitted to the World Bank within 45 days after the end of the semiannual period. Internal auditors will also be provided training on the World Bank's FM and disbursement guidelines.

8. BOAD has a functional Audit Committee that is essential in ensuring that the management addresses issues raised by both internal and external auditors. It also provides independence to the Head of Internal Audit who reports to it from a functional perspective while reporting to the management from an administrative perspective.

ANNEX 7: CLEAN TECHNOLOGY FUND

REGION: Western Africa
Regional Off Grid Electrification Project

Table 7.1. Summary of CTF Impact Indicators

Key Indicators	CTF/IBRD-funded Project	Market Potential
Number of systems/capacity supported (MW)	209	4,591
Tons of GHG emissions reduced or avoided -Tons per year (tCO_{2eq}/year) -Tons over lifetime of the project (tCO_{2eq})	0.188 million tCO_2/year 2.255 million tCO_2	4.12 million tCO_2/ year Not yet assessed
Financing leveraged through CTF funding [$ million]	259	Not yet assessed
CTF leverage ratio (1:X)	1:3.5	Not yet assessed
Cost-effectiveness - CTF cost-effectiveness [$(US $_{CTF}$/tCO_{2eq} avoided over lifetime of the project) - Total project cost effectiveness [$(US $_{Total\ Project}$/tCO_{2eq} avoided over lifetime of the project]	33.12/tCO_2 147.98/tCO_2	Not yet assessed
Increased access to electricity for households	1,456 million	31 million
Increase access to electricity for SMEs and productive use	51,000	1,049,000
Increased access to electricity for public facilities	62,000	1,424,000
Increased employment opportunities	The project will generate employment opportunities throughout the stand-alone solar business value chain	
Environmental Co-Benefits	Switching to solar will result in GHG emissions reduction and other local environmental pollution associated with the use of traditional energy sources	
Health and education Co-Benefits	Increased electricity access will lead to improved health and educational outcomes	
Gender impact	Increased electricity access will narrow the gap in impact between men and women	

Introduction

1. *Regional Context.* Regional cooperation is critical to ending extreme poverty and boosting shared prosperity in West Africa and the Sahel. These regions are economically, culturally, and ecologically diverse, presenting both opportunities and challenges for regional cooperation. Countries in these regions have shifted toward greater cooperation for regional prosperity. In this regard, the first effort at integration dates to 1945 with the creation of CFA franc that brought the francophone countries of this region into a single currency union. Later, on May 28, 1975, 15 countries—Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Sierra Leone, and Togo—came together through the treaty of Lagos to promote economic integration across the region by forming the ECOWAS. Forty years later, ECOWAS is still promoting economic cooperation and regional integration as a tool for an accelerated development of the West African economy according to ECOWAS Vision 2020.

2. Five Sahel countries came together on December 19, 2014 and formed G5 Sahel to coordinate policies and strategies for development and security. These five Sahel countries—Burkina Faso, Mali, Mauritania, Niger, and Chad—are homogenous in socioeconomic development, history, geography, and culture. One of the guiding principles of G5 is to combine their actions and focus on border areas given their landlocked geography, low population density, little state presence, and low performance on several socioeconomic indicators generally below neighboring countries' national averages.

3. Forming regional economic communities, in general, has had a positive impact on income convergence in this region.[65] Regional integration helps with income convergence between poor and rich economies through three key factors. First, integration encourages capital and labor mobility, which increases productivity and output. Second, agreements on free trade areas and customs unions offer potential to increase trade volume among the integrated countries. Finally, regional integration promotes the spread of technology and knowledge through the exchange of goods and ideas. ECOWAS also adopted a common external tariff since January 2015 to attain a near-complete integration by 2020. The common external tariff was created on the basis that it would minimize lost revenues that may arise from competition in external tariff rates between the member states.

4. The proposed project is part of the SRMI, an integrated approach to tackle policy, technical, and financial issues associated with scaling up solar energy deployment, especially in some of the world's poorest countries. The SRMI was developed in support of the ISA's objective of scaling up solar and mobilizing finance for solar investments and is led by the World Bank and AFD. ROGEP aims to provide TA and investment support for building an enabling environment for solar businesses in West Africa through harmonization of policies, standardization of products, and aggregation of demand and offer financial risk mitigation instruments utilizing climate finance from the CTF.

[65] African Economic Outlook, 2016. AfDB, OECD, UNDP.

5. The SRMI will support countries to develop a sustainable solar ecosystem and will help them access a robust risk mitigation coverage to leverage private sector investments, including (a) support for the development of an enabling policy environment in targeted countries; (b) a new digital procurement (e-tendering) platform to facilitate and streamline solar auctions; and (c) improved access to risk mitigation coverage for both on- and off-grid projects.

6. *Macroeconomic Situation*. Around 50 percent of the population in West Africa and the Sahel still lives on less than US$2 per day.[66] Though there is some contrast between countries such as Liberia, Guinea-Bissau, and the Central African Republic where over 65 percent of population lives on less than US$1.90 per day compared to Mauritania with 11 percent, the general trend is grim with over 70 percent of this region's population living on less than US$3.10 per day. This region is also home to around 33 percent of the continent's population with around 17 percent of the land area. The region accounted for 28 percent of Africa's GDP in 2015—at US$1,606 billion based on a PPP valuation.

7. Countries across West Africa and the Sahel have struggled to diversify and restructure their economies to shift away from less productive (that is, agricultural) to more productive sectors (that is, services). Economic growth in this region is driven by the large economies, such as Nigeria, Côte d'Ivoire, and Ghana.[67] The transition from less productive to more productive sectors has been slow because of the overdependence of many states on the agricultural sector as a source of livelihood for large segments of the rural populations as well as export revenue for Governments. Without significant economic diversification efforts, economic growth and development in many countries remain dependent on the performance of the agricultural sector. Job creation in the formal economy of most countries also remains relatively limited, as most people are employed by the informal agricultural economy and lack the education and skills required for the services sector.

8. *Sector Context*. Over 50 percent of the population in West Africa and the Sahel lacks access to electricity. Of the 406 million people residing in these 19 countries, it is estimated that 208 million inhabitants have no access to electricity, about 70 percent of whom live in rural areas. Of the 198 million people with access to electricity services, about 67 percent reside in urban areas, but they also suffer from unreliable electricity supply. While electricity access is substantially confined to the urban areas in most of these countries, about 33 percent of people living in urban areas at present do not have access to

[66] The World Bank defines extreme poverty as living on less than US$1.25 per day and moderate poverty as less than US$2 a day

[67] Africa's Development Dynamics.2018. Growth, Jobs, and Inequalities - African Union Commission; OECD Development Centre.

electricity. Electricity in the region remains among the costliest in the world, at US$0.25 per kWh, more than twice the global average.[68]

9. Electrification rate of public institutions such as schools and health clinics is very low and efforts to electrify them have been insufficient. In the most recent survey carried out by the United Nations Educational, Scientific and Cultural Organization UNESCO in 2014, data compiled from 46 countries in Sub-Saharan Africa showed that the vast majority of schools report having no electricity in nearly all countries. data on electricity access in health care facilities are rarely collected and reported in a multi-country initiative, limiting the ability to comprehensively report the electrification status of all health facilities in project countries. Discussion with internal World Bank teams and some clients points to a low electrification status of health facilities—especially for primary care and basic child and maternal care.

10. Significant energy access inequalities exist between urban and rural areas. Household access to electricity across the region varies considerably between urban and rural areas. Urban electrification rate in the region averages around 67 percent, with countries such as Ghana and Cameroon on the higher end with about 90 percent electrification and countries such as Chad and Central African Republic on the lower end with less than 15 percent. Rural electrification rate averages around 33 percent with six countries—Chad, the Central African Republic, Liberia, Mali, Niger, and Sierra Leone—standing at less than 5 percent.

11. Several countries in West Africa and the Sahel are addressing the issue of off-grid electrification to some degree through various approaches. These include concessions, franchising, REAs, Rural Electrification Funds, fee-for-service approaches, leasing, and so on. Countries such as Senegal and Mali, for example, have adopted private concessions to scale up mini-grids in rural areas. On the other hand, countries such as Nigeria and Ghana have achieved good results for rural electrification based on a government investment approach. Thus, the institutional and legal frameworks of countries determine the feasibility of each approach.

12. A regional program can help create a sustainable market for OGS PV electrification products in West Africa and the Sahel. A regional program can leverage the region's economies of scale, harmonized policies, and business procedures. Favorable policies could attract the private sector to create a sustainable market for OGS products. A regional program could help all project countries adopt a similar quality standard to establish a regional market. For example, agreement on quality standards for standalone-alone solar systems among the countries in West Africa and the Sahel could help the solar system companies create a large contiguous market. This will increase trade between the countries in West Africa and the Sahel and create jobs and incentive structures to support a sustainable market.

[68] https://www.worldbank.org/en/news/feature/2018/04/20/regional-power-trade-west-africa-offers-promise-affordable-reliable-electricity.

13. A regional market could also benefit from access to finance facilities set up at a regional level to support private companies interested to open business in multiple project countries. Risk mitigation facilities, needed to help scale up new markets, would also benefit by hedging risks among multiple countries.

Project description

14. ROGEP is a robust and integrated regional program based on SOP placing Renewable Energy and Energy Access at the heart of the development of a sustainable ecosystem with a strong transformational potential.

15. This program aims at providing clean energy access to countries with good solar resources at affordable conditions and with a good quality owing to (a) harmonization of the regulatory framework; (b) standardization of the technical specifications; and (c) the aggregation of the market at a regional level. It also supports the development of local solar businesses relying on innovative standalone-alone solar systems (benefiting to households and to companies with new products such as solar pumps) with disruptive business models (based on the PAYGO model, which is still nascent in the West Africa region).

16. This program has a high mitigation potential as the lack of electricity access—with an average of more than 50 percent of people not having access to electricity in the region—contributes to increased GHG emissions because of increased reliance on carbon-intensive fuels such as firewood, kerosene, and diesel. Bridging the energy access gap with innovative solar energy technologies will substantially reduce GHG emissions.

17. ROGEP aims to help establish a regional market for off-grid products and services to electrify households, businesses, and public institutions while simultaneously contributing to GHG mitigation outcomes, across 19 countries in West Africa and the Sahel. Of these, 15 countries belong to the ECOWAS—Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Nigeria, Niger, Senegal, Sierra Leone, and Togo—along with four additional countries: Cameroon, the Central African Republic, Chad, and Mauritania. ROGEP will be implemented by ECREEE and BOAD. ROGEP comprises two main components: Component 1 – developing a regional market and Component 2: access to finance for stand-alone solar system businesses. The project will apply the LGQA[69] framework and will help the project countries develop QA framework for stand-alone solar systems for institutional applications such as health clinics, schools, and other public administration offices to ensure the long-term performance of these systems.

[69] The LGQA framework is designed to support the market development of modern off-grid lighting and energy systems. More information on testing methods and quality standards is available at https://www.lightingglobal.org/qa/standards.

18. The project will form potential end users on the many benefits of high-quality OGS products through producing consumer awareness materials and conducting consumer awareness campaigns in project countries aimed at behavioral change toward off-grid product familiarity and adoption. The project will further support the private sector by providing working capital loans or long-term loans through experienced and responsible CFIs, which will be selected according to predetermined eligibility criteria. The CFIs will receive their funding through the line of credits established in BOAD. The project will use grant and contingent recovery grant financing to support startup-up entrepreneurs to remove start-up business barriers and provide comfort to CFIs to support innovative stand-alone solar technologies with disruptive business models that do not have a track record. This contingent grant facility will support the solar entrepreneurs to raise financing for solar businesses. Finally, the project will conduct market intelligence studies demonstrating the opportunities and challenges presented by the off-grid markets encompassing the project countries. These studies will provide critical data to help manufacturers, distributors, and retailers make informed business decisions.

19. ECREEE has established a PIU using the PPA. It has also carried out several regional workshops, national workshops, and entrepreneurship training programs to finalize the project design following a consultative approach. ROGEP is designed as an SOP in which the overarching development objective is to increase electricity access of households, businesses, and public institutions using modern stand-alone solar technology through a harmonized regional approach. Lessons from one project will help identify interventions of the subsequent projects and will allow a flexible program design with course correction to achieve the ultimate objective. Such a programmatic approach will help the project (a) benefit from multiple funding agencies and will accommodate different preparation timelines , such as World Bank, CTF, Government of the Netherlands (DGIS), and other interested donors; (b) adopt an approach to scale up project initiatives in the whole region based on the ability of selected implementing agencies; (c) gain lessons from one project that will strengthen the design of the next projects; and (d) support parallel projects to achieve the common development objective.

20. Under the ROGEP SOP1, the countries will focus on (a) internalizing the key policies of ROGEP; (b) strengthening its national electrification plan and identifying specific areas to be supported under ROGEP; (c) developing adequate implementation capacity and leadership in the country for moving forward the specific measures/actions relevant to ROGEP; and (d) developing satisfactory M&E arrangements that will aid in providing feedback on ROGEP's performance. The ROGEP SOP1 will inform the stakeholders in each country on the impacts and benefits of supporting stand-alone solar for electrification. At this phase, all the 19 ROGEP countries will prepare their individual capacity toward implementing subsequent projects where the countries would borrow specific resources to support off-grid electrification in their respective countries. Lessons from the ROGEP SOP1 implementation will strengthen the design of the second and subsequent projects. Table 7.2 provides an overview of the components of ROGEP.

Table 7.2:. Overview of ROGEP Components

Project components	Objective	Scope	Rationale	Implementing entity	Beneficiaries	Procurement	Financing (US$, millions)
1A. Enabling Environment	Support the design and implementation of a harmonized regional framework for the successful development of stand-alone solar systems allowing inhabitants to benefit from electricity from solar for various uses (households and businesses)	Implementation of regional policy and regulatory frameworks in participating countries Definition of regional standards and quality framework Identification of trade barriers and simplification of tax regime Consumer awareness and promotional campaigns Capacity building of banks and financial institutions Establishment of a PIU at the level of ECREEE	Fragmented markets Absence of a harmonized regional framework with requirements for stand-alone solar systems aligned with best practices and standards (such as LGQA framework) Lack of information on these solar systems	ECREEE in coordination with the Ministry of Energy of participating countries	All 19 ROGEP Countries (Benin, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Chad, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo)	Subcomponents 1A, 1B, 1C, and 1D will be carried out in accordance with the World Bank procurement procedures and other provisions stipulated in the Financing Agreements Solar entrepreneurs will be selected following a set of eligibility criteria stated in the project operation manual to benefit from Subcomponents 1C and 1D	World Bank (IDA) grant 7 Government of Netherlands (DGIS) grant 4 CTF grant 1.5
1B. Entrepreneurship Technical Support	Provide solar entrepreneurs with the TA needed to launch their solar businesses	Entrepreneurship and business training, customized business acceleration support, and facilitation of entry to the solar industry	Lack of technical expertise needed to launch solar businesses and operate them successfully	ECREEE	Stage 1 (start-ups) and Stage 2 (early stage) solar companies in all 19 ROGEP Countries		IDA grant 3 DGIS grant 3 CTF grant 1
1C. Entrepreneurship Financial Support	Provide solar entrepreneurs with the financing support to launch their solar businesses	Seed-in capital through matching grant support to solar companies	Lack of capital to start solar businesses	ECREEE	Stage 1 (start-ups) and Stage 2 (early stage) solar companies meeting eligibility criteria to be defined in the project operation manual in 13 CIF-eligible and Sahel countries (Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Chad, Gambia,		DGIS grant 3 CTF grant 2

Project components	Objective	Scope	Rationale	Implementing entity	Beneficiaries	Procurement	Financing (US$, millions)
					The, Ghana, Liberia, Mali, Mauritania, Niger, Nigeria, and Sierra Leone		
1D. Barrier Removal for Challenging Markets	Provide additional financial support to the solar entrepreneurs willing to operate in challenging markets	Financial incentive through market entry grant and performance grant to solar companies operating in the Sahel region	Perception of higher risks preventing equitable development in countries with challenging business environments, such as Sahel countries	ECREEE	Stage 2 (early stage) and Stage 3 (mature) solar companies operating in 13 CIF-eligible and Sahel countries		DGIS grant 30 CTF grant 3
2A. Line of Credit for Stand-alone Solar Businesses	Make funding available to local entrepreneurs	Loan from World Bank to BOAD to be extended to local institutions CFI (commercial banks, micro finance institutions, leasing companies) and so on-lend to local entrepreneurs	Lack of confidence of the local institutions CFI in the technology (because of a misperception) and in the related innovative business models	BOAD	Stage 2 (early stage) and Stage 3 (mature) solar companies operating in 8 WAEMU countries (Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo)	Subcomponents 2A and 2B will follow the FI procedures of the World Bank	IDA SUF 140
2B. Contingent Grant Facility to CFIs	Provide risk mitigation coverage to institutions CFI to unlock financing to solar entrepreneurs	Contingent grant facility to institutions CFI lending to local entrepreneurs for their solar businesses to mitigate the financial losses because of the underperformance of the technology (up to 50% of the corresponding loan for Stage 3 companies and up to 80% of the loan for Stage 2 companies)	Lack of confidence in the technology (because of a misperception) and in the related innovative business models leading institutions CFI to refuse to lend without an appropriate risk mitigation scheme in place	BOAD	Institutions CFI lending to solar companies promoting innovating solar technologies in case of underperformance of the technology in 5 CIF eligible WAEMU Countries (Benin, Burkina Faso, Côte d'Ivoire, Mali, and Niger)		CTF contingent recovery grant 67.2
TOTAL							264.7 out of which 74.7 from CTF

21. *Rationale for CTF Funding*. Market assessments identified that the lack of track record of innovative stand-alone solar technologies using disruptive business models relying on mobile money for PAYGO leads to a misperception and lack of trust. This is preventing the solar companies from raising debt financing from CFIs to scale up their businesses. The CTF funding could support the SRMI, an integrated approach to tackle policy, technical, and financial issues associated with scaling up solar energy deployment, especially in ROGEP countries. The CTF contingent recovery grant will be used to create a contingent grant facility to provide adequate comfort to the CFIs against the risk of revenue shortfall of solar entrepreneurs. The CTF funding will help facilitate access to debt for solar companies to enter the West African market and mitigate risks of institutions' lending to solar companies that are interested in operating in the market. The contingent recovery grant from CTF will unlock the BOAD line of credit extended to CFIs. The CTF grant will be used to support technical capacity building, training, and increasing knowledge of the solar entrepreneurs along with providing them financing support to start up solar business activities. The CTF grant will complement IDA's regional grant to support the enabling market component and the entrepreneurship support component.

22. CTF funding is expected to play a critical role to overcoming key challenges associated with off-grid projects and catalyzing their uptake in the West Africa region. It will help access financing for innovative solar businesses with disruptive business models by mitigating key associated risks. In addition, owing to the integrated approach of ROGEP and the complementary co-financing mobilized, it will also contribute to lowering the financing cost, improving affordability to customers, and putting in place favorable policies and measures to mobilize additional resources to scale up and support the development of successful solar businesses.

Potential for GHG Emissions Savings

23. *Emission Reduction potential of Investment*. The project will provide electricity access to households, SMEs, businesses, and public institutions with stand-alone solar systems. This will increase access to sustainable energy sources by target market reducing GHG impacts. As a result, adoption of the OGS technologies will reduce end users' carbon footprint. The project will support installation of about 1.568 million off-grid systems of various types within 12-years, leading to an aggregated 209 MW installation capacity. Refer to the table 7.3 for details.

Table 7.3:. Estimate of system number and capacity to be installed over 12 Years with CTF and IDA fund Leverage

Type of Systems	No. of systems ('thousands)	System capacity (WP)	Total Capacity (MW)
Solar lanterns	538	3.0	1.6
SHS plug and play	315	10.1	3.2
SHS small	315	50.4	15.9
SHS medium	289	248.8	71.8
Institutional	62	1812,.2	111.6
SMEs - water pumping	17	192.4	3.3
SMEs - mobile charging	34	50.0	1.7
Total			**209.0**

24. The Total emission reductions from the project are expected to be 0.188 tCO_2 per year over 12 years. Table 7.4 shows the emission reductions over the lifetime of the project with leverage from CTF and IDA funding (see the appendix at the end of this annex for detailed methodology used to make the calculations).

Table 7.4:. Estimate of Emission Reductions Over 12 Years with CTF and IDA fund Leverage

Emission reductions (ktCO2)													
System type	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**	**Year 11**	**Year 12**	***Total***
Solar lanterns	0.1	0.8	3.7	8.7	13.9	13.6	7.7	6.7	10.7	10.6	6.6	6.7	**89.6**
SHS plug and play	0.1	0.5	2.2	5.5	10.0	11.4	9.4	7.1	7.7	8.8	7.6	6.5	**76.9**
SHS small	0.3	1.9	9.4	23.6	44.0	57.3	61.3	64.7	66.2	56.4	48.6	53.7	**487.4**
SHS medium	0.5	3.3	15.8	39.5	73.8	95.9	102.7	108.3	110.9	94.4	81.4	90.0	**816.4**
Institutional	0.4	2.7	13.4	33.4	62.4	81.1	86.8	91.5	93.8	79.8	68.8	76.0	**690.1**
SME –s- water pumping	0.0	0.2	0.8	2.1	3.9	5.0	5.4	5.7	5.8	5.0	4.3	4.7	**43.0**
SMEs - mobile charging	0.0	0.2	1.0	2.5	4.7	6.1	6.5	6.9	7.1	6.0	5.2	5.7	**52.0**
Annual Emission reduction	**1.4**	**9.6**	**46.4**	**115.3**	**212.7**	**270.5**	**280.0**	**290.9**	**302.1**	**261.0**	**222.5**	**243.3**	**2,255.5**
Cumulative ER	**1.4**	**10.9**	**57.3**	**172.6**	**385.3**	**655.7**	**935.7**	**1,226.6**	**1,528.7**	**1,789.7**	**2,012.2**	**2,255.5**	
Average ER (tCO2/year)	**0.001**	**0.005**	**0.019**	**0.043**	**0.077**	**0.109**	**0.134**	**0.153**	**0.170**	**0.179**	**0.183**	**0.188**	

25. Households benefitted from the project will discontinue using traditional carbon-intensive energy sources such as biomass, kerosene, and so on to meet their basic energy needs, thereby reducing their exposure to any adverse health and environmental risks leading to increased resilience. Institutions such

as schools and health centers will be able to provide better services to their communities, increasing access to education and afford health care. SMEs will engage in productive uses of energy, increasing incomes in the community and reducing vulnerability to climate and economic shocks. SMEs can also include water pumping, so increased energy access will reduce the climate vulnerability of agriculture and increase food security. Once the track record is set and alongside the SOP is implemented through ROGEP, the broader deployment of this low-carbon technology is expected to lead to a widespread replication of the technology contributing to a significant proportion of emissions reductions at the regional level.

26. *Technology Development Status*. The project supports the promotion of stand-alone solar systems that can range from a small solar lantern that can be used as a reading lamp to a large stand-alone solar system that can be used to electrify a health clinic or an SME for productive uses. Innovation and falling costs of standalone-alone solar systems have resulted in more efficient and cheaper products. The systems come with (a) a solar panel that converts sunlight to electricity; (b) a battery to store electricity to be supplied according demand; (c) a charge controller/inverter to protect the battery from overcharging or over-discharging; and (d) lights, switches, and outlets to operate appliances such as mobile phone charging or TV, fan, radio, or other efficient appliances that can be operated with stand-alone solar systems. The physical size of the systems varies depending on their capacity. Most stand-alone solar systems are housed within the user's residence, with the solar panel being put in the sun for battery charging. Larger systems would require installation of the solar panel either on the roof of the building being electrified or at the yard of the consumer. These products are commercially available and yet face specific barriers for their implementation in the ROGEP countries due to a lack of information and a lack of confidence in this technology which keeps evolving and which rely on disruptive business models such as the PAYGO technology (which represents a real development lever regarding access to electricity for millions of people living in remote areas).

Table 7.5:. Stand-alone Solar Systems Usage and Price Range.

Solar Product	Type of Service	Price Range
Pico Solar Systems/ Solar Lantern	One light and mobile phone charging. Meets MTF-1 level of access	US$10–US$20
Systems	Multiple lights, mobile phones, and efficient basic home electric appliances	US$70–US$500
Stand-alone Solar Systems for productive uses	Solar water pumps, solar irrigation, solar SMEs, and so on.	US$500–US$15,000
Stand-alone Solar Systems for Public Institutions	Schools, health clinics, public administration offices, community centers, street lights, and so on.	US$5,000–US$100,000

27. Households (or people) and businesses including public institutions that lack access to an electricity connection (grid or mini-grid) or that have poor reliability (unreliable grid) will benefit from

stand-alone solar systems. The stand-alone solar systems include (a) solar lanterns and simple multi-light systems (which may enable mobile phone charging) of up to 11 Wp enabling partial or full Tier 1[70] electricity access; (b) all-in-one packaged SHS kits up to 350 Wp, typically powering several lights as well as energy-efficient appliances and enabling full Tier 1–Tier 3[71] electricity access for a household; and (c) component-based systems, where PV module, battery, lights, inverter, wiring, and so on are compiled independently. These systems are modular and can meet larger loads. In addition to electrifying households, these systems are currently being used to operate solar water pumps for drinking water and irrigation. These systems are also used for productive uses in conjunction with efficient appliances.

28. While the innovations in the stand-alone solar system space has drastically reduced the price of this technology and made it affordable to the poor people who can meaningfully use it as an alternative solution to grid electricity, the same innovative nature of this business has made it difficult for the entrepreneurs to raise debt financing to scale up the promotion of the solar systems. As new, cheaper, and efficient products are entering the market, the existing products are becoming obsolete in a short time. Hence, a specific product has not built a long-term track record to provide comfort to the CFIs to raise debt financing. Furthermore, new solar products that can be used for productive uses are entering the market at a very fast pace. These show the potential of the sector to become a suitable alternative to grid electricity.

Cost-effectiveness

29. *CTF investment per tCO_{2eq} reduced***.** The adoption of stand-alone solar systems by the project countries will result in an estimated emission reduction of 0.188 million tCO_2 per year, which translates to 2.255 million tCO_2 on a 12-year lifetime basis. On this basis, the CTF intervention of US$74.7 million will result in a cost-effectiveness of US$33.12 per tCO_2 (Refer to the details in table 7.6).

Table 7.6:. Estimate of CTF Cost-effectiveness

Scope and Results	Units	Values
CTF funding	Mil.US$	74.7
Total funding (IDA, Private Equity, and CTF)	Mil.US$	333.7
Total Emission Reductions from the project	Mil.tCO2	2.255
CTF Cost Effectiveness	US$/tCO2	33.13
Total Project Cost Effectiveness	US$/tCO2	147.98

[70] Tier 1 refers to task lighting and phone charging with daily consumption of > 12 Wh.

[71] Tier 2 refers to general lighting and phone charging and television and fan with daily consumption of > 200 Wh. Tier 3 refers to Tier 2 and any medium-power appliances, such as refrigerator. Daily consumption is > 1,000 Wh.

30. *Expected cost reduction of technologies*. The global trend of falling costs and rising efficiency of components and appliances—which has allowed for steady reductions in the price of OGS products—is likely to continue, although at a slower pace. DC appliance efficiency is improving rapidly and is playing an increasingly important role in improving the economics and service capacity of SHS. The main drivers of declining global prices of stand-alone systems have been improvements in the efficiency and economics of the three main components—PV panels (predominantly C-Si), LED lights, and batteries (Li-ion)—prices for which have dropped by 79 percent, 80 percent, and 73 percent, respectively between 2010 and 2016.[72]

31. However, due to lack of economies of scale, the consumers in the West Africa region did not entirely benefit from this global trend of price reduction, as the cost of trading solar products remained high. Attracting entrepreneurs in the solar technologies and providing them with financing support through CFIs will bring in economies of scale and make the solar products available in the West African markets—eventually reducing the cost of doing business and benefiting the consumers from the global trend of reducing prices of solar technologies.

Demonstration Potential at Scale

32. *Scope for avoided annual GHG emissions*. A market assessment conducted under the project highlights the significant market potential for OGS, as shown in Table 7.7. The assessment indicates that several private sector companies have started to operate in West Africa, but with asymmetric distribution. One of the objectives of the project is to remove market barriers to make all 19 countries attractive for private sector investment in providing standalone-alone solar electricity services. As the price of the solar products will be determined through market forces, ensuring participation of multiple companies is key to competitive pricing and service that would benefit the people. Affordability of standalone-alone solar products also remains a challenge. The project will help the governments understand the benefit of providing a level playing field in taxation, customs duty, and VAT between the public service providers and private service providers, where both provide access to electricity to the citizens of the country. As such, the CTF co-financing will help open up the sector and build the necessary capacity of institutions CFI and solar companies to engage in off-grid financing. This will in turn lead to further GHG emission reduction. For instance, based on the market potential of 4,591 MW of installed systems capacity, the total GHG emission reduced would be 4.12 million tCO_2 per year.

[72] Off-grid Solar Market Trends Report 2018

Table 7.7: Potential Market Size of Stand-alone Solar Products and Project Target of 12 Years

Market Segment	Potential Beneficiary Million Units		MW		Potential Value (USD Million)	
	Market Potential	Project's target	Market Potential	Project's target	Market Potential	Project's target
Household Market	30,426	1,456	1,911	92	6,675	322
Productive Uses	1,049	51	103	5	178	9
Public Institutions	1,423	62	2,579	112	6,609	320
Grand Total	**32,898**	1,568	**4,592**	209	**13,462**	651
Note: The estimated size, targeted by the project, takes into account the effect of recycling of available project funding during the 12-year project implementation period						

33. *Transformation Potential:* The project will have transformational and ambitious impact**.** To crowd in private sector investment and to develop a regional market across 19 project countries in West Africa and the Sahel. The project will benefit from IDA18 SUF to establish a regional line of credit that can be accessed by eligible institutions CFI to provide access to finance to private companies promoting electrification services through standalone-alone solar system across the region. Dedicated financing support would be provided to solar entrepreneurs to involve them in solar electricity business to make the project results sustainable. The uptake of ROGEP will lead to the deployment of low-carbon technology based on solar and to the implementation of policy reforms that will result in significant reductions in emissions growth against national and regional baseline.

34. The project will influence CFIs to extend financing support to private sector-led electricity service businesses, which till now has kept its distance from this innovative and disruptive technologies. By creating a regional market, the project will attract credible private sector companies to support all countries in West Africa and the Sahel, which so far had been focused only in larger economies. The project has an ambitious target of providing electricity services to about 1.7 million people, of which about half would be women. The project will provide entrepreneurship support facility to local companies, through a series of training, capacity building, and incubation support, to ensure market sustainability and satisfactory electricity service delivery. The project will extend financing support and collateral support to help early-stage solar companies raise debt financing from commercial markets. To provide comfort to the CFIs to lend to solar companies that will be disseminating innovative technologies, the project will use a contingent recovery grant fund to reduce the risk of technology failure that would prevent the solar companies from meeting their lending obligations to the CFIs.

35. The project supports resilience building and long-term behavioral change. Most countries in West Africa are focused on meeting their electricity access challenge by expanding grid network. This project will allow the countries to increase electricity access by promoting standalone-alone solar technology.

This will reduce carbon emissions significantly as people converting to solar-based renewable energy technologies would stop burning fossil fuel for their electricity needs.

Development Impact

36. *Environmental Co-Benefit*. Increased proliferation of OGS products in the market will divert households', business', and public facilities' heavy reliance on carbon-intensive fossil fuels for meeting their basic energy needs. Switching to the cleaner energy alternative can help mitigate climate change by cutting down GHG emissions, as they have low specific emissions of carbon dioxide into the atmosphere relative to fossil fuels.

37. *Health and Education Co-Benefits*. Improving electricity access can also entail better health and educational outcomes. For example, benefits to health can be accrued through reduced fossil fuel for lighting and electrification of health centres. In education, the use of a stand-alone solar system, for instance, can increase the amount of time spent studying at home or at schools.

38. *Increased access to electricity*. Households, businesses, and public facilities will receive new or improved electricity services. With improvements in solar technology, the market is experiencing higher demand for larger SHS from grid-connected consumers. The MTF surveys show that in general more than 60 percent of the grid-connected consumers receive less than Tier 3 of electricity service. Most of these grid consumers experience load shedding during evening hours when electricity demand is at its peak. Stand-alone solar systems are in high demand in these households, which help them get into a higher tier level of electricity reliability.

39. *Increased employment opportunities*. The project will invest in human capital development in the West Africa and Sahel region. By supporting a favorable business environment and increasing cross-border trade, the project will create new employment in electricity service delivery business using stand-alone solar technologies. The project, through its various technical interventions, will develop local entrepreneurs' skills and knowledge to increase their value proposition. Furthermore, end users will be able to use their OGS equipment to improve income-generating capacity, for example, extended business hours, using solar systems to boost agricultural productivity, and so on.

40. *Gender impact*. Lack of access to electricity service disproportionately affects women. Increasing access to sustainable electricity services through renewable off-grid technologies can contribute to narrowing impact gaps between .men and women Specifically, women's health outcomes will improve by reducing reliance on polluting and inefficient solid fuels and by going to maternal health clinics that are well lit. Girls' education will improve too as they are freed from the responsibility of assisting fuel collection and can study longer periods of time at home with lighting. Availability of public lighting increases general safety perception and could reduce women's risk toward. GBV ability of women to report cases of sexual assault through electrically charged communication technologies (for example,

mobile phones) would increase. Ability to use TVs, radios, and mobile phones would enable access to news and information and can contribute to increasing women's awareness on issues such as HIV/AIDs and can improve their self-esteem and confidence.

Implementation Potential

41. *Sector strategies*. The West Africa and Sahel region hosts a community of bilateral and multilateral agencies that are active in the off-grid sector. Some of the major financiers in off-grid electrification in the region include the AfDB, AFD, DFID, European Investment Bank (EIB), EU, and U.S. Agency for International Development (USAID). ROGEP will support 19 countries, which are at different stages of attracting private investment in the stand-alone solar space, by establishing a platform through which different donor interventions can be used to address different market needs in ROGEP countries and support the development of the stand-alone solar market.

42. The project contributes to SDG 7 of energy access and SEforALL targets. The SEforALL Action Agenda is supported in the West Africa and Sahel region through ECOWAS. To achieve universal access to electricity by 2030, ECOWAS has adopted an EREP as a response to the severe energy crisis in the member countries. The EREP explores the vast renewable energy generation potential that exists in the region through the support of the private sector. The project is also aligned with the project countries' electricity access objectives as well as with the World Bank's Country Partnership Framework in those countries.

43. ROGEP aligns with the ACBP and World Bank's ESDP. According to the ACBP and ESDP, the World Bank Group's engagement in the energy sector is designed to help client countries secure affordable, reliable, and sustainable energy supply, which is needed to end extreme poverty and promote shared prosperity. Additionally, the project follows the principles set out in the new strategic directions for the World Bank's Africa Energy Practice in OGS energy, which includes the following six ways in which the World Bank can catalyze the stand-alone solar systems market in Sub-Saharan Africa: (a) develop the policy and regulatory environment for stand-alone solar systems; (b) support Governments to mainstream stand-alone solar systems planning; (c) facilitate access to working capital; (d) issue guarantees to reduce risk for commercial lenders; (e) use performance-based grants to push the market; and (f) support receptive markets through QA and consumer awareness activities. The project is also in line with the EREP, which, among others, targets off-grid and standalone-alone applications as a significant mitigation measure, and hence has the political acceptance at both the regional and country levels.

44. *Institutional arrangements*. The project will have two regional implementing agencies: (a) ECREEE and (b) BOAD. ECREEE will be responsible for implementing TA and capacity-building activities (Subcomponents 1A, 1B, 1C, and 1D). BOAD will implement the components-related financial intermediation activities (Subcomponents 2A and 2B). ECREEE will facilitate policy change, remove market information barriers, build capacity of the stakeholder, introduce harmonized QA and customs duty framework to facilitate regional trade, and so on. BOAD will provide financing support to solar

entrepreneurs starting from early stage companies to mature solar companies. BOAD will also provide a line of credit to CFIs to provide liquidity in the market and will use contingent recovery grants to reduce the technology risk borne by the CFIs when lending funds to companies promoting innovative solar technologies.

45. ECREEE by its institutional mandate from the ECOWAS Commission and Member States, exercise power to convene stakeholders in the renewable energy sectors in a way that other organizations are not able to. Thus, it can position itself so that its areas of activity encompass areas where the private sector, government and multilaterals, nongovernmental organizations, and academic institutions all overlap. ECREEE has worked with many Sahel countries on renewable energy and energy access issues. ECREEE is currently implementing several initiatives directly linked to the scope of this project in the framework of the ECOWAS Program on Access to Sustainable Electricity Services. ECREEE offers complete geographic coverage of the region whereas the geographic coverage of the other organizations varies considerably, with only a very few institutions making a credible claim to being regional actors in the renewable energy and energy efficiency sector. Many nongovernmental organizations and businesses do not have their own networks, but they have links and networks with local organizations, or they manage programs with local partners.

46. BOAD is the regional development bank carrying out financial intermediation. This FI has existing line of credit operations with CFIs. They also have experience with providing loans in the conventional electricity sector. BOAD is a suitable organization that could borrow funds from the World Bank and provide access to finance to eligible CFIs. CTF funds would help BOAD reduce exposure of the CFIs to enter into solar technology space.

47. BOAD will receive loans and grants to support different project interventions. Grant funds will be provided to early-stage companies that are unable to raise funds from commercial markets based on eligibility criteria to be specified in the POM. Incentive would be provided to companies that will be operating in more challenging markets in the region, such as in Sahel countries. CFIs exposure when lending to solar companies will be reduced by using contingent recovery grant funds. This will comfort the CFIs to lend to solar companies. BOAD will use loan funds to establish a line of credit with the CFIs, which will then provide working capital and term loans to solar companies to promote stand-alone solar systems in the region.

48. *Sustainability.* The project interventions are to attract private capital to meet electricity demands of remote economies, through a market-based approach. The project will identify electricity demands of the economies without reliable grid electricity and will help private investors in supporting businesses that would provide electricity service to those economies in a financially sustainable manner. This approach will ensure that even after the project is closed, the market would sustain itself until there is demand for off-grid electricity.

49. Experience from World Bank-funded stand-alone solar projects implemented through market-based approach demonstrated how creating a market crowded in investment in the sector and helped the countries move toward universal electricity access. Creating such a market can unlock the market potential as it would no longer depend on the Government's ability to support electrification initiatives through its budgetary resources.

50. *Leverage*. The CTF co-financing will directly contribute to increasing electricity access of households and businesses using modern stand-alone solar systems through a harmonized regional approach. Under the co-financing arrangement proposed in ROGEP, the CTF funds of US$74.7 million will leverage loan funds of about of US$140 million extended by local private commercial banks and another US$69 million from private investors though equity investments in the ratio of approximately 1:3. The CTF funding is crucial to mobilize private financing as local commercial banks (because of a misperception) refuse not only to lend but also to lend to solar businesses of this type without proper risk mitigation schemes in place. Mobilization of private financing is expected to increase with the deployment of future SOPs to take place in the context of ROGEP as the track record becomes proven and local commercial banks get more comfortable to lend under different risk mitigation schemes.

Additional Costs/Risk Premium

51. The CTF and IDA financing are critical to enhancing the financial viability of the project and achieve results. The CTF funds will support OGS companies to enter the West African market and encourage institutions CFI to lend to solar entrepreneurs and consumers by mitigating the risks of operating in a nascent and fragmented market. The 19 project countries vary considerably in country risk and level of financial sector development. Institutions CFI such as banks, institutions MFI, and leasing companies are reluctant to lend to SMEs in the stand-alone solar systems market because of several factors including perceived borrower credit risk, insufficient track record, insufficient collateral to secure loans, and smaller ticket sizes for transactions. At the same time, the CFIs also lack capacity in understanding the solar industry, its supply chain, and its evolving nature and accompanying innovations.

52. About US$7.5 million grant from the CTF will complement US$10 million of IDA Regional Grant to support developing the enabling market and technical capacity building of the entrepreneurs that would also include establishing relationship with the interested CFIs. Matching grant support would be provided to early stage companies which are unable to raise commercial debt given their lack of track record of business performance. This initiative will ensure that local entrepreneurs get involved and ensure sustainability of the initiative. About US$67.2 million of the contingent recovery grant will be used to create a contingent grant facility to comfort the CFIs through covering risk of innovative technologies through disruptive business models. The objective of this support would be to crowd in commercial financing to the sector. This facility is expected to unlock a line of credit of US$140 million that BOAD would extend to eligible CFIs. Market assessment indicates that without the CTF contingent grant facility, reducing the technology risk exposure of innovating solar businesses, the CFIs will not extend debt

financing to the solar companies. The interventions would include collateral support for Stage 2 companies by unlocking debt financing and contingent recovery grant to commercial banks against technology failure risk of the solar companies (Stage 3) which may reduce their ability to service the CFI debt. Details of these structures are provided in Annex 2.

Implementation Readiness

53. ROGEP SOP1 will be implemented at a regional level by two regional implementing agencies, ECREEE and BOAD. ECREEE will implement project activities to develop a regional market, conduct market intelligence studies, provide policy and regulatory support, conduct consumer education activities for institutions and end consumers, develop a regional QA framework for the products and services, provide business development support to the private sector enterprises in the project, engage with the public institutions to be electrified under the project, and coordinate with development partners with existing risk mitigation facilities. BOAD will provide eligible CFIs with a line of credit facility to provide working capital and medium-term financing needs of solar companies.

54. ECREEE has benefited from a PPA and established its PIU. During the preparation phase, ECREEE has conducted two regional workshops where project stakeholders from the project countries participated. ECREEE also carried out national workshops in most of the project countries to inform county counterparts on how they would benefit from the project. ECREEE also carried out a training workshop with private entrepreneurs to assess and improve its training curricula for the solar entrepreneurs. ECREEE has further initiated the study to harmonize the technical and quality standards for stand-alone solar products in the region. Hence, ECREEE will be in a position to start implementation of the project soon after its approval. BOAD has also initiated discussions with its partner commercial banks, which are interested to extend the line of credit to solar entrepreneurs if supported with adequate risk mitigation schemes.

Appendix

- Methodology on GHG Emissions Savings

- **Methodology**: To ensure that GHG impacts can be monitored transparently and conservatively, emission reductions are calculated based on approved Carbon Development Mechanism baseline methodologies that have been used for solar lanterns and OGS PV projects. Two methodologies are needed, because the one for systems/stand-alone solar PV systems does not apply to portable solar lanterns.

- AMS I. Electrification of rural communities using renewable energy' (version 3.0)[73]
- AMS III.AR 'Substituting fossil fuel-based lighting with LED/CFL lighting systems' (version 6.0)[74]

- **Eligibility for solar lanterns**: The methodology is appropriate for this program because it would meet the eligibility criteria for the methodology, ROGEP
  - Uses only solar-charged lamps, which would meet the quality requirements by adhering to the LGQA[75] framework
  - Lamps replace fossil fuels, based on prevailing consumption patterns in target countries.
- **Eligibility criteria for stand-alone solar systems**: The methodology is appropriate for this program because it would meet the eligibility criteria for the methodology, ROGEP.
  - Focuses on installation of renewable electricity generation systems that displace fossil fuel use, such as in fuel-based lighting systems, stand-alone power generators, and fossil fuel based mini-grids
  - includes only greenfield individual, RE system projects
  - targets consumers not connected to a national/regional grid
  - Including more than 75 percent households
  - Complies with international standards (that is,) LGQAs
- **Estimating emission reductions - solar lanterns**
  Emission reductions per year per solar lantern are calculated using the following equation from the CDM methodology:

  $$BE_{lamp,y} = FUR \times O \times U \times EF \div 1000 \times LF \times n \times NTG$$

  Where

$BE_{lamp,y}$	=	Baseline emissions per lamp in year y (tCO_2)
FUR	=	Fuel use rate (0.03 l per hour)
O	=	Utilization rate (3.5 hours per day)
U	=	Annual utilization (365 days per year)
EF	=	Fuel emissions factor (2.4 $kgCO_2$ per liter)

[73] *http://cdm.unfccc.int/methodologies/DB/CCZKY3FSL1T28BNEGDRSCKS0CY0WVA*.

[74] *http://cdm.unfccc.int/methodologies/DB/B3NUID7DZJNPZ39NP3ZHAL9D42CA4S*.

[75] The LGQA framework is designed to support the market development of modern off-grid lighting and energy systems. *https://www.lightingglobal.org/qa/standards* has more information on testing methods and quality standards.

LF	=	Leakage factor (1.0)
n	=	Number of fuel-based lamps replaced per project lamp (1.0)
NTG	=	Net-to-gross adjustment factor (1.0)

The annual emission savings per operational lamp per year are therefore 0.092 tCO_2. Based on the methodology, the lamps are only assumed to last for two full years but are all considered 100 percent operational during that period. This is conservative because, even though some lamps could fail in the two-year period, most will last well beyond.

- **Estimating emission reductions - stand-alone solar systems**

The baseline approach for solar systems depends on the output of the system, regardless of the consumer group. The CDM baseline methodology provides the following equation to calculate baseline emissions.

$$BE_y = BE_{55,y} + BE_{250,y} + BE_{250\ plus,y}$$

Where

BE_y	=	Baseline emissions in year *y* (tCO_2)
$BE_{55,y}$	=	Aggregate baseline emissions for consumers that consumed equal to or less than 55 kWh of renewable electricity from project renewable electricity systems in year *y* (tCO_2)
$BE_{250,y}$	=	Aggregate baseline emissions for consumers that consumed more than 55 kWh but equal to or less than 250 kWh of renewable electricity from project renewable electricity systems in year *y* (tCO_2)
$BE_{250\ plus,y}$	=	Aggregate baseline emissions for consumers that consumed more than 250 kWh of renewable electricity from project renewable electricity systems in year *y* (tCO_2)

The emission factors for each group of consumers are different. As an example, for consumers that consumed more than 55 kWh but equal to or less than 250 kWh, baseline emissions are calculated as

$$BE_{250,y} = \sum_{z}^{M} \left(\left(EG_{z,y} - 0.055 \right) \times EF_{CO2,250} + C \right)$$

Where

$EG_{z,y}$	=	Electricity delivered by project renewable electricity generation system to consumer *z* in year *y*, where the electricity delivered to the facility is more than 55 kWh but equal to or less than 250 kWh in year *y* (MWh)
$EF_{CO2,250}$	=	1.3 (tCO_2/MWh)

Z	=	Consumer supplied with renewable electricity from operating project renewable electricity generation systems consuming more than 55 kWh but equal to or less than 250 kWh in year *y*
C	=	0.374 (tCO_2), a constant calculated as (0.055 MWh x 6.8 tCO_2/MWh)
M	=	Number of facilities in the project activity consuming more than 55 kWh but equal to or less than 250 kWh per year

Similar equations for consumers below 55 kWh per year and above 250 kWh/ per year are also provided in the methodology. Note that electricity consumption may be measured directly but may also be calculated from installed capacity and the availability factor/capacity factor of solar in the relevant location. This avoids the necessity of metering all of the solar systems while still providing a robust estimate of consumption.

- **Fixed parameters**
  - For solar lanterns, all baseline parameters are fixed, so that emission reductions per lamp-year are fixed ex ante.
  - For stand-alone solar systems, the tiered emission factors are specified in the methodology (for example, 6.8 tCO_2 per MWh for the first 55 kWh/ per year, 1.3 tCO_2 per MWh for the next 195 kWh per year, and 1.0 tCO_2 per MWh for consumption above that level).
  - Solar availability factor/capacity factor is also fixed ex ante. The Solar PV electricity output (kWh/kWp) across the region ranges from 1300, in coastal areas (equivalent to 14 percent availability) to 1850, in northern Mali, Niger, and Chad (21 percent). While most of the total population would be in the areas with the lowest availability, a large share of the population without electricity access is in rural areas, where availability is higher. As a conservative estimate, 16 percent is used for the GHG calculations.

- **Ex ante estimate of monitored parameters. T**he ex-ante calculation of GHG emissions reductions for the total project is over a 12-year period.

- **Number and capacity of lamps and stand-alone solar systems**: As discussed above earlier, this is based on the total funding available to support solar purchases (that is, lines of credit that support lending, ….), and so on the expected share of sales of different system sizes, and the unit costs of the different system sizes.

- Total capacity is then the number of systems times the average size of each system type.

ANNEX 8: IMPACT EVALUATION

REGION: Western Africa
Regional Off Grid Electrification Project

1. The proposed project will include a rigorous impact evaluation (IE) to be developed with support from the Development Impact Evaluation Initiative. This IE will focus on 'Electrification of Households and Commercial Enterprises' and 'Electrification of Public Institutions and Community Facilities' with the objective of understanding the impact of proposed electrification measures and inform policy making according to learning priorities. ECREEE will finance the activity under subcomponent 1A while the Development Impact Evaluation Initiative will finance their participation by raising funds from interested development partners.

2. In relation to the IE of electrification of households and commercial enterprises, there is a growing body of evidence on the impacts of household energy access on health, education, and productivity, but important questions remain about the cost-efficiency of investments to balance the coverage (extensive margin) and per-connection availability (intensive margin) of electricity provisions. Where the average annual energy consumption of electrified households in many Sub-Saharan African countries is 20 times less than the average American household, understanding the demand and impact of different tiers of access from solar lanterns (Tier 1) through to reliable grid access (Tier 5) becomes an important concern to help Governments efficiently allocate resources. There is an important tradeoff—while lower-level tiers of access may provide less opportunities for economic growth (for example, being unable to power large appliances and machines), the benefit of lower investment cost and easier expansion may outweigh this concern.

3. The IE of electrification of public institutions and community facilities offers the opportunity to address an important knowledge gap related to the impacts of electrification. While most of the electrification strategies in developing countries have a strong focus on public facilities, most of the evidence available focuses on household impacts and, currently there exists no experimental evidence on the impacts of electrification on health facilities. The IE will focus on measuring the impacts of providing health facilities with solar energy through the program.

4. A rigorous IE serves to establish the causal links between a treatment (here electrification) and a set of outcomes of interest. To estimate the causal relationship between the treatment and the outcomes of interest, a counterfactual is required—in other words, a comparison group that shows what would have happened to the target group in the absence of the treatment. The gold standard for establishing a valid counterfactual is the method of a randomized controlled trial), where study subjects (for example, households or health facilities) are randomly assigned to the treatment group or the comparison group. Baseline and follow-up survey data covering all study subjects is required, with the number as well as frequency of survey rounds depending on the specific question of the IE.

5. Without a valid counterfactual, specific outcomes of interest can still be tracked among those who receive the intervention (treated group) through conventional M&E tools; however, it cannot be established that the observed progress in specific outcomes is attributable to the treatment. RCTs and M&E are thus complementary methods for results M&E.

6. The details of the IE design will be developed as the project becomes effective. For illustration, below is an example of the outline of a design and set of hypotheses for the IEs concerning the two components. These will be revised and refined in close coordination between all partners involved in delivering the project.

A. Indicative IE Design for Electrifying Public Institutions and Community Facilities

7. While there is growing evidence on the impact of household and business electrification, there is a dearth of evidence on the impacts of electrification on health services. The project is well positioned to address this knowledge gap by randomly assigning 200 non-electrified health facilities to be electrified under the program or serve as a control (no electrification).

8. Four health facility surveys will be run over the course of the project: one round before electrification (baseline), one round within three months of electrification, and the remaining two rounds within 24 and 36 months after electrification. As outcome variables, the study will use several indicators that allow the study to understand health service delivery (type of services, quality of services, and patient results) and how it is affected by improved electricity supply. The work will draw from the World Bank service delivery indicators and carry out patient exit surveys. Options to use the data for measuring health facility efficiency and productivity following established methodologies will be explored.[76]

B. Indicative IE Design for Electrifying Households and Commercial Enterprises: Development effect of grid electricity versus various tiers of access through stand-alone solar systems

9. An important strategic question for the energy sector in African economies centers around the best approach for electrification in terms of service levels and technologies. Recent evidence suggests that grid electricity consumption levels of many poor households can be fully served through stand-alone pico-PV systems. Among those consumers, the latter are therefore expected to yield roughly the same development effects as grid electricity at a lower cost. One often cited argument in favor of grid electricity is that it allows income-generating activities that require higher levels of power compared to standard residential uses. In relation to this, revenues from productive use are arguably stronger in areas with

[76] For a comprehensive review of empirical studies and the employed methodologies, see Hollingsworth. 2008. "The measurement of efficiency and productivity of health service delivery. HSD" *Health Economics* 17: 1107–1128.

access to markets, suggesting a critical link between development effects of different tiers of electricity access and economic factors in the environment.[77]

10. This study component will examine how the development effects of various tiers of electricity access on households and microenterprises differ across different economic settings in one identified study country (for example, Senegal). The main hypotheses are that (a) the development effects are increasing with the general economic potential of an area and that (b) this association is more pronounced among microenterprises compared to households. A possible emphasis of the study lies on highlighting how electricity from stand-alone solar systems compares with grid electricity.

11. In terms of methodology, the following aspects of the study are discussed in more detail:

a) Tiers of access and approximating grid-electricity service levels through stand-alone solar systems.
b) Counterfactual analysis.
c) Identification of economic settings.

(a) Simulating Tiers of Access

12. Various solar energy systems would be required to provide power at all five tiers of electricity access. In terms of technologies, pico PV products SHS will be sufficient to provide the two tiers of access. Stand-alone solar panels with large battery capacity will be used for higher tiers. Data from the multi-tier measurement surveys will be used to approximate service levels provided by the national grid in the study country.[78] The team will work with engineers to use stand-alone solar panels for the provision of electricity service levels that approximately correspond to the grid in terms of dimensions of the multi-tier measurement framework.

(b) Counterfactual Analysis

13. The program will aim to randomly assign 3,600 non-electrified households and 3,600 non-electrified microenterprises to six experimental groups:

- Control group
- Access Tier 1–2
- Access Tier 3
- Access Tier 4

[77] Following ESMAP's MTF for measuring energy access.
[78] These were conducted in several recipient countries. For more granular data, measuring power supply and reliability of the national grid through grid monitors at around 20 randomly selected locations across the selected country over three to six months. is considered

- Access Tier 5
- Possibility: grid-level access (approximated)

14. Households and enterprises will be sampled from approximately 400 locations (town and villages) that are currently not covered by the national grid.

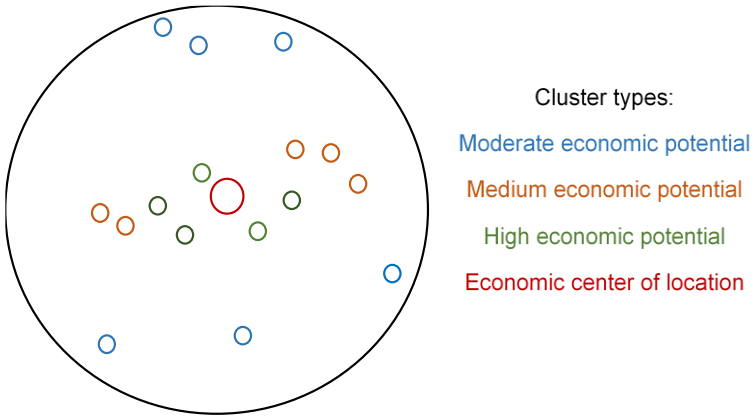
(c) Identification of Economic Settings

15. Locations will be selected based on criteria that ensure a good mix in terms of proximity to economic centers and within-location variation of economic activity. The first step will be to define clusters of households within each town and village. These clusters are then classified according to the assessed economic potential. The following categories can be considered:

- High economic potential (proximity to economic center within urban/semi-urban area)
- Medium economic potential (detached from economic center within of urban/semi-urban area)
- Moderate economic potential (proximity to economic center within rural area)
- Low economic potential (detached from economic center within rural area)

16. The IE will aim to identify approximately 200 clusters per category, that is, roughly two clusters per location. The objective will be to have different cluster types within each location, as displayed in Figure 8.1.

Figure 8.1. Cluster Types



17. Figure 8.1 displays three distinct cluster types within one location that can comprise a town and adjacent villages. Households closest to the economic center of the location have the highest economic

potential, households in the outskirts have a medium economic potential, and households residing in nearby villages have a moderate economic potential. The size of the economic center of the location itself determines to a certain extent, the categorization of the surrounding clusters. The specific classification system needs to be developed during an IE mission to a selected country.

18. One round of baseline data and one follow-up survey round would be collected between one and three years after implementation of the electrification measurers. The IE would plan to measure changes across a broad spectrum of social and economic outcomes including energy consumption patterns, individual development and human capital, household wealth, empowerment, and gender.

ANNEX 9: MIGA - STANDARD DESCRIPTION OF RISKS

REGION: Western Africa
Regional Off Grid Electrification Project

1. MIGA has indicated its support to provide PRI to private solar companies when electrification of public institutions is structured through a concession, and the Power Purchase Agreement of the public institutions is backed by a sovereign guarantee. The economies of scale offered by ROGEP will allow MIGA to design a suitable guarantee structure to mitigate the political risk of the private sector when serving public institutions. MIGA guarantee design will benefit from the two pilot projects that are being implemented in Niger and Nigeria to electrify public institutions.

2. MIGA coverage can be extended to match the Power Purchase Agreement tenor and will cover the risk of Breach of Contract, Expropriation, War and Civil Disturbance, and Transfer Restriction. Investors could elect to cover their investments selecting the full range of risk mitigation or specific risks. Under Breach of Contract coverage, MIGA will cover risks associated with the sovereign government failure to make termination payment to cover equity investors in accordance with provisions under the government guarantee. Brief description of the risk coverages is provided in the following paragraphs.

Breach of Contract

3. Under Breach of Contract coverage, MIGA's liability depends on the following series of conditions being fulfilled: (a) termination of the Power Purchase Agreement; (b) breach by a sovereign government of one or more of its payment obligations under the Power Purchase Agreement and Government Guarantee; (c) the guarantee holder obtaining a final arbitration award against the host government for the breach of MIGA-covered obligations, and (d) the refusal by the Government to recognize and pay such award for the duration of MIGA's waiting period.

4. Breach of Contract coverage protects against losses arising from a repudiation or breach by the host government of a contract entered with the guarantee holder, provided that a final and binding arbitration award or judicial decision has been rendered in favor of the guarantee holder and cannot be enforced against the host government. Compensation is based on the amount that the guarantee holder is entitled to recover from the host government in accordance with the terms of the arbitration award or judgment.

Expropriation

5. Expropriation Coverage protects against losses attributable to measures taken or approved by the host government that deprive the guarantee holder of its ownership or control over its investment, or in

the case of debt, results in the project enterprise being unable to meet its obligations to the lender. Both direct and indirect (creeping) expropriation are covered. Compensation for equity is based on the guaranteed percentage of the net book value of the guaranteed investment in the project enterprise. For debt, compensation is based on the guaranteed percentage of the principal and interest that is in default because of expropriation.

War and Civil Disturbance

6. War and Civil Disturbance Coverage protects against losses arising because of military action or civil disturbance in the host country, including sabotage and terrorism, that destroys or damages tangible assets of the project enterprise or interferes with its operations (business interruption), or, in the case of debt, results in the project enterprise being unable to meet its obligations to the lender. Compensation is based on the guaranteed percentage of the value of the assets destroyed or damaged or, in the case of business interruption, the net book value of the guaranteed equity investment. For debt, compensation is based on the guaranteed percentage of the principal and interest that is in default because of war and civil disturbance.

Transfer Restriction

7. Transfer Restriction Coverage protects against (a) the inability to convert, from local currency into guarantee currency, loan payments, dividends, profits, and proceeds from the disposal of the guaranteed investment and (b) host government actions that prevent the transfer of the guarantee currency outside the host country, including the failure of the Government to grant an authorization for the conversion or the transfer of such currency. Compensation is based on the guaranteed percentage of any payments that cannot be converted or transferred.

ANNEX 10: STATE OF INVESTMENT ENVIRONMENT IN PROJECT COUNTRIES FOR OFF-GRID

REGION: Western Africa
Regional Off Grid Electrification Project

1. Countries in West Africa intend to create an attractive investment environment for the investors in solar energy projects, but only a handful of countries provide competitive and equitable incentives. There is a need for ambitious renewable energy policy at the ECOWAS/WAEMU level with strong tax incentives for solar energy. Governments provide incentives for end consumers during grid electrification by often not charging them the full cost of connection. Off-grid electrification programs could also aim to provide subsidy schemes benefitting end consumers, because the result for the Governments in either mode is provision of electricity to their populations.

2. WAEMU—composed of Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo, —directive in 1998 provides for reduced VAT rates varying from 5 percent to 10 percent on solar energy equipment but only few countries adopted such reduced rates. Côte d'Ivoire implemented 9 percent reduced VAT rate on sales of solar energy equipment. Burkina Faso has full VAT and customs duty exemption (importation and internal) on specific listed solar energy equipment. Mali has 5 percent reduced VAT rate on sales of solar energy equipment. Senegal has an investment tax allowance (that is, additional tax depreciation for the use of solar energy (not automatic, only on request). This allowance amounts to 30 percent of the solar energy investments. However, this incentive is for individuals only. While the other countries in West Africa (for example, Niger, Benin, and Ghana) have no specific tax legislation on solar energy, their investment code could still cover this type of investment. A summary of available incentives related to VAT and customs duty exemptions is provided in Table 10.1.

Table 10.1. Tax and Duty Incentives Provided by Project Countries

Country	VAT Incentive	Custom Duty Exemptions
Benin	No exemption	75–100% exemption for goods and exemption
Burkina Faso	Exemption on imported solar energy equipment	Exemption on imported solar energy equipment—5% reduced rate
Cabo Verde	Information not available	Information not available
Cameroon	Information not available	Information not available
Central African Republic	Information not available	Information not available
Chad	Information not available	Information not available
Côte d'Ivoire	Exemption on imported equipment 9% VAT on solar energy equipment	40–50% exemption on equipment and goods

Country	VAT Incentive	Custom Duty Exemptions
Gambia, The	Exemption from corporate tax, VAT, and retail tax	No import duties on solar PV, solar water heaters, wind equipment
Ghana	Exemption from VAT in importing RE products only if the components are brought whole (that is, not in separate pieces)	No import duty on RE generators including solar generators and wind turbines
Guinea	Information not available	Incentives/tax exemptions for RE equipment
Guinea-Bissau	Information not available	Incentives/tax exemptions for RE equipment
Liberia	Information not available	Information not available
Mali	5% reduced VAT rate on sale of solar energy equipment	Information not available
Mauritania	Information not available	Information not available
Niger	Information not available	Incentives/tax exemptions for RE equipment (mostly for solar lamps)
Nigeria	Information not available	Information not available
Senegal	No exemption but a deferred payment of VAT investment tax allowance (that is, additional tax depreciation for the use of solar energy—not automatic, only on request—only for individuals)	Exemption on equipment and goods
Sierra Leone	Information not available	Information not available
Togo	Information not available	Incentives/tax exemptions for RE equipment

Note: RE = renewable energy.

3. Data on tariff charged on imported solar products are limited but still reveal a pattern. Tables 10.2 and 10.3 show the percentage of import duty charged in ECOWAS countries for different kinds of solar products. Amount of duty charged varies considerably depending on the type of the product/sub product or the country. All countries that have reported data have at least a 10 percent duty on solar lanterns and batteries. The upper bound for such duties can go as high as 50 percent for solar lanterns and batteries in countries such as Sierra Leone and Nigeria.

Table 10.2. Most Favored Nation Average Ad Valorem Duty for Solar Products in Project Countries (%)

Country	PV Cells and Modules	Solar Batteries	Solar Lanterns	Solar Water Heaters	Solar Water Purifiers
Benin	—	—	—	—	—
Burkina Faso	.0	20	20	12.5	5
Cabo Verde	3.5	20	20	2.5	0
Cameroon	—	—	—	—	—
Central African Republic	—	—	—	—	—
Chad	—	—	—	—	—
Côte d'Ivoire	.0	20	20	12.5	5
Gambia, The	—	—	—	—	—
Ghana	5.0	10	10	15	0
Guinea	10.0	20	20	12.5	5
Guinea-Bissau	—	—	—	—	—
Liberia	—	—	—	—	—
Mali	—	—	—	—	—
Mauritania	—	—	—	—	—
Niger	—	—	—	—	—
Nigeria	.0	20	20	12.5	5
Senegal	.0	20	20	12.5	5
Sierra Leone	20.0	20	20	5.0	5
Togo	.0	20	20	12.5	5

Table 10.3. Bound Rate for Solar Products in Project Countries (%)

Country	PV Cells and Modules	Solar Batteries	Solar Lanterns	Solar Water Heaters	Solar Water Purifiers
Burkina Faso	7	7.0	7	5.0	0
Cabo Verde	0	17.5	25	12.5	2.5
Cameroon	—	—	—	—	—
Central African Republic	—	—	—	—	—
Chad	—	—	—	—	—
Côte d'Ivoire	7	7.0	6	5.0	.0
Gambia, The	—	—	—	—	—
Ghana	0	.0	0	.0	.0

Country	PV Cells and Modules	Solar Batteries	Solar Lanterns	Solar Water Heaters	Solar Water Purifiers
Guinea	7	7.0	6	5.0	.0
Guinea-Bissau	—	—	—	—	—
Liberia	—	—	—	—	—
Mali	—	—	—	—	—
Mauritania	—	—	—	—	—
Niger	—	—	—	—	—
Nigeria	0	.0	0	50.0	50.0
Senegal	30	30.0	30	30.0	30.0
Sierra Leone	50	50.0	50	50.0	50.0
Togo	0	.0	0	.0	.0

4. Readiness and action of countries in the region regarding an enabling policy and regulatory framework for off-grid electrification varies considerably. Ghana and Senegal have already over 30 percent of rural population with access to electricity and the existing policy and legislative framework are relatively well developed. Countries such as Côte d'Ivoire have specific national targets for renewable energy and energy access, but incentives and other financial instruments are not in place. Mali and, in less extent, Benin and Burkina Faso have relatively well-developed policy frameworks for rural electrification (targeted mostly through off-grid solutions), but current rates of energy access indicate those countries need more effort to achieve their objectives. All countries except Guinea validate the 2025–2030 National Renewable Energy Action Plans National Renewable Energy Policy and Action Plan and SEforALL Country Action Agenda. Some specific policy actions initiated by the ECOWAS countries toward off-grid electrification (targeted toward rural populations) are detailed in Table 10.4.

Table 10.4. Project Country Policy Initiatives for Off-grid Electrification

Country	Access Target 2030 (%)	Policy Action
Benin	100	• Policy for Rural Electrification (2004), Directorate General of Energy
Burkina Faso	65	
Cabo Verde	100	• Fund for Decentralized Rural Electrification
Cameroon	—	• Information not available
Central African Republic	—	• Information not available
Chad	—	• Information not available
Côte d'Ivoire	100	• Information not available
Gambia, The	100	• Draft Renewable Energy Policy 2012 (Section 13 of the Act) and setup RE fund

Country	Access Target 2030 (%)	Policy Action
Ghana	100	• Energy Sector Strategy and Implementation Plan 2010–2020. Ministry of Energy stated objective to increase
Guinea	100	• Master Plan for Rural Electrification (2006). It states a target of 15% access to electricity by 2015 • Strategic White Paper for Access to Modern Energy Services
Guinea-Bissau	80	• Statement for the Domestic Energy Development Policy in Guinea-Bissau (2005)
Liberia	100	• National Energy Policy (2009) set targets on access to energy for 2015 Strategic White Paper for Access to Modern Energy Services
Mali	87	• Framework for Rural Electrification (2003) - Rural Energy Service Agency creates Rural Electrification Fund
Mauritania	—	
Niger	60	• National Strategy for Access to Modern Energy Services (2009), ECOWAS/WAEMU • Aims to increase access to modern energy to 66% by 2015, including access to electricity for the rural and peri-urban population
Nigeria	90	• National Power Policy - REA to strengthen the role of RE in rural electrification
Senegal	100	• Senegalese Rural Electrification Plan of Action sets a target of 62 percent access for rural households by 2022
Sierra Leone	82	• National Energy Policy and Strategic Action Plan (2009) Ministry of Energy and Water Resources
Togo	100	• Electrification Master Plan is being implemented for 2014–2028

Note: RE = renewable energy.

5. Governments have started to include and/or consider off-grid electrification as part of their broader electrification strategy and could benefit from following policy, regulatory, and institutional good practices as outlined below:[79]

(a) **Right to sell product or service freely.** Since off-grid electrification involves sale of products and services, the Governments could consider policy options that range from a completely open market to exclusive rights given to specific products or services, depending on the broader electrification strategy of the Governments.

(b) **Adoption of technological standards to QA.** Governments could adopt, at a minimum, international standards for quality and performance of off-grid lighting products. Globally accepted standards include Lighting Global QA and International Electrotechnical Commission (IEC) standards. All policy benefits that a government provides to the off-grid

[79] Lighting Africa Policy and Regulatory study (Harvard Policy Group).

industry should be linked to the QA framework to ensure only products that meet quality standards get the benefits. Since ECOWAS has decided to reference these standards when it adopts a new quality framework for pico-solar products, it is already a step in the right direction.

(c) **After-sales quality of service.** Policy incentives could range from minimal enforcement to minimum standard required for warranty and quality of service.

(d) **Similar exemptions for grid and off-grid electrification.** These could result from import tax, sales tax, and VAT exemptions. Policy options could range from waiver for off-grid products used for electrification similar to waiver for products (goods and services) used in most grid-based electrification programs to no waiver for all electrification-related products (irrespective of grid or off-grid programs) to provide a level playing field. Waiver for off-grid products should be linked to the QA framework adopted so that only quality-approved products get the benefit of such policy incentives.

(e) **Investment protection, dispute settlement, and consumer protection.** Governments should ensure a fair investment protection and dispute settlement mechanism (either nationally accepted system in place or a dedicated and/or new consumer protection agency) to attract competent and professional private sector firms.

(f) **Light-touch regulation.** Since most of the activity in the stand-alone solar systems market happens either through a transaction between a buyer and seller of products/services or through contracts between businesses or businesses and public entities, regulation should remain limited to the contract.

ANNEX 11: PROJECT COUNTRY BRIEFS

REGION: Western Africa
Regional Off Grid Electrification Project

Benin

1. Benin is a low-income country with a small population of 11.1 million, its per capita GDP based on PPP in 2016 was US$2,177, and it is one of the least developed countries (LDCs) in the world. Situated next to Nigeria, Benin provides a gateway to landlocked countries in the north. Its economy relies heavily on reexport and transit trade with Nigeria and neighboring countries. GDP growth accelerated in 2018 thanks to the continued booming of the agricultural sector (notably, cotton) and a stronger port activity that facilitated trade. Poverty remains widespread but is projected to decrease in the medium run. The outlook is favorable as growth is projected to average 6.5 percent over 2019-2021. The fiscal and current account deficits are projected to narrow further in the medium run. However, growth prospects could be adversely impacted if structural reforms are not carried out in a timely manner. Likewise, the outcome of the 2019 legislative elections will determine the government's ability to pursue the necessary structural reforms. Real GDP growth accelerated from 5.8 percent in 2017 to 6.5 percent in 2018 (3.6 percent in per capita terms), driven by a vibrant agricultural sector buoyed by record cotton production (estimated at 700 Kiloton in 2018) and a stronger activity of the port of Cotonou reflecting higher trade volumes. Inflation remained positive for the second year and remained stable at 0.1 percent in 2018 (from 0.1 percent in 2017 and -0.8 percent in 2016). Terrorism and civil unrest are likely to weigh on mining, tourism and government revenue. Terrorist attacks have spread out across the country, including in the regions with gold mining activities. This may negatively affect investment and growth. On the external front, the country is vulnerable to higher international oil prices, as well as volatility in the prices of its main export products (i.e. gold and cotton). However, the significant population growth rate and low and non-inclusive pattern of growth have hindered the country's efforts to curb persistent poverty.

Burkina Faso

2. Burkina Faso is a low-income landlocked country with a population of 18.6 million, and its per capita GDP based on PPP in 2016 was US$1,770, and it is one of the LDCs in the world. Economic growth remained solid at 6 percent (slightly higher than its potential) in 2018, despite increasing terrorist attacks and higher international oil prices. It was driven by continued expansion of gold mining and rebound of agriculture. The external current account deficit (CAD) narrowed to 8.1 percent of GDP in 2018, down from 9.7 percent in 2017. This was driven by a slightly lower trade deficit, because of lower public investment-related imports due to fiscal consolidation. Higher official current transfers also contributed to reduce the CAD. Similar to past years, the CAD was largely financed by foreign direct investment inflows and concessional aid inflows. The inflation rate was estimated at 2 percent in 2018 (up from 0.4 percent in 2017) due to higher prices of beverages, housing and fuel. But inflation remained well below the 3

percent regional threshold of WAEMU. Economic prospects remain positive, with GDP growth rate projected to stabilize around 6 percent during 2019-2021.

Cabo Verde

3. Cabo Verde is a lower-middle-income country with a population of 546,000 and its per capita GDP based on PPP in 2017 was estimated at US$6,900. Real GDP growth of 4.5 percent is estimated for 2018, placing growth above 4% for the third year in a row following years of near stagnation. The latest projection is for growth to remain in the 4 to 5 percent range over the medium-term. The emerging recovery is driven mostly by a strong performance of the private sector including manufacturing, electricity, water, tourism and financial services. There has been a notable contraction in agriculture reflecting the impact of the year long drought in 2017. Expansionary fiscal policy in the aftermath of the global crisis and increasing support to loss-making state-owned entities (SOEs) led to a rapid increase in debt to around 130 percent of GDP. The government is now implementing a program to reduce debt including the rationalization of the SOE sector and boosting revenue collections. The current stock of public debt, at 126 percent of GDP, is among the highest on the continent, but is largely concessional. While the country is at high risk of external debt distress, its debt-carrying capacity, as estimated under the new Debt Sustainability Analysis (DSA) framework, is considered strong (7% of export revenues). Considering the debt level, the Government is seeking to change the underlying growth paradigm in the country, which has up to now been based on the public sector. This requires enforcing a credible and far-reaching engagement to further improve the business environment, with efforts to promote industrialization and entrepreneurship. However, further improving the business environment depends on removing—through well-coordinated sector-based policies—current binding constraints such as limited market access, high-energy costs, and a lack of inter-island transportation.

Cameroon

4. Cameroon is a lower-middle-income country with a population of about 24 million, and its per capita GDP based on PPP in 2016 was US$3,228. Though Cameroon's relatively diversified economy has proved more resilient than those of more oil-dependent countries of Central Africa, domestic challenges have worsened the country's economic situation. Outbreaks of violence in the North and Far North Regions, coupled with a secessionist movement in English-speaking areas, have suppressed economic activity and spurred a rise in security spending. Growth of real GDP nonetheless rebounded to 4 percent in 2018 compared to 3.5 percent in 2017, thanks to a recovery in the construction sector, increases in natural gas production, and buoying tertiary activities in retail, telecommunication and the financial sector. Inflation remained low at 1.1 percent for the year—well below the regional ceiling of 3 percent. Fiscal policy has remained focused on fiscal consolidation, despite increasing fiscal pressures related to the deteriorating security situation. The overall fiscal deficit is estimated to have reached 2.4 percent of GDP, compared to 4.9 percent in 2017.

The Central African Republic

5. The Central African Republic is a low-income country with a population of 4.7 million, its per capita GDP based on PPP in 2016 was US$641, and it is one of the LDCs in the world. The upturn in economic activity that began in 2014 was confirmed during the first nine months of 2015, but its dynamism was interrupted by the resurgence of cross-community violence at the end of September 2015. The worsening security environment held back growth of real GDP to an estimated 4.8 percent in 2015, compared with an initial target of 5.5 percent. The political transition was completed when presidential and legislative elections were held, with former Prime Minister elected as president in the second round of voting. Overall conditions in the social and humanitarian areas were relatively stable for part of 2015 but deteriorated amid fresh outbreaks of cross-community violence, which claimed many victims and swelled the number of people displaced both inside and outside the country. A peace agreement was signed under the African Union's leadership in Bangui on Feb 6, 2019 between CAR Government and 14 armed groups, after the negotiations in Khartoum. As a result, a new government was established on March 3, 2019.

Chad

6. Chad is a fragile, oil-exporting, low income country with a real GDP per capita of USD$820 (2018). It has an estimated population of 15.4 million (2018) and hosts more than 403,000 refugees. Over the past 2 decades, macroeconomic stability and growth have been continuously challenged by conflict, lack of structural investment and the economy's exposure to oil price volatility. Chad is currently emerging from a fiscal, economic and social crisis triggered by the global oil price shock in 2014. After severe recession in 2016 and 2017, real GDP growth is estimated at 2.6 percent in 2018, but recovery remains dependent on the oil economy. In addition, the privatization of the cotton public enterprise is expected to greatly improve the contribution of agriculture to growth. Significant fiscal consolidation helped to reduce the non-oil primary deficit from 9.7 percent in 2015 to 4.4 percent in 2018. Following successful commercial debt restructuring with Glencore (June 2018), Chad regained liquidity and debt sustainability. However, the risk of external debt distress remains high and external budget support is needed to close the short-term financing gap.

Côte d'Ivoire

7. Côte d'Ivoire, a lower-middle-income country, with a population of 23.2 million and a per capita GDP based on PPP of about US$3,746 in 2018, is the third-largest economy and the third-most populous country in West Africa. Economic growth remained strong for the fourth straight year due to booming agriculture, a better business climate, and returning investors despite international uncertainty. The country's GDP growth has gradually declined from 10.1 percent in 2012 to 7.4 percent in 2018. Despite the high growth rates observed, poverty remains high at about 46.4 percent. The incumbent president was reelected in October 2015 in a peaceful vote that was a big step in consolidating peace and economic

confidence in the country, although presidential elections in October 2020 may create uncertainty and have a negative impact on private investments. Inflation was at 1.5 percent in 2015 along with strong foreign currency reserves.

The Gambia

8. The Gambia is a low-income country with a population of approximately 2.1 million in 2017 and per capita GDP based on PPP in 2017 of US$1,700. Economic recovery continued in 2018 with growth estimated at 6.6 percent (from 4.6 percent in 2017), driven by (i) strong recovery in tourism and trade, and construction, and (ii) improvements in electricity provision. The number of tourists rebounded by 43 percent in the first half of 2018 compared to the same period in 2017. Growth in the agricultural sector was behind expectations, mainly due to dry spells during June-August 2018. Headline inflation declined from 8 percent in 2017 to 6.2 percent in 2018 due to a stable exchange rate. Signaling a stronger private sector activity, especially in construction, and lower interest rates, private sector credit growth reached 24 percent (year-on-year) by end-October 2018, compared to 3 percent at end-2017. In 2018, the fiscal deficit increased to 6.6 percent in 2018 (from 5.4 percent in 2017), mainly due to lower grant revenues (3.1 percent of GDP) and unbudgeted transfers to SOEs. This led to a sharp increase in net domestic borrowing from -0.7 percent of GDP in 2017 to 3.4 percent in 2018. IMF/WB DSA of June 2018 indicates The Gambia to be in external debt distress. Public debt is projected to decline by 4.7 percentage points in 2018, reaching 83.2 percent of GDP, aided by higher than expected GDP growth and lower interest rates on T-Bill. Interest payments consumed 30.2 percent in 2018, leaving very little fiscal space for public investment and improved service delivery.

Ghana

9. Ghana's economy has rapidly expanded in 2017 and 2018. With 29.5 million people, the lower middle-income Ghanaian economy had a GDP per capita of USD 2,416 in 2018. Ghana was the second-fastest growing economy in Africa in 2017 (8.1 percent) and growth remained high in 2018, estimated at 6.2 percent which was spurred largely by robust expansion in mining and petroleum. In addition, strong agriculture growth was supported by sustained expansion in the forestry and logging, crops, and livestock sub-sectors. Average inflation moderated to single digit (9.8 percent) driven by both food and non-food inflation. The Government further reduced the fiscal deficit in 2018 to 3.7 percent from 6.1 percent in 2016 through sustained fiscal consolidation. Ghana's merchandise trade balance remained in surplus in 2018, and the current account deficit narrowed to 3.2 percent of GDP in 2018, from 6.7 percent in 2016. However, the key challenge includes boosting domestic revenues; as well as stabilizing the cedi which, as a result of both external developments and domestic speculative activities, came under pressure in the latter half of 2018. The central bank put in measures to stabilize the cedi which resulted in a US$250 million decline in gross international reserves to US$5.5 million (2.5 months of imports). Further, risks to growth, fiscal management and Ghana's external position could come from external shocks arising from higher cost of financing, as normalization of US monetary policy progresses, and the Federal Reserve

continues its path of gradual increases in the benchmark interest rate. In addition, Ghana's heavy reliance on primary commodities, including cocoa, gold, and oil, together with the projected weakness and possible volatility in international commodity prices, create significant uncertainty for its growth, export receipts, and domestic revenue. The key mitigating factors to these risks include the authorities' strong commitment to keep the fiscal consolidation on track, and strengthen the financial sector, as demonstrated by the adoption of the fiscal responsibility law, the fiscal council, the financial stability council and the increase in Capital Adequacy Requirements in December 2018. Ghana held its elections in December 2016 that led to the election of a new political party and government that is committed to a 'Ghana beyond Aid' agenda. This is driving its development program and also influencing the engagement of its partners.

Guinea

10. Guinea remains a fragile economy (one of the LDCs) with a population of 13.1 million and a per capita GDP based on PPP of about US$2,242 in 2017. Growth slowed down from an exceptionally high level (at 10 percent) in 2016 and 2017, but remained robust at 5.8 percent in 2018, driven by mining sector growth and FDI flows. This growth rebound followed the Ebola epidemic, which ended in December 2015. The Macroeconomic framework has remained broadly stable since 2016, and the risk of debt distress remains moderate, although external non-concessional borrowing (NCB) increased significantly in 2018, due to the Souapiti dam (US$1.2 billion) and two other non-concessional loans for the rehabilitation of the RN1 national road and urban roads in Conakry (US$598 million) that were signed in mid- 2018 with Chinese entities. Progress has been slow to materialize in the social sectors, though the extreme poverty rate is estimated to have declined gradually (to 26 percent in 2018). However, Guinea ranked only 175 out of 189 countries for the Human Development Index. The medium-term growth prospect is positive and expected at about 6 percent over 2019-21, driven by mining, agriculture, and infrastructure. Declining commodity prices, lower-than-forecast mining production, and election-related fiscal slippages are downside risks to the outlook.

Guinea-Bissau

11. Guinea-Bissau is a low-income country with an estimated population of 1.9 million in 2018 and per capita GDP based on PPP in 2017 of US$1,900. Guinea-Bissau's return to constitutional order in 2014 allowed the country to improve its socioeconomic situation and return to growth. After three years of stagnation due to the 2012 coup, Guinea-Bissau's economy returned to significant growth— 4.8 percent in 2015, up from only 0.8 percent in 2013 and 2.7 percent in 2014; and 5.9% in 2017. Real GDP growth declined to 3.8% in 2018, primarily reflecting a decrease in cashew production caused by adverse weather conditions. Cashew exports declined by about 25 percent in 2018. The cashew sector also suffered from uncertainties caused by artificially high cashew farmgate prices (double the market price) imposed by Government. Weak revenue collection and increased capital spending led to an increase in the fiscal deficit, from 1.7 percent of GDP in 2017 to 4.6 percent in 2018. Tax revenue declined significantly due

mainly to lower cashew income and a decrease in trade taxes owing to lower imports. The external current account deficit slightly narrowed from 1.9 percent of GDP in 2017 to 1.6 percent in 2018, supported by higher wood exports.

Liberia

12. Liberia is a fragile state with a population of 4.9 million striving to overcome the legacy of two devastating civil wars and the twin shocks of Ebola crisis and the protracted slump in global commodity prices. The two civil wars between 1989-2003 caused widespread loss of life, suppressed economic activity, and destroyed vital infrastructure. After the end of the war, Liberia's per capita GDP grew by 6.2 percent on average per year between 2003 and 2013 but the twin shocks brought Liberia's renewed expansion to a halt. The economy contracted an average rate of 0.8 percent per year during 2014-2016, or 3.2 percent in per capita terms. With per capita GDP based on PPP in 2016 was US$841 in 2016, Liberia remained one of the poorest countries in the world. Liberia's economy expanded by an estimated 1.2 percent in 2018, a significant slowdown from a growth rate of 2.5 percent in 2017. The incipient recovery is driven largely by increased production of gold and iron ore, while non-mining sector growth was flat in 2017 and negative in 2018. Inflation reached an all-time high of 28.5 percent by end 2018, driven by a rapid currency depreciation. The medium-term outlook remains challenging, with growth projected to remain below population growth and poverty set to increase.

Mali

13. Mali is a large landlocked LDC with a rapidly growing population of about 18.5 million and a per capita GDP based on PPP of about US$2,016 in 2017. Mali's large 1,240,000 km2 of land area is 60 percent desert, making the rapid population growth spread quite unevenly in the country. Growth declined for a third consecutive year to 4.9 percent (1.9 percent in per capita terms) in 2018, as the economy reverted to its potential rate of growth. Slower growth is partly due to the spread of insecurity in the center and southern regions. Uncertainty in the run-up to the 2018 presidential elections also played a role. Mali has a democratic political system with mostly nonviolent transfers of power. However, in 2012–2013, it faced complex crisis on three fronts (conflict and insecurity in the north, institutional and political turmoil in the south, and humanitarian and food insecurity across the country due to the 2011 drought) tackled with a combination of government resilience and internal military and external support. The country's peace and reconciliation agreement, signed on May 15 and June 20, 2015, has stabilized political life, but the security situation is still fragile. The extreme poverty rate is estimated to have declined from 46.3 percent in 2015 to 42.7 percent in 2017.

Mauritania

14. Mauritania is a lower-middle-income country with a population of approximately 4.4 million in 2017, and its per capita GDP based on PPP in 2017 was estimated at US$4,500. The ongoing drop in world iron prices has derailed the Mauritanian economy from its high-growth track. From 6.6 percent in 2014, GDP growth dropped to an estimated 3.1 percent in 2015. The slowdown in growth is also due to a decline in gross investment. Growth has been gradually recovering in 2018, increasing from 3 percent in 2017 to 3.5 percent in 2018 (0.7 percent in per capita terms). This moderate pick-up was driven by a 5.2 percent increase in the non-extractive GDP, namely due to improvements in the commerce, telecommunications, transport, and primary sectors. On the other hand, the extractive sector remains a drag on growth and contracted, for a second consecutive year, driven by continued operational problems at SNIM coupled with rising production costs due to higher international oil prices, and a lower demand from China for iron. The fiscal position strengthened further in 2018. The fiscal deficit of 0.2 percent of GDP in 2017 turned into a surplus of 0.5 percent of GDP in 2018, supported by the ongoing fiscal consolidation, and tightened controls over transfers to public enterprises and reduced public investment. Meanwhile, improvements in aggregate demand have boosted tax revenues especially through increasing consumption and corporate taxes. The macroeconomic outlook is favorable. Growth is projected to average 4.8 percent in 2019-2021, driven by strong activity in the primary sector, increasing mining production, and structural reforms in the business environment and ICT to boost the private sector.

Niger

15. Niger is a low-income country with a population of 22.3 million, its per capita GDP based on PPP in 2018 was US$1,270 in 2018, and it is one of the LDCs in the world. Niger's economy has registered a steady growth over the past three years. Despite persisting shocks, growth reached 4.9 percent in 2017 and 5.2 percent in 2018, although per capita growth was much lower at 1.3 percent given the high population growth rate (3.9 percent). A good crop season, more favorable oil prices coupled with and the liberalization reforms in the oil sector, and buoyant services sector accounted for such performance. The Nigerien economy remains vulnerable to commodity price and weather shocks. An intensification of terrorist activities would also negatively impact production, investment and exports.

Nigeria

16. Nigeria is a lower-middle-income country with a population of 186.9 million, and its per capita GDP based on PPP in 2016 was US$5,824. The Nigerian economy has been adversely affected by external shocks, especially in the fall in global crude oil price. Growth slowed sharply from 6.2 percent in 2014 to an estimated 3.0 percent in 2015. Inflation increased from 7.8 percent to an estimated 9.0 percent. The Nigerian economy officially entered recession in the second quarter of 2016 and emerged from it in late 2017 as oil prices and production recovered. Nigeria's emergence from recession remains slow: annual real GDP growth averaged 1.9 percent in 2018. The risks remain high as current macroeconomic outcomes

are fragile to external and domestic shocks. The oil sector remains a necessary but not sufficient condition for growth; any negative shocks to oil production or price will negatively affect fiscal revenues, the external balance, and banking sector stability. The accelerated implementation of the structural reforms (including the power sector) articulated in the Government's Economic Recovery and Growth Plan could boost growth rates and start reducing poverty.

Senegal

17. Senegal, an LDC with a population of about 16.3 million in 2018, has recently experienced a track record of impressive growth, over 6% since 2015 and attaining 7.2% in 2017 and 7% in 2018. Its per capita GDP in 2018 based on PPP was about US$2,860. Senegal's current performance contrasts with stagnation over the 2000-2010 period, when growth averaged only 4 percent compared to an average growth rate of 6 percent in the rest of Sub-Saharan Africa. All sectors supported growth in 2018, but agriculture and total investment–linked to large infrastructure investments–remain key drivers. Maintaining high growth requires sustained macro stability and structural reforms, and efficient public investment, which should further boost private investment. However, there are concerns about the efficiency of some investment projects and about the commitment to reform, which can be affected by the political cycle. Looking forward, growth would further accelerate since 2022 as production of offshore oil and gas begins. Continued efforts to strengthen the macro-fiscal framework are needed. The fiscal stance remains under pressure due to fixed domestic energy prices in a context of high international oil prices, resulting in lower energy revenues and higher subsidies. The current account deficit remains large, due to still high commodity prices and imports of intermediary goods. Going forward, policy will be guided by the government's development plan for the country, the Plan Senegal Emergent, adopted in 2014. The PSE includes structural reforms to support private investment and increase economic diversification.

Sierra Leone

18. Sierra Leone, an LDC with a population of about 7.2 million and a per capita GDP based on PPP of about US$506 in 2018. The country has made notable economic progress after emerging from a decade-long civil war in 2002, but has also suffered occasional setbacks, such as the Ebola Virus Disease epidemic of 2014. The Ebola outbreak affected the socioeconomic livelihoods of the country, disrupting normal health care and education services, agricultural production, and trade. The Ebola epidemic, combined with the collapse in iron ore prices, led to a severe contraction in Sierra Leone's economy in 2015—by 21 percent --which the country has been trying to recover from. Although the country was declared Ebola free in March 2016, the economic recovery has been volatile. Growth rebounded to 6.4 percent in 2016 only to decelerate to 3.8 percent in 2017 and remaining roughly stagnant at 3.7 percent in 2018. Broad macroeconomic stability is yet to be assured as high inflation, rising debt and widening current account deficits remain key challenges. However, growth will improve to 5.4 percent in 2019 and stabilize at 5.2 percent over the medium term reflecting the recovery in mining sector but also improvements in agriculture and services. Inflation is also expected to decline over the medium term

underpinned by continued tightening of monetary policy and the Government's fiscal consolidation reforms.

Togo

19. Togo, an LDC, has a small population of 7.8 million and a per capita GDP based on PPP of about US$1,548 in 2016. Economic growth accelerated in 2018 to 4.7 percent (2.1 percent in per capita terms), supported mainly by a rebound in the extractive industry and continued expansion in cotton production. On the demand side, growth was driven by stronger private investment, which benefited from improvements in the business climate. Inflation returned to positive territory in July 2018 and maintained an upward trend to reach 2 percent at end 2018. The growth outlook remains positive over the medium term but is contingent on political stability. GDP growth is projected to average 5.1 percent (2.6 percent in per capita terms) over 2019-2021, primarily because of a rebound in industrial production and a gradual recovery in the tertiary sector (namely logistics and transport). Another driver of projected growth is an expected upturn in private investment following on the recent improvements in the business climate. Average inflation is expected to rise steadily to reach 2 percent by 2021 as domestic demand continues to strengthen but will remain well-below the WAEMU convergence target of 3 percent. According to a 2011 household survey, the poverty rate declined from 62 percent in 2006 to 59 percent in 2011.

ANNEX 12: CHARACTERISTICS OF THE OFF-GRID SOLAR MARKET IN PROJECT COUNTRIES

REGION: Western Africa
Regional Off Grid Electrification Project

1. **The project is informed by a regional OGS market assessment**, which identified about 31 million households or about 180 million people who can be provided with electricity using stand-alone solar systems in West Africa and the Sahel. Though these solar systems would range from 1W to 350W per household, in aggregate, it could be equivalent to about 2 GW of capacity using solar PV-based technology coupled with storage facilities. The potential value of the household solar market is estimated to be about US$6.6 billion. Table 12.1 provides an indication of the total stand-alone solar systems market potential in the region including breakdown of public institutions, such as schools and health centers along with productive uses, such as water pumping, mobile phone charging, and so on.

Household

2. **The West Africa and Sahel region has a relatively small household solar PV market that is still largely undeveloped.** Rapid uptake of household lighting and communication technology are driving demand for new electricity sources. However, despite the recent entrance of PAYGO and finance players into the household market segment, the region's household solar market is still in early stages and dominated by the informal sector.[80]

3. **The 19 ROGEP countries present a diverse array of market characteristics.** Among these, several indicators are important for market development of stand-alone solar systems. Looking at the total population without access to electricity alongside GDP per capita allows us to roughly estimate potential market size for stand-alone solar systems and their attractiveness to suppliers and investors. Population density is also an important indicator for market attractiveness to suppliers, based on distribution and maintenance costs. Using these demographic indicators based on the World Bank World Development Indicators database, countries can be grouped into market segments for analysis, as shown in Table 12.2.

4. **Larger markets are those with relatively high GDP per capita, large populations without access to electricity, and higher population density.** These are generally more diverse economies with stronger infrastructure. Most of these markets are already reporting growing sales of quality-verified stand-alone solar systems. Nascent markets are poised for growth, with large off-grid populations, slightly lower GDP per capita rates, and some reported stand-alone solar systems sales. Smaller markets present more challenging characteristics, including small population, low GDP per capita, and low population density. Countries dominated by the Sahel region fall into a distinct category, characterized by low population

[80] The informal market includes the grey market, hawkers, and the over-the-counter market. Note that for the sake of this study, all informal/grey markets/hawkers are over the counter (but not all over-the-counter market players are informal).

density but large off-grid populations with a range of GDP per capita levels. Throughout this section, these market segments are leveraged to support regional analysis.

Table 12.1. Indicative Total OGS PV Market Potential in ROGEP Countries

	Estimated Market Size (Units)	MW	Value (US$ millions)
Household			
Stand-alone Solar Systems Cash Market Segment			
Pico solar	11 million	33	500
Plug and Play SHS	4 million	44	541
Small SHS	2 million	122	608
Medium and large SHS	0.5 million	80	203
Total	**18 million**	**279**	**1,852**
Stand-alone Solar Systems Financed Market Segment			
Pico solar	0.5 million	1	14
Plug and Play SHS	2 million	22	276
Small SHS	4 million	205	1,025
Medium and large SHS	6 million	1,403	3,509
Total	**13 million**	**1,631**	**4,824**
Institutional			
Primary and secondary schools	726,000	384	1,084
Health facilities	62,000	180	411
Public lighting	127,000	32	157
Village water supply	509,000	1,982	4,956
Total	**1,424,000**	**2,578**	**6,611**
Productive Use			
Solar Water Pumping			
Small head	339 thousand,000	51	127
Medium head	5,000	8	19
Large head	10 ,000	9	23
Mobile charging stations/shops	695,000	35	9
Total	**1,049,000**	**103**	**178**

Source: ECREEE, ROGEP Market Assessment, 2018.

5. **Other market characteristics important to stand-alone solar systems sales include mobile connectivity and agricultural production.** While mobile money platforms are less pervasive in many West African markets than in East Africa, mobile internet penetration rates set a baseline for the entry by PAYGO business models. Connectivity also supports economic development, value addition, wealth creation, and thereby household purchasing power. Mobile phone ownership indicates a baseline of

connectivity and a nascent market for internet penetration. Agricultural production indicates rural wealth as well as the potential market size for rural stand-alone solar systems productive use applications such as water pumping for irrigation, grain milling, and cold chain equipment.

Table 12.2. Solar Household Consumer Market Segments

Demographic Group	Low income rural Segment	High-income rural Segment	Low-income peri-urban Segment	Middle-high-income urban Segment
Description	• Engaged in farming, SME, or mining support activities • Lives on less than US$3.20 per day • Lives more than 15km from the nearest grid connection	• Small portion (±1.5%) of rural households using a petrol generator set • Has a demonstrated ability to pay for solar off-grid systems • Often <5% of overall household population	• Low-income urban population engaged in SME work or casual labor • Lives near the grid but cannot afford or does not have access to connection	• Professionals, business owners and salaried people are likely to be connected to the grid • Desires solution as a back-up or replacement to grid or generator power • Often <5% of overall household population
Current Energy Use Category	Tier 0, Tier 1	Tier 2, Tier 3	Tier 1, Tier 2	Tier 2, Tier 3, Tier 4
Key Market Outcomes	Seasonality and type of income (agricultural, mining, SME) and so on	Lesser number of customers and limited confidence in solar	Type and consistency of income (casual, salaried) and so on	Competition with grid power

Source: African Solar Designs analysis.

6. **Demographic and socioeconomic segmentation of the household market.** Over 208 million people in the ROGEP countries (over 50 percent of the total population) do not have access to electricity. Together this represents a significant potential market for stand-alone solar systems. While the industry remains nascent across much of the region, diverse national markets including Nigeria, Ghana, Mali, and Burkina Faso are reporting growing sales of household solar products.[81]

7. **Agriculture is the largest sector of employment across the region**, ranging from 37 percent of total employment in Nigeria to 87 percent in Chad.[82] The large number of smallholder and subsistence farmers in many countries presents a relatively large market for stand-alone solar water pumping and milling. Off-grid household income is highly seasonal and depends on crop cycles. Potential financing mechanisms for financing solar equipment must be based on this seasonality (many solar industry players already consider seasonality aspects when planning sales cycles). Pastoralist communities also represent a significant economic segment. Households throughout the Sahel region have distinct characteristics

[81] GOGLA Sales and Impact Report H2 2017.
[82] World Bank World Development Indicators, employment in agriculture, percentage of total employment, modelled International Labour Organization estimate (2017).

requiring unique service models tailored to low population density, livestock-based wealth, sharia finance, mobile/small-scale lighting, and household cooling.

8. **Consumer purchasing power.**[83] While GDP per capita is relatively high on average across the region, this is for many countries driven up by natural resource wealth. Income data show a high incidence of poverty that constrains the majority of households' ability to pay for electricity in most countries, despite high demand for electricity. The majority of the ROGEP countries have poverty rates higher than the sub-Saharan Africa regional average. There are several notable exceptions to this trend, such as Ghana, Cameroon, and Mauritania, where the incidence of poverty is significantly lower.

9. National data suggest that rural households prioritize electricity services and have an ability to pay for electricity albeit in small amounts. The market assessment found that the average households in representative countries spend between US$3 and US$8 per month on Tier 1 equivalent energy needs.[84] This range rises to US$11–33 for Tier 1.5 and US$25–40 for Tier 2. A study from Sierra Leone found that the "cost of lighting, on average, occupied between 10–15 percent of household incomes. Households using generators were found to spend a greater proportion of their income (upward of 20 percent) on lighting."[85] Other research has shown household energy spending between 6 and 12 percent for the low-income segments in sub-Saharan Africa.[86]

10. **Geographic components of the solar market.** Based on demographic and income data,[87] the household solar market can be divided into four distinct segments, as shown in table 12.2, which each require a different business and financing approach. Each segment fits into a distinct tier group as indicated by the MTF[88] (note that Tier 5 is not included in this analysis. Stand-alone solar systems that can provide a Tier 5 level of service are beyond the reach of the vast majority of the population in the ROGEP countries). Solar suppliers have already developed business models to approach market groups with growing sophistication.

11. Household poverty holds back geographical expansion of solar products, and 'pure' rural markets are largely untapped because of lack of ability to pay and lack of ability of companies to reach consumers. Four market segments—high- and low-income rural, peri-urban, and urban—were listed as most important for those selling household equipment. Small-scale productive use equipment is closely

[83] No poverty was reported for Cabo Verde, so it had no data and was therefore removed from this chart to avoid confusion.
[84] Based on focus group data for Ghana, Sierra Leone, Liberia, and Mali.
[85] European Network of Family Offices (ENFO) EU Project Baseline 2015 (Sierra Leone), page 18.
[86] Average rural household expenditure on energy varies considerably. Ten percent is an acceptable figure for lighting and cell phone charging costs for low-income groups. See https://www.brookings.edu/blog/africa-in-focus/2017/03/17/figures-of-the-week-benefits-of-off-grid-electricity-solutions/.
[87] 2011 World Bank income data, 2015 National Census (see page 19), File "BSL_Mapping_Report_30Nov2017_Access to Finance and Financial Inclusion," pages 17–23.
[88] The MTF energy use definitions from the ESMAP report at the following link: https://www.esmap.org/node/55526.

associated with household stand-alone solar systems (and dealers do not distinguish between the two markets).

12. In rural areas, demand for household systems is concentrated in areas where there are high populations and high productivity. However, in many countries, demand is spread over a large area given the large areas that are unelectrified and distant from the grid. Low population density is a significant challenge in Sahel countries, which have relatively large populations without access to electricity but also very large land mass.

Institutional

13. The 19 ROGEP countries were clustered into four groups based on GDP per capita and population density as shown in Table 12.3.

Table 12.3. Grouping of Countries

Category 1	Category 2	Category 3	Category 4
Low income/low population density	*Low income/high population density*	*High income/low population density*	*High income/high population density*
Burkina Faso	Benin	Cameroon	Cabo Verde
Central African Republic	Gambia, The	Côte d'Ivoire	Ghana
Chad	Sierra Leone	Mauritania	Nigeria
Guinea	Togo		Senegal
Guinea-Bissau			
Liberia			
Mali			
Niger			

14. **Water supply.** This covers the need for village water supply for communities, households, and livestock. Available GIS data on water points in 8 out of the 19 countries revealed that the water points cover a varying range of sources from wells to boreholes each of which has different energy supply needs. The three pump sizes were classified as low, medium, and high power. The largest market for this sector is Nigeria due to its high population and relatively high income with 272,687 pumps valued at US$2.9 billion. The smallest market is Cabo Verde at 144 units valued at US$1.5 million, which is to be expected as it has the highest electrification rate out of all the countries.

Table 12.4. Expected Total Cash Market Potential for Regional Off-Grid Water Supply

	Water Pumping			
	Country	**Units**	**Size (kW)**	**Cash Market**
Category 1	Burkina	10,531	35,832	89,580,349
	Central African Republic	11,162	37,979	94,948,609
	Chad	37,233	126,689	316,722,976
	Guinea	23,286	79,232	198,080,175
	Guinea-Bissau	4,375	14,887	37,216,293
	Liberia	10,453	35,566	88,915,149
	Mali	32,990	112,252	280,629,340
	Niger	48,937	166,513	416,282,076
Category 2	Benin	5,709	20,048	50,119,521
	Gambia, The	953	3,348	8,370,847
	Sierra Leone	5,282	18,549	46,371,840
	Togo	3,619	12,709	31,773,141
Category 3	Cameroon Côte d'Ivoire Mauritania			
Category 4	Cabo Verde	144	604	1,510,224
	Ghana	21,501	90,302	225,756,097
	Niger	272,687	1,145,283	2,863,208,669
	Senegal	19,709	82,776	206,940,890
	Total ROGEP Market	**508,568**	**1,982,570**	**4,956,426,196**

Source: GIS and World Bank World Development Indicators
Note: Due to lack of GIS data, the cluster of Cameroon, Côte d'Ivoire, and Mauritania has no village water pumping information.

15. **Health centers.** Access to electricity is critical to health care delivery and to the primary goal of universal health coverage. This analysis considers ordinary power needs for off-grid clinics in the region. Off-grid clinics require power for lighting and other services such as phone charging, powering maternity and theatre equipment, vaccine refrigeration, laboratory equipment, sterilization, and staff housing. The size of the facility and number of patients served determines the amount of energy that each facility requires. Based on available data, the market assessment estimated the potential cash market in the off-grid health sector as shown in Table 12.5.

Table 12.5. Expected Total Cash Market Potential for Regional Off-Grid Health Sector

		Health Center Tier 2			Health Center Tier 3		
	Country	**Units**	**Size (kW)**	**Cash Market**	**Units**	**Size (kW)**	**Cash Market**
Category 1	Burkina	582	873	2,329,253	63	267	666,445
	Central African Republic	617	926	2,468,837	67	283	706,383
	Chad	2,059	3,088	8,235,376	224	943	2,356,305
	Guinea	1,288	1,931	5,150,446	140	589	1,473,645
	Guinea-Bissau	242	363	967,692	26	111	276,876
	Liberia	578	867	2,311,956	63	265	661,497
	Mali	1,824	2,736	7,296,875	199	835	2,087,781
	Niger	2,706	4,059	10,824,094	295	1,239	3,096,988
Category 2	Benin	217	325	541,582	54	227	541,586
	Gambia, The	36	54	90,454	9	38	90,454
	Sierra Leone	200	301	801,736	50	210	526,144
	Togo	137	206	343,334	34	144	343,337
Category 3	Cameroon	7,560	11,341	18,901,044	13,896	58,365	138,963,394
	Côte d'Ivoire	6,839	10,258	17,096,692	12,570	52,793	125,697,520
	Mauritania	2,027	3,041	5,067,691	3,726	15,649	37,258,447
Category 4	Cabo Verde	1	2	3,445	0	1	2,943
	Ghana	206	309	823,989	44	185	462,000
	Niger	2,613	3,919	6,531,527	558	2,344	5,580,416
	Senegal	189	283	472,072	40	169	403,329
	Total ROGEP Market	**29,922**	**44,883**	**90,258,094**	**32,061**	**134,656**	**321,195,492**

Note: HC2: Clinic that could include a ward and a waiting room. These provide a more robust outpatient set of services that could include a vaccination as well as curative measures.
HC3: Medium-size health centers with multiple ward rooms, a maternity ward, and possibly a theatre room. These offer a wider range of outpatient medical services and a laboratory.

16. **Primary and secondary schools.** Data used to calculate the market size included off-grid populations of children ages 0–14 years for the primary schools and youth ages 15–19[89] for secondary schools. From the analysis, Nigeria, Ghana, and Senegal have the highest potential market in this sector.

[89] Based on World Bank populations data for each of those age-groups in each country.

Table 12.6. Expected Total Cash Market Potential for Regional Off-Grid Education Sector

		Primary Schools			Secondary Schools		
	Country	**Units**	**Size (kW)**	**Cash Market**	**Units**	**Size (kW)**	**Cash Market**
Category 1	Burkina	11,709	5,855	29,273,283	176	338	879,615
	Central African Republic	2,943	1,472	7,358,364	195	374	974,706
	Chad	10,694	5,347	26,736,022	622	1,194	3,109,994
	Guinea	5,994	2,997	14,985,456	389	747	1,945,006
	Guinea-Bissau	1,104	552	2,759,097	70	134	348,827
	Liberia	2,668	1,334	6,670,566	175	335	873,083
	Mali	9,566	4,783	23,915,756	526	1,010	2,630,326
	Niger	14,901	7,450	37,252,070	780	1,498	3,901,793
Category 2	Benin	808	404	1,10,06	79	153	397,385
	Gambia, The	143	72	179,181	13	25	66,370
	Sierra Leone	740	370	1,849,306	70	135	350,958
	Togo	500	250	624,749	46	88	229,019
Category 3	Cameroon	21,343	10,672	26,679,008	1,878	3,605	9,388,000
	Côte d'Ivoire	19,158	9,579	23,947,413	1,779	3,416	8,896,164
	Mauritania	5,349	2,675	6,686,301	479	921	2,397,221
Category 4	Cabo Verde	194	97	242,862	4	8	19,678
	Ghana	35,845	17,923	89,613,725	562	1,078	2,807,791
	Niger	529,733	264,866	662,166,017	6,783	13,023	33,914,778
	Senegal	37,339	18,669	46,673,167	515	988	2,573,781
	Total ROGEP Market	**710,732**	**355,366**	**1,008,622,349**	**15,141**	**29,071**	**75,704,497**

17. **Public lighting.** The market assessment analysis considered the public lighting needs for off-grid villages and market centers. Public lighting projects are technically mature and stand-alone. The assessment looked at lighting based on off-grid populations based around town centers. It should also be noted that Cabo Verde has a Renewable Action Plan that seeks to provide public lighting that is powered by 100 percent by renewable energy by 2020.

Table 12.7. Expected Total Cash Market Potential for Regional Off-Grid Public Lighting Sector

	Public Lighting			
	Country	**Units**	**Size (kW)**	**Cash Market**
Category 1	Burkina	3,595	1,438	3,594,956
	Central African Republic	3,810	1,524	3,810,390
	Chad	12,710	5,084	12,710,433
	Guinea	7,949	3,180	7,949,170
	Guinea-Bissau	1,494	597	1,493,530
	Liberia	3,568	1,427	3,568,260
	Mali	11,262	4,505	11,261,957
	Niger	16,706	6,682	16,705,847
Category 2	Benin	1,853	185	2,779,741
	Gambia, The	310	31	464,266
	Sierra Leone	1,715	686	1,714,591
	Togo	1,175	117	1,762,210
Category 3	Cameroon	12,067	1,207	18,101,103
	Côte d'Ivoire	10,915	1,092	16,373,116
	Mauritania	3,235	324	4,853,213
Category 4	Cabo Verde	16	2	23,496
	Ghana	2,342	937	2,341,530
	Niger	29,697	2,970	44,545,577
	Senegal	2,146	215	3,219,570
	Total ROGEP Market	**126,566**	**32,202**	**157,272,955**

Productive Uses

18. **SME applications.** Several business types can be found in most West African villages. From the data collected from surveys conducted in off-grid villages in Sierra Leone, Liberia, Mali, Mauritania, Niger, and Guinea-Bissau, the most common businesses include retail shops, small restaurants and bars, barbershops, and tailors. In most of the villages, there was at least one shop serving cold drinks from a refrigerator powered by a diesel generator. Cold drinks are an important value add for retail shops in off-grid rural areas since cold drinks have higher demand than warm drinks leading to increased incomes for the shop owners. For small restaurants and bars, appliances such as DC televisions would replace petrol/diesel generator-powered conventional televisions. In Togo, BBOXX, an SHS supplier, plans to

install 300,000 SHS in Togo in the next four years.[90] The SHS can power a DC television. Such products would be ideal for small retail shops, bars, and restaurants.

19. **Solar water pumping.** The market assessment estimated that total cash market for solar water pumps in the region is US$169 million. The small water pump market (about 150 W) is the largest market because it is estimated that small farms of about 2 ha make up 90 percent of the irrigated farms in rural unelectrified areas. The largest potential markets for solar water pumps in the region are Nigeria, Sierra Leone, Chad, Guinea, Niger, and Mali. Apart from irrigation, solar water pumps could be used to increase agricultural income in these countries in other ways. For example, in Liberia, a solar water pump is used to provide water for a cashew processing plant in an electrified village

20. **Grain milling.** Cereal crops such as maize, sorghum, millet, and rice are grown in most West African countries. The off-grid villages visited in Mali, Mauritania, and Niger had maize or rice milling establishments that were powered by diesel generators. While the cost savings are clear, the upfront cost of the solar-powered mill is beyond the reach of many people in this region. Equipment financing with flexible payment terms aligned with the income obtained from such businesses would open up the market significantly.

21. **Small-scale commercial cooling.** Small solar-powered refrigerators and freezers in rural areas can serve multiple purposes. Refrigerators to store milk and fish extend the life of these items and reduce losses. In addition to storing produce, ice makers can increase the income of rural SMEs by providing ice to businesses that require cold storage such as bars and restaurants. This emerged as a key application in Côte d'Ivoire and Ghana. Additionally, another value-added solar application that could be explored in the region includes solar-powered water purification with the water distributed and sold to neighboring households.

22. **Mobile connectivity.** Cellular connectivity is important for solar PV markets for a number of reasons. First, the availability of cell phones drives demand for off-grid phone charging; in many African countries, cell phone charging provides a major productive use application for stand-alone solar systems. Mobile phone access—and more importantly connectivity—helps drive commerce and employment in rural areas. Finally, cellular phones and connectivity are a necessary precursor to mobile money and PAYGO solutions. Countries with expanding cell phone coverage and use are more attractive to PAYGO solar companies. As such, phone charging stations make up a critical demand element for solar systems. In at least half of the countries in the region, mobile penetration rates exceed the national electrification rates. In addition, the electrification rates in rural areas are significantly lower in most countries and the mobile penetration rates in those areas are probably not that drastically different from the national average. This indicates that a significant number of mobile phone users are off-grid creating a significant potential solar-powered phone charging market. The market assessment highlighted that the total cash

[90] http://www.bboxx.co.uk/bboxx-receives-invitation-meet-president-togo-roll-300000-solar-home-systems/.

value of the potential phone charging market is about US$9 million with a total capacity of about 35 MW. The top five markets are Nigeria, Burkina Faso, Chad, Mali, and Benin.

23. Another potential market related to mobile connectivity is powering telecommunications infrastructure installed in off-grid areas. Given the low electrification rates in most of the countries in the region, there is a significant number of telecom infrastructure that requires power such as off-grid base stations and relay antennas. Data on the number of base stations in each country are not readily available and therefore quantifying this market is difficult. However, in some of the countries where site visits to off-grid villages were conducted, there were examples of solar-powered telecommunication infrastructure.

ANNEX 13: CURRENT PRIVATE SECTOR PARTICIPATION OF STAND-ALONE SOLAR BUSINESSES IN WEST AFRICA - MARKET TRENDS AND FINANCING

REGION: Western Africa
Regional Off Grid Electrification Project

Context

1. Sub-Saharan Africa is in the early stages of a dramatic energy transition, and affordable stand-alone solar systems can represent a path toward energy independence. stand-alone solar lanterns, home systems, and component-based equipment for productive use are on the rise in Africa, and the PAYGO technology represents a real development lever with regard to access to electricity for millions of people living in remote areas.

2. A preliminary market assessment conducted by ECREEE has identified up to 500 companies operating in the stand-alone solar sector or companies that could be easily adapted to the stand-alone solar sector. These companies have been classified into three stages according to their stage of maturity, development, and financing needs.

3. Over the past three years, a transformation of the sector's ecosystem has been observed and several international companies with proven experience in stand-alone solar and PAYGO—notably from East Africa—have entered the West and Central African markets and launched operations with the clear objective to reach regional scale.

4. A limited number of indigenous companies are also expanding their activities sometimes through partnerships with international players to better respond to the needs of the millions of unelectrified households on this part of the continent. At least 11 companies, including leading East African players such as Greenlight Planet, D. Light, OGE, Fenix International, and BBOXX, have moved into the region.[91] With potential market worth billions of dollars, major European energy companies such as French utilities, EDF and Engie, and leading telecommunications operator such as Orange SA, have also started to make a few strategic investments in the sector. Table 13.1 highlights the profiles of a few companies.

[91] Reuters, Reporting by Joe Bavier, editing by David Clarke.

Table 13.1. Profiles of Few Companies Involved in the Project

BBOXX	Greenlight Planet and Benalya	ZECI (OGE and EDF)
A venture-backed company developing solutions to provide affordable, clean energy to off-grid communities in the developing world. Since 2010, BBOXX has sold 70,000 units in 35 countries, providing 350,000 people with electricity. In West Africa, BBOX now has partners in Burkina Faso, Côte d'Ivoire, Mauritania, Nigeria, Senegal, and Sierra Leone. In August 2017, BBOX also finalized a deal with the Government of Togo to provide 300,000 SHS to local communities.	Benalya, a stand-alone solar system company based in Niger signed a partnership with Greenlight Planet in late 2017 Benalya is now positioning itself as a pioneer in the integration and distribution of solar kits in Niger. Benalya's objective is to sell 20,000 SHS per year in Niger. The company already has a solid experience manufacturing and distributing stand-alone solar systems for productive use and installing stand-alone solar systems. Founded in 2009, Greenlight Planet has become a leading provider of solar energy products to over 27 million rural consumers in more than 60 countries.	OGE and EDF teamed up in Côte d'Ivoire to build up a sustainable and affordable off-grid business. A leading stand-alone solar company, OGE started its activities in Tanzania and Rwanda with the objective to provide clean and affordable energy to off-grid communities and create a greener future. With EUR 70 billion in annual revenue, EDF, a French utility company, is a global leader in low-carbon energy; the EDF Group covers every sector of expertise, from generation to trading and transmission grids.

Note: ZECI = Zola Electricity Côte d'Ivoire.

Providing Access to Energy through Stand-alone Solar Solutions: Early Developments in a High-potential Market

5. Acquisitions of off-grid start-ups by large international companies combined with large investments from international investors have been on the rise over the past three years. Table 13.2 highlights solar off-grid deals registered in West and Central Africa while the following few examples provide additional background regarding the nature of a handful of specific transactions.

- October 19, 2017**.** Engie SA agreed to buy U.S. energy technology start-up Fenix International to help fund the rollout of solar power systems for Africans without access to electricity grid. The French utility will provide capital and help raise debt to expand the electricity service into at least 10 African countries over the next five years. "In order to achieve our goals, we need hundreds of millions of dollars in equity and debt, and Engie is committed to provide what is needed," said Fenix CEO Lyndsay Handler.[92]

[92] Loni Prinsloo, Bloomberg.

- October 27, 2017. West African solar company PEG Africa has raised US$13.5 million in funding through a combination of debt and Series B equity financing, which will be used to accelerate growth in Ghana and Côte d'Ivoire to reach 500,000 people. This latest round enabled PEG's total funding to reach over US$21 million, with the Series B aspect led by Blue Haven Initiative with participation from EAV, *Investisseurs* and *Partenaires*, ENGIE *Rassembleurs d'Energies*, Acumen, and PCG Investments. PEG also worked with SunFunder on a large multi-currency syndicated loan, with participation from six lenders, including SunFunder, ResponsAbility, Oikocredit, Global Partnerships, and Palladium Impact Investments. The transaction was advised by Nixon Peabody LLP.[93]

- February 13, 2018: Easysolar**.** S: Acumen, a nonprofit global venture fund, and Gaiaï Impact Fund, a venture fund specializing in clean energy, announced their investment in Azimuth (trading as Easy Solar), a PAYGO distribution company operating in Sierra Leone. Easy Solar is the second investment under Acumen's Pioneer Energy Investment Initiative to bridge the funding gap in off-grid energy and accelerate access across the developing world. Launched in April 2017, the initiative aims to affect 8 million lives by 2026.[94]

- March 27, 2018**.** Orange aims to become a key player in energy transition in Africa and extends its services to five new countries. At the Africa CEO Forum, which was held in Abidjan (Côte d'Ivoire), on March 26–27, 2018 Orange confirmed its desire to become a key player in the energy transition sector in Africa, by providing services directly to the general public or as a wholesaler to public operators. Orange already provides rural populations access to solar energy in the Democratic Republic of the Congo and Madagascar. On March 27, 2018 Orange announced the launch of this service in Burkina Faso and further ahead in Senegal, Mali, Guinea, and Côte d'Ivoire. Orange's current partners include BBOX and Niwa.[95]

- June 18, 2018**.** AfDB will help ZECI raise US$28 million in local currency, a groundbreaking example of local currency financing structure. The project will pilot a local currency receivables-backed financing structure to allow ZECI—a 50/50 joint venture between OGE and EDF—to provide access to approximately 100,000 rural households with PAYGO SHS by 2020. This operation would be the first large-scale local currency financing structure using the securitization technique for the off-grid renewable energy sector in Africa.[96]

[93] Tom Jackson, Disrupt Africa.
[94] Gaia Impact Fund.
[95] Nathalie Chevrier, Orange Paris.
[96] Africa's Power Journal.

Table 13.2. Solar off-grid Deals Registered in West and Central Africa

Countries	Type of installation	Company	Deal Amount (US$, million)	Date	Type of Funds	Investors
Côte d'Ivoire	SHS	Zola EDR Côte d'Ivoire (ZECI)	28.0	June 18	Debt	SGBCI, CACIB, and AfDB
Côte d'Ivoire, Ghana, Rwanda, and Tanzania	SHS	Off-Grid Electric	55.0	January 18	Equity	Helios Investment Partners and General Electric's Venture Capital
Senegal	SHS	Oolu	3.2	October 17	Equity	Persistent Energy Capital (PEC) and Y Combinator (YC)
Nigeria	SHS	Lumos Global	90.0	November 16	Equity and debt	OPIC and Pembani Remgro Investment Fund
Nigeria, Burkina Faso, Senegal, Sierra Leone	SHS	Bboxx	35.0	August 16	Equity	—
Nigeria	SHS	D.light Energy	50.0	April 18	Equity and debt	EIB, responsAbility Investments, Social Investment Managers and Advisors (SIMA), and SunFunder
			22.5	September 16	Equity, debt, and grant	**Equity:** KawiSafi Ventures Fund, Energy Access Ventures, Omidyar Network and NewQuest Capital Partners **Debt:** SunFunder **Grant:** Shell Foundation, USAID, UNCDF
			10.5	February 17	Debt and grant	Norfund, while Beyond the Grid and Shell Foundation
Africa	Micro-grid	Powerhive	20.0	June 16	Equity	Prelude Ventures, Caterpillar Ventures, Total Energy Ventures, Tao Capital Partners, and Pi Investments
Cameroon	SHS	UpOwa	n.a.	August 17	Equity	Gaïa Impact Fund
Sierra Leone	SHS	Easy Solar	n.a	February 18	Equity	Gaïa Impact Fund and Acumen

Côte d'Ivoire and Ghana	SHS	PEG Africa	13.5	November 17	Debt and equity	**Debt:** SunFunder, ResponsAbility, Oikocredit, Global Partnerships, and Palladium Impact Investments **Equity:** Blue Haven Initiative avec la participation d'EAV, d'Investisseurs and Partenaires (via le fonds IPAE 1), d'ENGIE Rassembleurs d'Energies, d'Acumen and de PCG Investments
			1.5	January 17	Debt	ResponsAbility, SunFunder, and Oikocredit
			7.5	November 16	Debt and equity	I&P, ENGIE Rassembleurs d'Energie, Energy Access Ventures, and Blue Haven Initiative
Côte d'Ivoire and Nigeria	SHS	Fenix International	12.6	January 15	Equity	DF Suez, Schneider Electric, Orange France Telecom, clean tech entrepreneurs CTE, Tom Dinwoodie, and Warner Philips
			4.0	August 17	Debt and equity	MTN, Swedish Embassy, and USAID
Ghana and Nigeria	SHS	Azuri Technologies	20.0	January 18	Debt	—
Nigeria	SHS	SunKing (Greenlight Planet)	60.0	December 17	Debt and equity	Apis Partners
			10.0	February 15	Debt and equity	Fidelity Growth Partners India, Deutsche Bank, and investment firm Global Partnerships

Note: CACIB = Crédit Agricole Corporate and Investment Bank; SGBCI = Société générale de banques en Côte d'Ivoire; UNCDF = United Nations Capital Development Fund.

6. However, these investments remain insufficient to bring the market at scale specifically in a context where the off-grid population is expected to keep growing. International companies' acquisitions and international investments could only cover a fraction of the unelectrified market size.

7. Several Stage 3 companies and most small players—companies identified as Stage 1 and Stage 2 under ECREEE's market assessment—remain on the margin of the existing financing opportunities and are considered too risky and not structured enough to benefit from CFIs or international investors. In addition, companies often operate in a cumbersome business environment in countries where off-grid energy policies are undefined and where the level playing environment required to build a sustainable market is still lacking. Fostering regional collaboration, creating a favorable enabling environment to promote a sustainable off-grid industry in the region, and unleashing financial opportunities for more players are needed to bridge the energy access gap in West and Central Africa.

SHS Companies' Challenges and Prospects for Scaling Up: A Zoom on the Financing Gap

8. While displaying a variety of business models and despite their very diversified experience, access to finance remains a shared preoccupation for companies operating in the SHS sector and is often considered as deadlocked in the SHS ecosystem. A sample survey led by ECREEE in April 2018 to which nearly 30 Stage 3 companies responded, reported that of the 61 percent respondents who received external financial support, only 44 percent could access loans from commercial banks. Undeniably, the lack of track record with this new technology, the fact that the target client is from low-income classes, and the fact that they are distributed in remote areas make financial institutions excessively cautious.[97] Therefore, CFIs often require a proof of technical and financial performance before investing or lending.

9. In addition, players in this market have easier access to financing in strong currencies, while customer payments are made in local currencies; this further restrains the offer that financial institutions, such as commercial banks, are willing to offer. A few actors in the market have nonetheless been able to mobilize some funding relying on venture capital, impact investors looking to generate social benefits as well as profits, and development institutions—funding that generally takes the form of grants or subsidies. However, these contributions are generally modest and do not really enable businesses to scale up while expansion requires significant capital due to the need to provide consumer financing for the relatively expensive kits. To make financing accessible in this sector and bridge the existing financing gap, some actions must be undertaken to introduce compatible financial instruments adapted for off-grid projects and willing to enhance the credit quality and bankability of projects. Companies interviewed under ECREEE's survey have highlighted the need for debt and a mixture of other instruments to support their growth and expansion. In terms of debt, companies interviewed have expressed needs raging from US$0.6 million to US$200 million.

The Need for a Favorable Ecosystem for More Players to Emerge and Grow at Scale

10. Although encouraging, the few deals finalized between major companies and SHS start-ups remain marginal, considering the market size and needs to be filled. Preparing the market to grow at scale requires implementing specific conditions without which the off-grid value proposition would not hold. These prerequisites include (a) the definition of clear off-grid energy access policies at the country level; (b) the development and adoption of regional standards and a QA framework for stand-alone solar systems; (c) the removal of trade barriers; (d) the adoption of a tax regime enhancing product affordability; (e) an enhanced penetration of mobile money; and (f) the support of a regional entrepreneurship ecosystem to catalyze a sustainable growth of the off-grid industry.

[97] Finergreen, Insights April 2017.

11. In addition, on the demand side, awareness campaigns would be needed to educate end users on the benefits of off-grid products—the products' unique economic advantages, health benefits, and living standards' improvement.

12. On the supply side, some investments are also required to educate CFIs and other FIs on this relatively new sector. Some capacity would also need to be built for FIs to understand the technology and to partner with other investors such as development partners to develop suitable financial products.

13. A regional collaboration throughout which Governments, regional organizations, and private sector actors would work jointly on defining such a regulatory framework, suitable off-grid policies, and an entrepreneurship ecosystem is essential to accelerate and catalyze the SHS sector.

Lessons Learned from Two East African Countries with Extensive Experience with SHS

14. Kenya and Tanzania count among the East African countries where the SHS penetration rate is the highest. Important takeaways from Lighting Africa experience in East Africa should be considered to help structure a sustainable SHS market in West Africa. Some of the major learnings from Kenya and Tanzania are as follows.

- **A high level of government commitment and engagement.** Both the Governments of Kenya and Tanzania have identified rural electrification as a main priority for their countries in several years. Both the Governments act as main investors in their REA (around 85 percent of the financing received by REA Kenya and Tanzania is coming directly from their respective Governments). The main takeaways of study tours organized by the Lighting Africa Program emphasized the central role of a government in the transformation and development of rural electrification.
- **A clearly defined ecosystem.** The roles and responsibilities of the different actors operating in the sector are not only clearly defined but a great coordination among different parties is orchestrated leading to a successful implementation of planned activities. The study tour also showed that an ecosystem of actors including government agencies, bureau of standards, civil society (professional association, consumer associations, well-trained technicians, and so on), and active private sector actors is essential to the development of the market. Indeed, discussions with government officials and operators confirmed that a strong engagement of Governments has to be combined with an active presence of private sectors in the field, all of them being key actors for the development of a sustainable off-grid market.
- **Policy environment and sector organization.** It is worthwhile emphasizing on the dispositions that have helped accelerate the stand-alone solar sector. Regarding the tax regime, zero duties and VAT are applied on solar panels and batteries. These exemptions do not apply to accessories though (TV, radio, and so on). Concerning the quality of stand-alone solar systems available in Kenya—more particularly SHS—the country has adopted the IEC quality standards since 2010 which have favored the presence of high-quality products at the country level. The Kenyan Bureau

of Standards has a list of labs that they can refer companies to for the latest ones to test their products at the point of origin and to get a Certificate of Conformity. Lastly, there are the sector organization and the active role of organizations such as Kenyan Energy Renewable Association. This is an independent nonprofit association dedicated to facilitating the growth and development of renewable energy business in Kenya. Among its key roles are promoting the interests of members of the renewable energy industry among the Government, public sector, the general public, and any other organizations that may affect the development of the industry and the creation of a forum for the dissemination and exchange of information and ideas on matters relating to renewable energy development and utilization in Kenya. They have been particularly successful at lobbying the Government on good tax incentives to promote the solar industry.

ANNEX 14: TASK TEAM COMPOSITION

REGION: Western Africa
Regional Off Grid Electrification Project

Name	Role	Specialization	Unit
Raihan Elahi	Team Leader(ADM Responsible)	Lead Energy Specialist	GEE01
Adebayo Adeniyi	Procurement Specialist(ADM Responsible)	Senior Procurement Specialist	GGOPA
Bayo Awosemusi	Procurement Specialist	Lead Procurement Specialist	GGOPA
Rahmoune Essalhi	Procurement Specialist	Procurement Analyst	GGOPA
Aissatou Diallo	Financial Management Specialist	Senior FM Specialist	WFACS
Angelo Donou	Team Member	Financial Management Specialist	GGOAW
Fatou Mbacke Dieng	Team Member	Financial Management Specialist	GGOAW
Alexandra C. Bezeredi	Social Specialist (ADM Responsible	Lead Social Development Specialist	GSU01
Ekaterina Grigoryeva	Environmental Specialist (ADM Responsible)	Environmental Specialist	GENA1
Abir Burgul	Team Member	Senior Underwriter	MIGOP
Adel Meer	Peer Reviewer	Principal Investment Officer	CFGSM
Aidan Coville	Team Member	Senior Economist, Evaluation	DECIE
Alexandra C. Sperling	Team Member	Legal Analyst	LEGAM
Arndt Rudiger Reichert	Team Member	Economist	DECIEI
Chandrasekar Govindarajalu	Peer Reviewer	Lead Energy Specialist	GEEES
Christopher James Arderne	Team Member	Consultant	GEEES
Claudia M. Pardinas Ocana	Team Member	Senior Counsel	LEGAM
Dana Rysankova	Peer Reviewer	Senior Energy Specialist	GEEDR

Deea Ariana	Team Member	Consultant	GEE01
Ezgi Canpolat	Team Member	Consultant	GSU03
Faly Diallo	Team Member	Finance Officer	WFACS
Federica Ricaldi	Team Member	Economist	GPSJB
Jean-Louis Charles Racine	Peer Reviewer	Senior Private Sector Specialist	GFCCFE
Jennifer Samantha Lynch	Team Member	Consultant	GEE01
Juliana Chinyeaka Victor	Team Member	Senior Operations Officer	GEE08
Kirtan Chandra Sahoo	Team Member	Senior Carbon Finance Specialist	GCCFM
Lindsay Caldwell Umalla	Team Member	Consultant	GEE01
Marie Claudine Fundi	Team Member	Senior Program Assistant	GEE07
Melissa Olga Basque	Team Member	Consultant	GEE01
Michael Ehst	Team Member	Senior Private Sector Specialist	GFCFE
Nadia Taobane	Team Member	Senior Energy Specialist	GEEES
Natalie Tchoumba Bitnga	Team Member	Program Assistant	GEE07
Prajakta Ajit Chitre	Team Member	Infrastructure Finance Specialist	GIPFS
Rahul Srinivassan	Team Member	Consultant	GEE04
Richard A Claudet	Team Member	Senior Financial Sector Specialist	GFCAW
William C. Haworth	Peer Reviewer	Financial Sector Specialist	CGRDR

ANNEX 15: PROJECT MAP