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The World Bank

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Report No: PAD2292

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

STRATEGIC CLIMATE FUND-SCALING-UP RENEWABLE ENERGY PROGRAM LOAN

IN THE AMOUNT OF US$27.50 MILLION

AND A

STRATEGIC CLIMATE FUND-SCALING-UP RENEWABLE ENERGY PROGRAM GRANT

IN THE AMOUNT OF US$21.44 MILLION

TO THE

REPUBLIC OF RWANDA

FOR THE

RWANDA RENEWABLE ENERGY FUND PROJECT

May 30, 2017

ENERGY AND EXTRACTIVES GLOBAL PRACTICE
AFRICA REGION

CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2017)

Currency Unit = Rwanda Franc (RWF)

826 RWF = US$1

FISCAL YEAR
July 1 - June 30

ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank	MININFRA	Ministry of Infrastructure
AFR	Access to Finance Rwanda	MTF	Multi-Tier Framework
AFREA	Africa Renewable Energy and Access Program	Ni-Cad	Nickel-Cadmium
AMIR	Association of Microfinance Institutions in Rwanda	NiMH	Nickel Metal Hydride
BNR	National Bank of Rwanda	NPF	New Procurement Framework
BRD	Development Bank of Rwanda	NPL	Non-performing Loan
BTC	Belgian Technical Cooperation	NPV	Net Present Value
CPS	Country Partnership Strategy	OM	Operations Manual
EARP	Electricity Access Rollout Program	OSC	Off-grid Solar Company
ECOP	Environmental Code of Practice	Pb-A	Lead-acid
E4I	Energy for Impact	Pb-gel	Lead-gel
EDCL	Energy Development Corporation Limited	PFI	Participating Financial Institution
EDPRS	Economic Development and Poverty Reduction Strategy	PIU	Project Implementation Unit
EnDev	Energizing Development	PPP	Public-Private Partnership
EEP	Energy and Environment Partnership	PPSD	Project Procurement Strategy for Development
EIRR	Economic Internal Rate of Return	PV	Photovoltaic
ESIA	Environmental and Social Impact Assessment	RAP	Resettlement Action Plan
ESMAP	Energy Sector Management Assistance Program	RBF	Results-based Financing
ESMF	Environmental and Social Management Framework	RCA	Rwanda Cooperative Agency
ESMP	Environmental and Social Management Plan	REF	Renewable Energy Fund
ESSP	Energy Sector Strategic Plan	REG	Rwanda Energy Group
EUCL	Energy Utility Corporation Limited	REMA	Rwanda Environmental Management Authority
FIL	Financial Intermediary Loan	REP	Rwanda Energy Policy
FM	Financial Management	RES	Rural Electrification Strategy
GDP	Gross Domestic Product	RICEM	Rwanda Institute of Cooperatives, Entrepreneurship and Microfinance
GHG	Greenhouse Gas	RPF	Resettlement Policy Framework
GIZ	German Agency for Technical Cooperation	RURA	Rwanda Utilities Regulatory Authority
GoR	Government of Rwanda	SACCO	Savings and Credit Cooperative

GRS	Grievance Redress Service	SE4ALL	Sustainable Energy for All
IEC	International Electrotechnical Commission	SEFA	Sustainable Energy for Africa
IFR	Interim Financial Report	SIDA	Swedish International Development Agency
IP	Investment Plan	SME	Small and Medium Enterprise
ISP	Implementation Support Plan	SOGER	Scaling-up Off-grid Energy in Rwanda
MINECOFIN	Ministry of Finance and Economic Planning	SREP	Scaling-up Renewable Energy Program
Li-ion	Lithium-ion	WB	World Bank

Regional Vice President: Makhtar Diop
Country Director: Diarietou Gaye
Senior Global Practice Director: Riccardo Puliti
Practice Manager: Sudeshna Ghosh Banerjee
Task Team Leader(s): Yadviga Viktorivna Semikolenova

BASIC INFORMATION

Is this a regionally tagged project?	Country(ies)	Financing Instrument
No		Investment Project Financing

[ ] Situations of Urgent Need of Assistance or Capacity Constraints

[✔] Financial Intermediaries

[ ] Series of Projects

Approval Date	Closing Date	Environmental Assessment Category
20-Jun-2017	30-Sep-2023	F - Financial Intermediary Assessment

Bank/IFC Collaboration
No

Proposed Development Objective(s)

The Project Development Objective is to increase electricity access in Rwanda through off-grid technologies and facilitate private-sector participation in renewable off-grid electrification.

Components

Component Name	Cost (US$, millions)
Line of Credit and Direct Financing for Off-grid Electrification	45.94
Technical Assistance, Capacity Building, and Project Implementation Support	3.00

Organizations

Borrower :	Government of Rwanda
Implementing Agency :	Development Bank of Rwanda (BRD)

PROJECT FINANCING DATA (IN USD MILLION)

[ ] Counterpart Funding	[✔] Trust Funds	[ ] Parallel Financing

Total Project Cost:	Total Financing:	Financing Gap:
48.94	48.94	0.00
	Of Which Bank Financing (IBRD/IDA):	
	0.00	

Financing (in US$, millions)

Financing Source	Amount
Strategic Climate Fund Credit	27.50
Strategic Climate Fund Grant	21.44
Total	**48.94**

Expected Disbursements (in US$, millions)

Fiscal Year	2017	2018	2019	2020	2021	2022	2023	2024
Annual	0.00	3.00	7.90	10.90	9.90	8.90	7.34	1.00
Cumulative	0.00	3.00	10.90	21.80	31.70	40.60	47.94	48.94

INSTITUTIONAL DATA

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Finance & Markets

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

COMPLIANCE

Policy

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

[ ] Yes [✔] No

Does the project require any waivers of Bank policies?

[ ] Yes [✔] No

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

Legal Covenants

Sections and Description

The Project Implementing Entity shall appoint, not later than October 1, 2017, and thereafter maintain throughout the implementation of the Project, a Project Manager with qualifications, experience and terms of reference satisfactory to the World Bank with the responsibility for overall management and coordination of the implementation of the Project. (Project Agreement Schedule, Section I.A.1)

Sections and Description

The Project Implementing Entity shall establish, not later than October 1, 2017, and thereafter maintain throughout the implementation of the Project, a Project Implementation Unit (PIU) with adequate staffing and resources, and under terms of reference satisfactory to the World Bank, which shall include, inter alia, responsibilities for the day-to-day operations of the Project. (Project Agreement Schedule, Section I.A.2)

Sections and Description

The Borrower shall establish, not later than October 1, 2017, and thereafter maintain throughout Project implementation, with terms of reference satisfactory to the World Bank and with adequate resources to carry out its responsibilities under the Project, a Project steering committee (the “Project Steering Committee”), composed of, inter alia, representatives of MININFRA/REG, MINECOFIN and the Development Bank of Rwanda, with the

World Bank as an observer, all for the duration of the Project. (Loan Agreement, Section I.A.1; and Grant Agreement Section I.A.1)

Conditions

Type	Description
Effectiveness	The Subsidiary Financing Agreement referred to in Section I.B of Schedule 2 to this Agreement has been executed on behalf of the Borrower/Recipient and the Project Implementing Entity. (Article V, 5.01(a) of the Loan Agreement and Article V, 5.01(b) of the Grant Agreement)
Effectiveness	The Strategic Climate Fund – Scaling-Up Renewable Energy Program Grant Agreement dated the same date as this Agreement, between the Recipient and the World Bank, providing a grant in support of the Project ("SCF-SREP Grant Agreement"), has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Recipient to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled. (Article V, 5.01(b) of the Loan Agreement)
Effectiveness	The Project Implementing Entity has appointed the Project Manager in accordance with the provisions of Section I.A.2 of the Schedule to the Project Agreement. (Article V, 5.01(c) of the Loan Agreement and Article V, 5.01(d) of the Grant Agreement)
Effectiveness	The Borrower/Recipient has established the Project Steering Committee, in accordance with the provisions of Section I.A.1 of Schedule 2 to this Agreement. (Article V, 5.01(d) of the Loan Agreement and Article V, 5.01(e) of the Grant Agreement)
Effectiveness	The Project Implementing Entity has adopted the Operations Manual in accordance with the provisions of Section I.B.1 of the Schedule to the Project Agreement. (Article V, 5.01(e) of the Loan Agreement and Article V, 5.01(f) of the Grant Agreement)
Effectiveness	A legal opinion has been furnished satisfactory to the World Bank, by counsel acceptable to the World Bank, on the application of the newly approved PPP Law in areas relevant to the Project. (Article V, 5.01(f) of the Loan Agreement and Article V, 5.01(g) of the Grant Agreement)

Type	Description
Effectiveness	The Additional Legal Matter consists of the following: namely, that the Subsidiary Financing Agreement has been duly authorized or ratified by the Borrower and the Project Implementing Entity and is legally binding upon the Borrower and the Project Implementing Entity in accordance with its terms. (Article V, 5.02 of the Loan Agreement)
Type	Description
Effectiveness	The execution and delivery of this Agreement on behalf of the Recipient and the Project Agreement on behalf of the Project Implementing Entity have been duly authorized or ratified by all necessary governmental and corporate action. (Article V, 5.01(a) of the Grant Agreement)
Type	Description
Effectiveness	The Strategic Climate Fund – Scaling-Up Renewable Energy Program Loan Agreement dated the same date as this Agreement, between the Recipient and the Association, providing a loan in support of the Project ("SCF-SREP Loan Agreement"), has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Recipient to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled. (Article V, 5.01(c) of the Grant Agreement)
Type	Description
Effectiveness	There shall be furnished to the World Bank an opinion or opinions satisfactory to the World Bank of counsel acceptable to the World Bank or, if the World Bank so requests, a certificate satisfactory to the World Bank of a competent official of the Member Country, showing, on behalf of the Recipient, that the Grant Agreement has been duly authorized or ratified by, and executed and delivered on its behalf and is legally binding upon it in accordance with its terms. (Article V, 5.02(a) of the Grant Agreement)
Type	Description
Effectiveness	There shall be furnished to the World Bank an opinion or opinions satisfactory to the World Bank of counsel acceptable to the World Bank or, if the World Bank so requests, a certificate satisfactory to the World Bank of a competent official of the Member Country, showing, on behalf of the Project Implementing Entity, that the Project Agreement has been duly authorized or ratified by, and executed and delivered on its behalf and is legally binding upon it in accordance with its terms. (Article V, 5.02(b) of the Grant Agreement)
Type	Description
Effectiveness	There shall be furnished to the World Bank an opinion or opinions satisfactory to the World Bank of counsel acceptable to the World Bank or, if the World Bank so

	requests, a certificate satisfactory to the World Bank of a competent official of the Member Country, showing that the Subsidiary Financing Agreement referred to in Section I.B of Schedule 2 to the Grant Agreement has been duly authorized or ratified by the Recipient and the Project Implementing Entity and is legally binding upon each such party in accordance with its terms. (Article V, 5.02(C) of the Grant Agreement)

PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
Yadviga Viktorivna Semikolenova	Team Leader(ADM Responsible)	Energy Economist	GEE01
Mulugeta Dinka	Procurement Specialist(ADM Responsible)	Procurement	GGO01
Enagnon Ernest Eric Adda	Financial Management Specialist	Financial Mamagement	GGO31
Brice Gakombe	Team Member	Financial Sector Specialist	GFM07
Edward Felix Dwumfour	Safeguards Specialist	Environmantal Safguards	GEN01
Federico Querio	Team Member	Energy Specialist	GEE01
Gibwa A. Kajubi	Safeguards Specialist	Social Safeguards	GSU07
Gunhild Berg	Team Member	Financial Sector Specialist	GFM07
Inka Ivette Schomer	Team Member	Gender Specialist	GCGDR
Kabir Malik	Team Member	Economist	GEE01
Marie Louise Felicite Soue	Team Member	Team Assistant	GEE07
Norah Kipwola	Team Member	Energy Specialist	GEE01
Regina Oritshetemeyin Nesiama	Team Member	Operations Analyst	GCCCI
Sylvie Ingabire	Team Member	Team Assistant	AFMRW

Extended Team

Name	Title	Organization	Location
Anil Cabraal	Renewable Energy Consultant		
Ian Muir	Off-grid Solar Specialist		

Kevin Kennedy	Renewable Energy Specialist	Independent consultant	Spain
Richard Mulama	Financial Sector Specialist		
Sonja Brajovic-Bratanovic	Bank Due Diligence Consultant		
Theogene Habakubaho	Safeguards Specialist		
Tito Kodiaga	Social Developement (Consultant)		Nairobi,India

RWANDA
RWANDA RENEWABLE ENERGY FUND PROJECT

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I. STRATEGIC CONTEXT

A. Country Context

1. **Rwanda is a small landlocked country in East Africa, bordered by Burundi, the Democratic Republic of Congo, Tanzania, and Uganda.** Rwanda's population is 11.6 million, of which 52 percent are women. Rwanda has one of the highest population densities in Africa, with an estimated 460 people per square kilometer. Rwanda has maintained political stability since the genocide and civil war of 1994. Agriculture, mostly subsistence farming, accounts for 30 percent of Rwanda's gross domestic product (GDP) and employs around 70 percent of the labor force.

2. **Rwanda has one of the fastest growing economies in Africa, with GDP growth averaging 7.6 percent over 2000–2015, driving substantial reductions in poverty and inequality.** Poverty decreased from 59 percent in 2001 to 45 percent in 2011, while extreme poverty fell from 40 percent to 24 percent in the same period. The 2013/14 household survey showed a further reduction in poverty to 39 percent and in extreme poverty to 16 percent, although, due to methodological changes, these numbers are not directly comparable with the previous surveys.[1] Sustained growth in household agricultural production has been a key driver of poverty reduction. Despite these achievements, Rwanda remains one of the poorest countries in the world, with high levels of vulnerability, notably among children and people living in rural areas. More than 90 percent of the poor live in rural areas, while poverty remains high among households with many children.[2] In addition, although the Government of Rwanda (GoR) has shown strong political will and target-driven gender policies, female-headed households are on average more likely to be poorer than male-headed ones even though the percentage of poor female-headed households has decreased from 66 percent in 2000/01 to 47 percent in 2010/11.[3] Gender gaps still persist in women's representation in local governance systems, public sector higher education, access to finance, entrepreneurship, and employment in nonfarm work.[4]

3. **Despite a recent slowdown in growth, Rwanda's economic outlook for the medium term remains strong.** As a result of deterioration of the external environment and lower prices for Rwandese exports, growth slowed down in 2016. To mitigate the impact of the slowdown, Rwanda is implementing a fiscal consolidation program supported by greater exchange rate flexibility. The program is complemented by structural policies to promote sustainable growth, with a special focus on export diversification and import substitution.

4. **Rwanda's long-term development vision is captured in Vision 2020, which seeks to transform the country from a low-income, agriculture-based economy to a knowledge-based and service-oriented, middle-income economy.** Vision 2020, adopted in 2000 and revised in 2011, has as its main

[1] Economic Development and Poverty Reduction Strategy 2013–2018; Fourth Integrated Household Living Conditions Survey (EICV4) (http://www.statistics.gov.rw/publications/rwanda-poverty-profile-report-results-eicv-4).
[2] Economic Development and Poverty Reduction Strategy 2013–2018; Fourth Integrated Household Living Conditions Survey (EICV4); Demographic and Health Survey of 2015 using the stunting rate as the rate of malnutrition.
[3] National Institute of Statistics of Rwanda. *The Evolution of Poverty in Rwanda from 2000 to 2011: Results from the household surveys*, http://eeas.europa.eu/archives/delegations/rwanda/documents/press_corner/news/poverty_report_en.pdf.
[4] http://www.rw.one.un.org/mdg/mdg3.

objective to place Rwanda on a higher growth trajectory to ensure that the country achieves middle-income status by 2020. The five-year Economic Development and Poverty Reduction Strategies (EDPRSs) operationalize this development vision. The ambitious second EDPRS, covering 2013–2018, is shaping policies and aims to achieve double-digit annual average economic growth and reduce poverty to less than 30 percent. The strategy envisages a primary role for the private sector to serve as the engine of growth and poverty reduction.

5. **Rwanda identifies energy as an essential condition for sustainable growth and development.** The GoR recognizes the importance of providing 'appropriate, reliable, and affordable energy supplies for all Rwandese' if the country is to achieve middle-income status by 2020. In view of this, half of the thematic areas identified to achieve the goals of the second EDPRS—economic transformation and rural development—are intended to address the primary constraints to scaling up investment flows, including access, reliability, and cost of energy.

B. Sectoral and Institutional Context

6. **While there has been significant progress in recent years, Rwanda's electricity sector faces several challenges.** Low access to electricity and high electricity cost, exacerbated by limited generation capacity, low efficiency of electricity supply, low household demand, and affordability constraints are primary obstacles to attracting and further scaling-up investment flows to the country. Consumer affordability and access to finance are particularly hindering the expansion of off-grid electricity services.

7. **The total share of population with access to electricity has risen from about 6 percent (about 110,000 households) in early 2009 to 24 percent[5] (about 600,000 households) by mid-2016.** This is an incredible achievement. However, the electrification rate primarily reflects grid-connected users in urban areas and remains largely concentrated in the top quintile, with almost negligible coverage in the bottom 40 percent of the population. For example, grid access within the districts of Kigali extends to 65–75 percent of the population in those areas, whereas the districts outside Kigali are characterized by lower access rates, with 10 districts (out of 30, all of which are connected) having connectivity rates of 6–15 percent of the population in those areas. Off-grid access to electricity remains low throughout the country, particularly in rural areas. According to the 2012 census, 0.48 percent of households had access to off-grid solar services and 0.17 percent to 'hydroelectric or other private sources'. In 2016, off-grid access was estimated at 2.6 percent.[6]

8. **Rwanda is particularly affected by high electricity costs.** Cost of service delivery in 2016 was about US$0.30 per kWh, much higher than the Sub-Saharan Africa weighted average of US$0.14 per kWh.[7] Electricity tariffs, US$0.21 per kWh on average, are not cost reflective and are high compared to

[5] Current electricity access calculations assume there are approximately 2.4 million households in the country. This figure can be traced to the most recent census from 2012 and, in fact, reflects the actual number of households in that year. The National Institute of Statistics Rwanda, however, projects that there are over 2.8 million households as of 2016, thus suggesting a grid electrification rate closer to 21 percent.

[6] Estimated Tier 1 access per Multi-Tier Framework (MTF) as suggested by recent evidence from solar companies' sales. Tier 1 access includes basic applications such as task lighting, radio, and phone charging.

[7] Chris Trimble, Masami Kojima, Ines Perez Arroyo, and Farah Mohammadzadeh. 2016. 'Financial Viability of Electricity Sectors in Sub-Saharan Africa. Quasi-Fiscal Deficits and Hidden Costs.' World Bank Policy Research Working Paper.

other countries in the region (for example, Kenya and Uganda US$0.15 and US$0.17 per kWh, respectively). Additionally, the average grid connection is heavily subsidized; out of the close to US$560 connection cost per household, consumers pay only an approximate US$75 connection fee over a two-year period.

9. **Limited domestic generation resources and low efficiency of power supply are among factors that drive up electricity costs.** The country's installed capacity by April-2017 was 213 MW (with available capacity of 190 MW and peak demand of about 170 MW), of which 45 percent is hydro, 14 percent is methane gas to power, 27 percent is thermal (heavy and light fuel oil) power generation, 7 percent is peat to power, 4 percent is solar, and 3 percent is imports. Most thermal generation is based on imported oil products transported to the country by trucks, with about half produced using expensive diesel. While hydropower supply is strongly affected by variations in hydrology, lack of adequate grid interconnection capacity leaves Rwanda with limited possibility of sourcing electricity from its neighbors, creating a fragile condition with regard to security of energy supply. The Rwanda electricity sector also has high system losses of 22 percent, of which 14 percent are technical losses (arising from prevalence of old and dilapidated networks) and 8 percent are commercial losses (caused by pilferage, defective meters, errors in meter reading, accounting and billing deficiencies).

10. **Low household affordability and, hence, low demand for electricity further hamper Rwanda's energy sector growth.** About 46 percent of Rwandese households are considered poor.[8] Their energy spending is quite low. Yet, households are dominant electricity consumers; they use 51 percent of all energy sold and use it primarily for lighting. As a result, almost half of the utility's consumers currently use less than 20 kWh per month (against a minimum of 130 kWh per month to make the connection financially viable to them[9]); thus, a large proportion of the population cannot afford connection fees. The GoR has recently completed a survey under the Sustainable Energy for All (SE4All) Multi-Tier Framework (MTF) initiative to better understand energy consumption patterns and affordability.[10]

11. **Rwanda's electricity sector has undergone several reforms since the genocide in 1994 aimed at achieving long-term sustainability, financial credibility, and increased private sector engagement.**

[8] In Rwanda, all households are categorized into four 'Ubudehe' categories. Ubudehe category 1 (16 percent of Rwandese households) are the poorest/most vulnerable households and Ubudehe category 2 (30 percent of households) are poor. About 16 percent of Ubudehe category 1 is considered extreme poor.

[9] Energy Sector Strategic Plan, 2015.

[10] The SE4All MTF initiative launched by the Secretary-General of the United Nations in 2011 aims to achieve universal access to modern energy services by 2030. The MTF was developed to monitor and evaluate energy access under SE4All by following a multidimensional approach (see: https://www.esmap.org/node/55526). The MTF approach goes beyond binary measurement of energy access as 'having or not having an electricity connection' or 'relying or not relying on solid fuels for cooking'. It takes into account a multidimensional view of the energy sector by considering various service levels and attributes such as availability, quality, reliability, health/safety, convenience, and affordability, and it addresses multiple technology options (for example, grid and off-grid electricity). The MTF measures access in the Tiered spectrum, from Tier 0 (no access) to Tier 5 (the highest level of access). Under the MTF, Tier 1 (minimum 12 Wh per day) and Tier 2 (minimum 200 Wh per day) are defined as providing access up to four hours per day and at least one hour at night and can be used for basic applications such as task lighting, radio, and phone charging (http://trackingenergy4all.worldbank.org). Tier 3 has a minimum of one kWh per day and up to eight hours per day and at least three hours at night. Tier 4 has a minimum of 3.4 kWh per day and up to 16 hours per day and at least four hours at night. Tier 5 consists of safe, reliable, unlimited 24-hour service from a grid system. See BEYOND CONNECTIONS: Energy Access Redefined, Energy Sector Management Assistance Program, 2015.

The institutional structure of the electricity sector involves three key institutions: (a) the Ministry of Infrastructure (MININFRA), which sets the policy and strategy for the sector; (b) the Rwanda Utilities Regulatory Authority (RURA), which regulates the sector, approves electricity tariffs, and so on; and (c) the Rwanda Energy Group (REG) with its two subsidiaries—the Energy Development Corporation Limited (EDCL) and the Energy Utility Corporation Limited (EUCL), which are responsible for new energy development activities and electricity utility operations. The Rwanda Energy Policy (REP) sets out the overall vision and policy framework, while the Energy Sector Strategic Plan (ESSP) translates the policy directives and principles into concrete measures necessary to reach medium-term targets.

12. **The GoR has an ambitious target to increase electricity access to 70 percent by mid-2018.**[11] The second EDPRS aims for the country to achieve 70 percent access to electricity by 2018 and 100 percent access by 2020. These targets are to be achieved through a combination of on-grid and off-grid connectivity; the second EDPRS sets 48 percent of the 2018 target to be achieved through grid extension and the remaining 22 percent through off-grid solutions. Given available funding, grid access is expected to reach 32 percent (763,000 households) by 2018 and 37 percent (870,000 households) by 2020. Moreover, the high cost of reaching rural households through the grid because of difficult terrain, together with low residential electricity demand and poor affordability, affects financial sustainability of grid extension investments in rural areas. Finally, the EDPRS is also focused on sector strategies that enable women and men to participate, access, control, and benefit equally from growth processes in a way that recognizes their different needs with regard to access to finance, exposure to gender-based violence, and control of assets.

13. **In May 2016, the GoR approved a Rural Electrification Strategy (RES) that integrates on-grid and off-grid solutions and promotes private sector investment in areas where extending the grid is not financially viable in the short term.** The RES reframes the 2018 access target with regard to the Tier level of access as defined by the SE4All MTF: the 70 percent target was defined to include 31–35 percent on-grid access; 13–17 percent off-grid access through systems providing at least Tier 2 access level; and the remaining 22 percent off-grid access through systems providing Tier 1 and above access level. To effectively monitor implementation of the RES, Rwanda is among the first set of countries to conduct the energy access baseline survey using the new methodology under the MTF. The MTF baseline survey results are expected to be available before the end of June 2017.

14. **The RES outlines four programs that will boost rural electrification in Rwanda by 2018.** Under Program 1, the GoR plans to establish a mechanism to allow low-income households to access modern energy services through a basic solar system. Under Program 2, the GoR will establish a risk mitigation facility targeting the private sector such that solar products will be made available on financial terms that the population can afford. Program 3 will facilitate the development of mini-grids by the private sector, with the GoR playing a key role in identifying sites and establishing a framework through which these can become financially viable investments. Under Program 4, the GoR will continue to roll out the electricity network through its Electricity Access Rollout Program (EARP), focusing on connecting high-

[11] The ESSP also targets that 100 percent of schools and hospitals will have access to electricity by 2018. Given the projected rate of population growth and decreases in average household size estimated by the National Institute of Statistics Rwanda, the number of households is expected to increase by over 100,000 annually over the short to medium term. This, in effect, makes the 70 percent electrification goal a 'moving target'.

consumption users and driving economic growth. The RES expects, through its programs, to channel approximately US$120 million of investment by 2018.

15. **Achieving the RES targets will require an aggressive expansion of the off-grid market**. The RES expects to connect 35–38 percent of the population, or almost one million households[12] using off-grid systems of different Tier levels of energy access by mid-2018. Over the last five years, the off-grid industry has grown substantially in Rwanda, though the market remains at early stages underlined by the limited market penetration of off-grid systems. Over 200,000 Rwandese households have access to solar products, mostly through small solar systems such as solar lanterns. At this time, the off-grid market offers solar products and systems ranging from solar task lamps and solar lanterns (up to Tier 1) to larger solar home systems (Tier 1 and above) and is preparing for considerable expansion. The solar mini-grid space is made up of about 80 solar photovoltaic (PV) micro-grids, with each system of 1 kW solar PV with batteries providing basic lighting and other services to clusters of up to 50 households per micro-grid. Moreover, the Hydropower Atlas, completed in 2007, identified 333 sites with capacities between 50 kW and 5 MW and 192 sites with capacities below 50 kW. There is a variety of productive loads in Rwanda, many of which are more than 5–10 km from the grid, which could be the basis for an anchor load for a mini-grid scheme. Although there is a plan to eventually connect such mini-grids to the central grid, the rate of grid rollout is dependent on available financing, and the timing of these connections is, therefore, uncertain.

16. **Over 20 off-grid solar companies (OSCs) are active in the Rwandese market, which developed as one of the most active in Sub-Saharan Africa in the last decade.** While early companies received financial support from donors and others, product costs were nevertheless high and only a small share of households were able to afford purchasing lanterns and systems outright. Over the last five years, the cost of solar systems has dropped significantly and new technology has fostered the emergence of pay-as-you-go business models. As a result, products, particularly solar home systems, have become far more accessible for Rwandese households. In the first half of 2016, over 100,000 quality-verified[13] solar products were sold in Rwanda, representing a 53 percent increase over the previous reporting period and 5.8 percent of all quality-verified products sold in Africa.[14] Over 13 percent of these products were solar systems offering Tier 1 and above level of energy access. By the end of 2016, it was expected that there would be about 30,000 systems deployed in Rwanda providing Tier 1 and above access to households. In response to the RES targets, several companies are interested in scaling up their operations in Rwanda, particularly to sell multi-light point solar home systems. Over US$40 million of financing would be required to deliver a multi-light point solar home system to the Tier 1 targeted

[12] According to the RES, 550,000 households (22 percent) are to be connected with Tier 1 and above off-grid systems and 325,000 to 425,000 households (13–17 percent) to at least Tier 2 off-grid systems.

[13] The product meets the World Bank Lighting Global Quality Standards (using International Electrotechnical Commission [IEC] Technical Specification 62257-9-5). These quality standards have been widely adopted as the third-party verifiable measure of quality for off-grid lighting products and solar home system kits across the world.

[14] Of the 101,726 overall quality-verified product sales, multi-light point solar systems sold over 13,600 units (including pay-as-you-go) and single solar lamps sold just over 88,000 units. Sales are registered when products are shipped into an end market and are, therefore, not necessarily reflective of actual sales to end-consumers for a given period. https://www.gogla.org/sites/www.gogla.org/files/documenten/global_off-grid_solar_market_report_jan-june_2016_public.Pdf.

550,000 households and over US$80 million to the Tier 2 targeted households. The operational challenge of delivering and maintaining this number of systems is also considerable.

17. **Few developers are providing mini-grid electricity services despite the existence of an encouraging legal and regulatory framework for mini-grids.** Issued by RURA in 2015, the Simplified Licensing Framework for Rural Electrification applies to small isolated grids (below 50 kW), medium-sized isolated grids (50 kW–1 MW), and small power distribution networks of at least 1 MW. The framework streamlines the licensing and permitting process, presents options to mini-grid companies when the national grid arrives, and lays out the principles for setting cost-reflective tariffs. As the mini-grid sector is nascent in Rwanda, developers have expressed concerns about the workability of the framework, especially with regard to setting cost-reflective tariffs and negotiating the interconnection to the national grid with the utility. In addition, compatibility of the Simplified Licensing Framework for Rural Electrification with the new Public-Private Partnership (PPP) Law, approved in June 2016, is unclear. Furthermore, lessons learned from other programs show the necessity to complement subsidies with access to financing. In other words, access to financing is essential to bring the mini-grid investment to commissioning, while subsidies are important to improve the affordability of mini-grid electricity. Other lessons learned show that approval processes for accessing financial support should be streamlined, simple, and straightforward. In Rwanda, lack of adequate commercial financing and cumbersome approval procedures for financial support for mini-grid development have forced developers to depend on their own equity, angel investors, and mostly donor grants to finance these mini-grids and improve the affordability of electricity connections and consumption by mini-grid customers.

18. **Access to finance is among the major challenges hindering the development of off-grid markets**. While commercial banks and microfinance institutions are the most important sources of financing, their lending operations are constrained by the maturity of their liabilities, which consists mainly of local short-term deposits. Although Rwanda's financial sector has become increasingly diversified in recent years (comprising commercial banks, microfinance banks, non-bank microfinance institutions, savings and credit cooperatives (SACCOs), insurance companies, pension funds, and a nascent but growing capital market), banks and microfinance institutions mainly finance traditional sectors with short-term financing needs and where collateral is readily available. As of June 2016, the general trading, construction, and manufacturing sectors respectively represented 54 percent, 23 percent, and 7.5 percent of total banks' lending portfolio with only 0.11 percent allocated to water and energy activities,[15] whereas 33.9 percent, 30.1 percent, and 16.5 percent of the total lending portfolio of microfinance institutions was respectively allocated to general trading, construction, and agriculture.[16] The existing and growing demand for financing in the off-grid electricity market remains untapped because financial institutions' understanding of the nature and risks of off-grid products is limited, making them reluctant to invest in this area. In addition, investing in sectors that require long-term financing creates a balance sheet mismatch between assets and liabilities and poses a risk to the stability of the financial institutions. [17] Offering a combination of dedicated financing with long tenures

[15] National Bank of Rwanda (BNR), new authorized loans data.
[16] BNR, Monetary Policy and Financial Stability Statement, August 2016
[17] In Rwanda, the lending environment is mainly to sectors requiring medium to long-term financing while financial institutions largely depend on short-term funding to support their lending activities. According to the National Bank of Rwanda, as of

and affordable rates along with technical assistance to address the knowledge gap is expected to overcome these issues.

December 2016, the banking sector demonstrated growth of loans driven mostly by mortgage, hotels and commercial activities. At the same time, deposits remained the main source of funding for the Rwandan banking system: deposits represented 79 percent of total liabilities of banks, most of which (60 percent) demand deposits.

Table **1** below shows key statistics for Rwandan banking sector in 2014-2016.

Table 1. Key statistics for Rwandan Banks and Micro-finance institutions, including SACCOs

Banks				Microfinance Institutions, Including SACCOs			
Indicator	**2014**	**2015**	**2016**	**Indicator**	**2014**	**2015**	**2016**
Assets (net) (RWF billion)	1,803.0	2,133.0	2,378.0	Assets (RWF billion)	159.0	209.0	223.0
Loans & overdrafts (RWF billion)	1,011.0	1,228.0	1,407.0	Loans (RWF billion)	87.0	112.0	128.0
Deposits (RWF billion)	1,233.0	1,418.0	1,528.0	Deposits (RWF billion)	86.0	117.0	114.0
Capital adequacy ratio (min 15%)	24.0	22.5	21.8	Equity (RWF billion)	52.8	65.0	78.5
Non-performing loans (NPLs)/gross loans	6.0	6.2	7.5	Net profit/loss	5.0	6.8	9.8
NPLs net/gross loans	5.1	5.2	5.9	Capital adequacy ratio (%)	33.2	31.1	35.2
Return on average assets	1.9	2.1	1.7	NPLs / gross loans (%)	7.0	7.9	9.0
Return on average equity	10.5	11.2	9.2	Return on assets (%)	3.1	3.3	4.4
Cost of deposits	3.3	3.2	3.7	Return on equity (%)	9.5	10.5	13.7
Liquid assets/total deposits (min 20%)	48.7	45.8	42.5	Liquidity ratio (%)	87.0	89.6	88.8

19. **Increasing off-grid energy access will require addressing issues of affordability as well as access to finance in Rwanda.** Local SACCOs and commercial banks have yet to play any meaningful role in the off-grid sector. Right now, Rwandese SACCOs have little experience in issuing loans for solar products given the lack of understanding of the solar market and technologies, as well as long-term finance constraints. However, during consultations, SACCOs have confirmed an existing and growing demand for solar home systems. SACCOs are easily accessible for the majority of the population and can act as a bridge between solar companies and consumers. SACCOs are already providing affordable products in other sectors with a government-led mandate to focus on increasing the economic inclusion of women and youth through targeted micro-credit, entrepreneurial skills development, and sex-disaggregated data collection. If provided access to longer-term finance and the necessary assistance in understanding the solar products, SACCOs can play a critically important role in stimulating the development of the off-grid sector. Rwandese banks, as the majority of commercial banks in Sub-Saharan Africa, have to observe prudential regulations limiting credit risk exposures, which implies collateral requirements, and this stimulates bank lending to wealthier and/or larger, well-established clients. However, banks can play a critical role because they have expressed interest and have capacity to enter the off-grid market and are opening branches throughout the country. Several OSCs have tailored their business models to address affordability of customers through pay-as-you-go business models, extending credit to customers to allow them to pay for the systems in more affordable monthly installments (instead of a lump-sum purchase). Mini-grid developers have been relying primarily on donor funding to make electricity services affordable to customers who are, in general, poorer than those in grid-served areas.

20. **The GoR intends to address affordability by incentivizing demand for off-grid electricity services through existing country systems.** Incentivizing demand for off-grid electricity services with the expectation that the private sector will be able to immediately serve such demand with affordable products will rapidly increase the uptake of solar systems. Although a relatively small proportion of off-grid households in Rwanda can afford a cash purchase of a Tier 1 solar system, evidence on the ground suggests that a large number of them can afford to purchase the system in installments. Data from the recently completed MTF survey shows that estimated average household expenditure on traditional lighting sources by households without access to electricity is US$1.25 per month (the median is about US$0.75 per month). Moreover, the survey revealed that (the upper) 40 percent of off-grid households are spending more than US$2.5 per month on lighting expenditure. This implies that of the approximately 2.5 million households in Rwanda, about 750,000 off-grid households would be able to afford solar lighting products at an installment of around US$2.5 per month. Meanwhile, pay-as-you-go players have already sold in excess of 50,000 Tier 1 and Tier 2 solar home systems to relatively wealthier households and envisioned further scaling-up opportunities given projected demand. The GoR has initiated public awareness campaigns on the benefits and opportunities from off-grid electrification, which, coupled with improved affordability options, will lead to higher electricity consumption. Addressing affordability by working through existing country systems will facilitate the sustainability of the approach.

21. **Donors have been providing support to the development of the Rwandese off-grid market.** The German Agency for Technical Cooperation (GIZ) remains one of the most active supporters through its Energizing Development (EnDev) program, which is providing results-based financing (RBF) to solar companies (€3.4 million) and viability-gap financing to mini-grid developers (€1.8 million), targeting over 100,000 household connections. The European Union has provided a grant (€6 million) to the solar company Mobisol to deliver off-grid solar services to 49,000 households. Off Grid Electric has raised US$7.5 million of debt for Rwandese expansion. Additionally, donor countries have funded various smaller, stand-alone solar system support programs targeting modest numbers of household connections, typically through grants or direct program funding. So far, existing donor support has not been enough to catalyze off-grid market growth to the extent envisioned by the GoR. A number of existing programs encountered challenges during implementation, for example, affordability of services by households, low ability of private sector to raise financing to supplement donor funding, poor quality of proposals received, and lengthy review processes that are discouraging to the private sector.

22. **In November 2015, the Scaling-up Renewable Energy Program (SREP)[18] approved the Rwanda Investment Plan (IP), developed and presented by the GoR, with an allocation of US$50 million.[19]** The objective of Rwanda's SREP IP is to accelerate growth of off-grid electricity access through stand-alone solar systems and renewable energy-based mini-grids. The SREP IP aims to catalyze private investments in the provision of off-grid electricity services through the establishment of a Renewable Energy Fund (REF), particularly targeting stand-alone solar systems and mini-grids. The priorities identified in the

[18] SREP is a multi-donor trust fund under the framework of the Climate Investment Funds.

[19] SREP funding for Rwanda consists of US$50 million, of which US$0.26 million grant was utilized for preparing the SREP Investment Plan for Rwanda and US$0.8 million grant for preparing the REF project. The former funds were fully utilized; any balance remaining from the project preparation grant will be used toward the actual implementation of the REF project.

SREP IP were the result of extensive consultations with energy sector stakeholders.[20] Commitments were also made to collaborate with the Africa Renewable Energy and Access Program (AFREA) Gender and Energy program to identify key gender issues, risks, constraints, and opportunities associated with the proposed SREP support to maximize gender and other socioeconomic benefits. The World Bank is the leading institution in managing SREP funds in Rwanda.

23. **The World Bank has been a major strategic partner in Rwanda's electricity sector development and is actively supporting development, implementation, and monitoring of the RES.** The World Bank assisted the GoR during the preparation of the Rwanda SREP IP and, subsequently, the RES. The World Bank has also been a leading supporter of the EARP, the anchor of RES Program 4, which facilitates further grid extension. The International Development Association (IDA)-financed Rwanda Electricity Access Scale-up and Sector Wide Approach Development Project (P111567) has improved access to reliable and cost-effective electricity services to over 160,000 households and 220 public institutions; and the IDA-financed Rwanda Electricity Sector Strengthening Project (P150634) will provide electricity access to an additional 72,000 households. The World Bank has also been advising the GoR on the design and implementation of RES Program 1, which aims to facilitate electricity access for low-income households. An Energy Sector Management Assistance Program (ESMAP)-World Bank team is supporting the MTF baseline survey in Rwanda that would allow for effective monitoring of the RES implementation.

24. **The proposed SREP-funded REF project will directly support the implementation of RES Program 2 (risk mitigation facility to incentivize private sector participation in off-grid solar space) and Program 3 (development of mini-grids by private sector)**. The REF is expected to increase off-grid energy access in Rwanda through effectively addressing consumer affordability and access to finance challenges, thus facilitating the achievement of the GoR's off-grid access targets. The GoR envisions the proposed project as a pilot that could be scaled up as a primary mechanism for directing funds and technical assistance to the off-grid electricity sector, eventually attracting additional financing for rural electrification from other development partners and the private sector.

C. Higher Level Objectives to which the Project Contributes

25. **The project is fully aligned with Rwanda's national and energy sector priorities.** Increased access and reliability and reduced cost of energy services are among the GoR's main objectives under Vision 2020 and the second EDPRS, which supports the implementation of the Vision 2020. As described above, the second EDPRS identifies rural development as a key thematic area and sets a target of increasing electricity access to 70 percent by mid-2018 through a combination of on-grid and off-grid solutions. Furthermore, the project will support implementation of the RES, which recognizes a prominent role for off-grid technologies in achieving the 70 percent access target.

[20] Consultations were conducted with relevant stakeholders, including Government and regulatory institutions, development partners and donors, financial services providers, the private sector, and civil society. The first consultation, held in December 2014, helped introduce the SREP in Rwanda, initiated preparatory activities, and gathered sector information. In June 2015, the second consultation discussed the technical aspects of the investment options with stakeholders. In September 2015, the third consultation with stakeholders validated the suggested investment priorities and implementation framework.

26. **The project is aligned with the World Bank Group FY 2014–2018 Country Partnership Strategy (CPS)[21] for Rwanda and the World Bank's twin goals of reducing poverty and boosting shared prosperity.** Increased energy access in Rwanda through greater private sector participation will foster economic growth and directly support the CPS's objective identified under the first theme, which calls for 'accelerating economic growth that is private sector driven' and places energy investments as a high priority to tackle high costs and low reliability of energy. The provision of electricity through mini-grids and larger solar systems for productive uses will contribute to the objective of the second theme, which is 'improving the productivity and incomes of the poor through rural development and social protection.' The proposed project will provide electricity access to rural households that are predominantly poor, thereby enhancing their ability to participate and contribute to the economic development of Rwanda. Moreover, the project is also aligned with the World Bank Group's Energy Directions Paper,[22] which is designed to help client countries secure affordable, reliable, and sustainable energy supply needed to meet the World Bank's twin goals.

27. **Furthermore, the project is consistent with the higher-level objectives of the SREP.** The project will support the development of off-grid energy markets in Rwanda and assist in establishing conditions necessary for off-grid markets to make their full contribution over the long term to a low-carbon development pathway, reductions in energy poverty, increase in energy security, and increase in access to renewable energy.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

28. The Project Development Objective (PDO) is to increase electricity access in Rwanda through off-grid technologies and facilitate private sector participation in renewable off-grid electrification.

B. Project Beneficiaries

29. The final project beneficiaries are Rwandese households and businesses, which will gain access to off-grid electricity services through solar systems or mini-grids and whose use of electricity will replace consumption of diesel, kerosene, and dry cell batteries as well as other alternative fuels. The direct project beneficiaries include (a) participating SACCOs and commercial banks, which will gain knowledge and experience in lending in a new sector; (b) mini-grid developers who will gain access to finance to build mini-grids; and (c) private companies engaged in off-grid electrification (mini-grid developers and potentially locally registered OSCs), which will get access to financing for expanding their businesses in Rwanda as well as gain experience of working with local financial institutions. The Development Bank of Rwanda (BRD) will also benefit from capacity building in energy lending.

[21] Report No. 87025-RW.
[22] *Toward a Sustainable Energy Future for All: Directions for the World Bank Group's Energy Sector,* The World Bank Group, July 2013.

30. The project will facilitate the deployment of an estimated 445,500 off-grid connections and benefit 1.8 million people, 52 percent of whom are women.

C. PDO-Level Results Indicators

31. The achievement of the PDO will be measured using the following indicators:

- People provided with new or improved electricity service (number) (Corporate Results Indicator); of which women (number).
- Enterprises provided with access to electricity (number).
- Increased private sector investment in renewable energy electrification (U.S. dollar).
- Annual electricity output from project renewable energy (MWh per year).

III. PROJECT DESCRIPTION

A. Project Components

32. Increasing off-grid energy access in Rwanda requires addressing customer affordability and access to finance constraints. The REF project, funded by the SREP Trust Fund, is designed as a financial intermediary loan (FIL) to address these constraints. The project uses existing country systems and promotes private sector investments to ensure sustainability of the approach. The GoR, as the Borrower, will take the currency risk and onlend (for the line of credit and direct financing component) and transfer (for the technical assistance component) the project funds in local currency (Rwanda franc) to BRD, which will administer the REF. The project is structured around two components—Component 1: Line of Credit and Direct Financing for Off-grid Electrification and Component 2: Technical Assistance, Capacity Building, and Project Implementation Support—which are summarized below. Further details are provided in Annex 1.

Component 1: Line of Credit and Direct Financing for Off-grid Electrification (US$45.94 million SREP funds)

33. This component will set up and operationalize an REF, a local currency line of credit and direct financing facility that will help address access to finance and affordability constraints to accelerate growth of the off-grid electrification market in Rwanda. The REF will provide lines of credit to local financial institutions for sub-loans to households and micro, small, and medium enterprises, as well as direct loans to private companies engaged in off-grid electrification (mini-grid developers and potentially locally registered OSCs). The REF will use existing country systems (SACCOs) [23] to facilitate access to finance for households and businesses, improve affordability of solar electricity services, and maximize geographic coverage.

[23] Currently, the 416 Umurenge SACCOs have 119 branches or outlets, and 90 percent of Rwandans now live within a 5 km radius of an Umurenge SACCO, 56 percent within a 3km radius. The Umurenge SACCOs have over 2 million customers/members and serve about 20 percent of the total population (34 percent of the estimated adult population). Hence, SACCOs are the most accessible financial institutions in Rwanda, especially to rural households.

34. The REF will provide access to local currency financing through the four financing windows described below. This will allow the facilitation of off-grid market development through the mobilization of all the key market enablers at the same time: SACCOs, banks (commercial and microfinance), and private companies (mini-grid developers and potentially locally registered OSCs).

(a) **Window 1 - Onlending through SACCOs to households and micro-enterprises.** This window will provide a wholesale line of credit to BRD for onlending to SACCOs that comply with established eligibility criteria. SACCOs will onlend the funds to eligible households and micro enterprises for purchasing Tier 1 and above solar systems.

(b) **Window 2 - Onlending through banks (commercial and microfinance) to households and small and medium enterprises (SMEs).** This window will provide a wholesale line of credit to BRD for onlending to eligible commercial and microfinance banks, which will then extend sub-loans to households and SMEs for the purchase (and possibly, in the case of SMEs, distribution) of solar systems of Tier 1 and above access level. Eligible SMEs will have to make a contribution equivalent to 20–25 percent of the total cost toward the purchase of the system.

(c) **Window 3 - Direct financing of mini-grid developers.** This window will provide direct financing to eligible mini-grid developers to finance up to 75 percent of the construction of renewable energy based mini-grid systems. The REF will provide 'bridge loan' financing until grant funding from existing RBF programs (for example, EnDev) becomes available, as well as long-term financing beyond commissioning. The REF loans will be used to bring a mini-grid project to commissioning, when RBF becomes available from other donor-funded programs. Selection of projects will adopt a technology-neutral approach. Hybrid systems, including diesel backup, will be eligible for support under the condition that the diesel component is financed from sources other than the SREP.

(d) **Window 4 - Direct financing of locally registered OSCs supporting Tier 1 or higher solar systems.** This window will provide direct financing to eligible, locally registered OSCs offering Tier 1 and above solar home systems and ongoing maintenance services to its clients through delayed payment options. Eligible companies will have to leverage REF financing 2:1.

35. Implementation of Component 1 will commence with Windows 1, 2, and 3 (SACCOs, banks, and mini-grid developers), whereas the activation of Window 4 (locally registered OSCs) will be postponed. A detailed assessment of experience under Windows 1, 2, and 3 will be conducted one year after project effectiveness to inform the activation of Window 4. The assessment will be consistent with the GoR's approach of attracting investments from locally registered solar companies by incentivizing demand for off-grid services as described above. The detailed performance assessment would look at, among others, the following indicators: (a) total number of off-grid systems supported by the project to date; (b) number of off-grid systems supported by each window to date; (c) implementation status of SACCOs' reform; (d) number of SACCOs, banks, and mini-grid developers participating in the project; (e) amount of project funds disbursed through each window; (f) amount of funds onlent by SACCOs and banks; and

(g) performance of project-related loan portfolios of SACCOs and banks. The project Operations Manual (OM) will describe the process for the activation of Window 4 in detail. Development and approval of the OM is a project effectiveness condition.

36. Access to financing for all active windows will be on a first-come, first-served basis to allow for flexibility during project implementation. All eligible beneficiaries interested to receive REF financing will be required to comply with eligibility criteria agreed with the World Bank. For Window 1, participating SACCOs will be required to enter into service agreements with solar companies to ensure that solar systems supported by the window are appropriately serviced during sub-loans' tenor; participating SACCOs will extend sub-loans to households and enterprises for solar systems purchases only from companies with whom they have active service agreements. All supported systems will be required to meet the Lighting Global Quality Standards or equivalent national quality standards, if those are acceptable to the World Bank, subject to regular independent verifications to ensure alignment with International Electrotechnical Commission (IEC) Technical Specifications. The OM will describe the eligibility criteria and onlending process for each window.

Component 2: Technical Assistance, Capacity Building, and Project Implementation Support (US$3 million SREP funds)

37. This component will provide the necessary technical assistance and capacity building on a need basis to BRD and participating entities (SACCOs, banks, and private companies engaged in off-grid electrification) as well as provide project implementation support to BRD as a host of the REF. Technical assistance and capacity building will include, among others, (a) capacity-building and awareness workshops for SACCOs, banks, and private companies engaged in off-grid electrification to facilitate partnerships between SACCOs, banks, and the private sector; (b) technical assistance and capacity building for participating SACCOs and banks to ensure their successful partnerships with the private sector; (c) capacity building of participating SACCOs and banks to manage energy credit lines (including management, operational, and monitoring and evaluation capacities, as well as citizen/consumer orientation to build demand for these new products); (d) capacity building of the Energy Division of BRD to manage direct energy lending; (e) technical assistance to BRD to develop a pipeline of mini-grid projects; (f) technical assistance and capacity building for BRD and participating entities on quality assurance and enforcement of technical standards for off-grid solar systems, and so on; and (g) public awareness campaigns to educate consumers on the benefits and opportunities of off-grid electrification.

38. Technical assistance activities will also cover gender aspects, including (a) monitoring Window 1 and Window 2 for the appearance of gender gaps in access to financial services for male and female applicants and enterprises for purchase and retailing of off-grid technologies to enhance development outcomes and economic opportunities; (b) identification of data sources and information to further understand the issues and barriers to financial services for off-grid technologies by gender, income level (with a focus on low-income households), rural or urban location, household headship, and other social dimensions; and (c) implementation of approaches and methods that off-grid market enablers (for example, BRD, SACCOs, and banks) could adopt and integrate to close gender gaps (for example, gender-sensitivity training for credit officers) related to access to financial services for the purchase of energy technologies in household or enterprise activities.

39. Project implementation support will include, among others, (a) establishment of the Project Implementation Unit (PIU) and provision of operational support to the PIU in the areas of project management, supervision, and monitoring; (b) outreach to off-grid market enablers and final project beneficiaries; (c) knowledge-sharing events between participating project entities; (d) sector-wide knowledge sharing and project results dissemination workshops; (e) preparation of required studies related to the project, including impact assessment and annual citizen/consumer feedback analysis through focus group discussions to better understand the market; (f) preparation of consolidated annual project audits; and (g) financing of incremental operating costs. Cooperation and co-financing opportunities with other donors, for example, Belgian Technical Cooperation (BTC) and Swedish International Development Agency (SIDA), will be explored.

B. Project Cost and Financing

40. The US$48.94 million project will be financed by the SREP Trust Fund. The SREP funding for the project[24] consists of a US$21.44 million grant and a US$27.50 million loan extended with a service charge of 0.1 percent per year on the disbursed and outstanding loan balance and 40-year maturity, including a 10-year grace period, with principal repayments at two percent for years 11-20 and four percent for years 21-40. Principal and service charge payments will be due semiannually. These resources will be transferred to BRD under terms and conditions to be agreed between the Ministry of Finance and Economic Planning (MINECOFIN) and BRD. The funds for the capitalization of the on-lending facility (Component 1: Line of Credit and Direct Financing for Off-grid Electrification) will be on-lent to BRD from both loan and grant portions of the SREP proceeds at a 60-to-40 percent ratio from the loan and grant, respectively, and at an interest rate determined to reflect the costs of borrowing (considering the blend of financing sources: the loan and the grant) and the attributable costs and other charges due under each), plus a reasonable spread to account for currency exchange risks assumed by MINECOFIN of no more than 1.5 percent. The funds for technical assistance (Component 2: Technical Assistance, Capacity Building, and Project Implementation Support) will be given to BRD as a grant from the grant portion of SREP proceeds; the amount of the grant to BRD will not exceed US$3,000,000.

41. BRD will enter into Subsidiary Lending Agreements with participating banks and SACCOs, on terms and conditions satisfactory to the World Bank. The Subsidiary Lending Agreements will specify an onlending margin, adequately commensurate to the BRD's costs of these funds, enabling it to carry out its administrative and other obligations under the project. The onlending margin shall not exceed 3.5 percent per year, in addition to the terms elaborated in the Operations Manual. Similarly, when BRD enters into the direct loan agreements with eligible beneficiaries under activated windows for direct lending, these agreements shall be on terms and conditions satisfactory to the World Bank, including an appropriate onlending margin no higher than 3.5 percent, in addition to the terms elaborated in the Operations Manual.

42. The GoR has indicated that it would like to commit US$7 million of its IDA 18 allocation to further scale up rural electrification investments once the initial learning phase of the REF has been

[24] The SREP envelope also included a US$0.26 million grant for the preparation of the SREP IP and US$0.8 million for the preparation of the REF project.

completed. It is expected that the IDA funding will be added to the REF project during the implementation in the form of additional financing.

Project Components	Project cost	IBRD or IDA Financing	Trust Funds	Counterpart Funding
Component 1: Line of Credit and Direct Financing for Off-grid Electrification	45.94	0.0	45.94	0.0
Component 2: Technical Assistance, Capacity Building, and Project Implementation Support	3.00	0.0	3.00	0.0
Total Costs	48.94	0.0	48.94	0.0
Total Project Costs	48.94	0.0	48.94	0.0
Front End Fees	0.0	0.0	0.0	0.0
Total Financing Required	48.94	0.0	48.94	0.0

C. Lessons Learned and Reflected in the Project Design

43. **Over the past 12 years, the World Bank's Africa Energy Practice has learned important lessons from investments in close to 20 IDA projects supporting electrification programs to develop grid and off-grid access (for example, Ethiopia, Uganda, Tanzania, Mali, Burkina Faso, and Liberia).** The Lighting Africa[25] program in particular has provided a set of early successes in supporting off-grid access. The project preparation has also taken into consideration World Bank experience in mini-grid projects in Sub-Saharan Africa and other regions as well as experience of mini-grid developers that have invested in and are providing mini-grid electricity services in Rwanda. The project design is consistent with similar programs currently under design in South Sudan and Kenya.

44. **Lessons learned were also gathered during the preparation of the SREP IP through a series of participatory consultations with key stakeholders in the energy sector, including government representatives, development partners, the private sector, and civil society.**

45. **Keys lessons learned from the World Bank's experience and SREP consultations include the following:**

(a) **Full integration of the off-grid agenda into a country's electrification through a programmatic approach sensitive to the circumstances of the country.** For success of off-grid electrification, the project needs to be tailored to meet individual country needs and

[25] The International Finance Corporation-World Bank Lighting Africa program catalyzes and accelerates the development of commercial markets for off-grid solar lighting products in Sub-Saharan Africa. It is part of the World Bank Group's wider efforts toward the goal of SE4ALL by 2030. Lighting Africa mobilizes the private sector to build sustainable markets that provide affordable, modern solar lighting products to families that are not connected to grid electricity, most of whom are low-income rural families.

priorities, ensuring comprehensive and complementary grid and off-grid development. Use of existing country systems is crucial for the sustainability of selected off-grid electrification approaches.

(b) **Strong government ownership and involvement.** Government ownership of the selected off-grid electrification approach is crucial for its sustainability. Strong government involvement during project preparation and implementation is essential for its success.

(c) **Flexibility in response to off-grid market developments, anticipating challenges during implementation.** The design of the project needs to be flexible to quickly respond to any changes and developments on the ground, especially in untested, developing off-grid markets. The project should have systems and frameworks in place to quickly react and adapt to address emerging issues.

(d) **Working through different market enablers.** To facilitate the development of any market, it is important to incentivize all market enablers to identify an approach that works best in the country and delivers the desired results. In the case of off-grid electrification, lessons learned from previous financial sector engagements will be applied to select and assist committed partners. If incentivizing private sector approach is selected, working with different intermediaries to provide access to finance to both consumers and the private sector should be explored to identify the best option to address affordability and access to services challenges.

(e) **Adequate sectoral knowledge and implementation capacity of market enablers.** It is important to facilitate necessary capacity and knowledge building of all market enablers to fast-track project implementation and, hence, market development. When financial intermediaries are encouraged to work in a new sector, systems should be put in place to ensure necessary sectoral and operational knowledge is acquired. If necessary, technical assistance should be provided to the private sector to facilitate their cooperation with financial intermediaries. A platform should be put in place allowing for ongoing knowledge and experience sharing between project participating entities. Performance of the financial intermediaries of energy lending programs needs to be assessed within 12 months of facility launch to promptly identify and address any capacity bottlenecks.

(f) **Support of quality-certified, guaranteed equipment.** Quality assurance of product performance needs to be established to boost credibility of the approach. Lighting Africa certification of solar products has been instrumental in establishing the off-grid market in East Africa. Given the fast evolving technology environment, it is important that the equality standards adapt to reflect the latest available technologies. Supported products should have service guarantees of appropriate duration. A framework should be put in place to effectively and efficiently monitor and enforce quality-assurance and adequate services provision.

(g) **Support of mini-grids structured with sustainable and robust finance models that adequately cover operational, maintenance, and management costs, while ensuring affordability of electricity.** It is important to carefully appraise the financial and technical

viability of mini-grid proposals. Tariffs should allow for full recovery of costs. [26] Subsidies are usually required to improve affordability of mini-grids' electricity tariffs; so, collaboration with existing grant programs is essential.

(h) **Complement subsidies with access to financing, while simplifying approval processes for financial support.** Access to financing is essential to bring the mini-grid investment to commissioning, while subsidies are important to improve the affordability of mini-grid electricity. Approval processes for accessing financial support should be streamlined, simple, and straightforward.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

46. BRD will be the project implementing agency. For Component 1, BRD will function as a wholesale institution for Windows 1 and 2, as well as lend directly to mini-grid developers under Window 3 and locally registered OSCs under Window 4, if/when the latter is activated. BRD was assessed against the criteria put forward in World Bank Operational Policy (OP) 10.00[27] and qualifies to be an intermediary for the credit line as well as a direct lending institution. The OP 10.00 assessment is summarized in ANNEX 5. BRD will also be in charge of implementation of Component 2.

47. BRD will host the PIU and will be responsible for monitoring indicators, supervising the credit lines and direct loans, and implementing the necessary technical assistance to the beneficiaries. This includes collecting necessary information from project beneficiaries, assessing and monitoring SACCOs' and banks' compliance with the respective eligibility criteria, supervising withdrawal applications and loan books, and reporting on progress during implementation. BRD will also review annual audited financial statements of the intermediaries and conduct periodic on-site supervision to assess compliance and progress. SACCOs and banks will report to BRD on their sub-loan portfolio on a quarterly basis. To do so, the PIU will have personnel with experience in off-grid energy, project management, procurement, accounting, and environmental and social management. The core staff (risk management officer, energy investment officer, and safeguards officer) will be BRD staff; other necessary skills will be brought in as necessary. Additionally, the PIU will undertake technical due diligence of proposals for mini-grid financing and, if necessary, direct lending to OSCs with support from specialized technical consultants, institutions with experience in the off-grid energy sector (for example, EDCL), and donor programs (for example, EnDev). BRD will receive capacity building and technical assistance to enhance

[26] OP10.00 does not allow subsidizing the interest rate from apex (BRD) to participating financial institutions (commercial banks, other financial intermediaries) or when BRD acts as a retail provider. This is also true of the on-lending interest rate from retail financial institution to final beneficiaries (household, business, or another actor). This as one of the principles underpinning the project design.

[27] OP 10.00 requires an assurance that all financial intermediaries in a World Bank-financed credit line are viable financial institutions determined by (a) adequate profitability, capital, and portfolio quality as confirmed by audited financial statements; (b) acceptable level of loan collections; (c) appropriate capacity, including staffing, for carrying out subproject appraisal (including environmental assessment) and for supervising subproject implementation; (d) capacity to mobilize domestic resources; (e) adequate managerial autonomy and commercially oriented governance; and (f) appropriate prudential policies, administrative structure, and business procedures.

its performance and project implementation capacity. Establishing an adequate PIU in BRD is a project effectiveness condition.

48. In less electrified districts, 30 better-performing SACCOs have been identified for initial project participation, and eight banks expressed interest to participate in the project. Out of the 30 SACCOs, 20 have been assessed against the established eligibility criteria; all of them generally meet the criteria, though given their small size, significant capacity building will be required to enhance their performance and ensure successful project implementation. An additional 10 SACCOs will be appraised after project implementation commences. More SACCOs are expected to join the project during implementation. Moreover, SACCOs are currently going through a consolidation process and will be merged into 30 district SACCOs; once the process is completed, most of the new district SACCOs are expected to participate in the project, though they will first have to be appraised based on the eligibility criteria. Against the OP 10.00 criteria, two banks have been assessed; one of them was found eligible to participate in the project. All interested banks will be appraised by effectiveness. Interested banks would be able to join at any time provided that they meet the eligibility criteria. An overview of the SACCO and banking sector as well as a summary of the due diligence criteria and appraisals are provided in ANNEX 6 and ANNEX 7.

49. For the wholesale windows, SACCOs will enter into service agreements with OSCs to coordinate their energy-related lending, disbursement, and customer service processes. The solar companies will need to provide product warranty and servicing for the whole duration of loan tenors extended by SACCOs. The project OM will provide a template of the agreement.

50. A Steering Committee will be established for effective coordination and project oversight. MININFRA/REG, MINECOFIN, and BRD will be members of the Steering Committee for the project, with the World Bank as an observer; other key energy sector stakeholders could be invited to the Steering Committee meetings if necessary. The Steering Committee will meet at least every six months or as needed during project implementation to review implementation progress, discuss emerging challenges, and identify mitigating measures. Key basic functions of the Steering Committee will include (a) monitoring project implementation progress; (b) identifying and addressing challenges with participating entities; and (c) approving any needed changes to the project OM. The terms of reference of the Steering Committee, including responsibilities and composition, will be stipulated in the OM. Establishment of the Steering Committee by the GoR is a project effectiveness condition and a dated covenant. The first meeting of the Steering Committee is expected in October 2017, soon after project approval. Additional information on implementation arrangements is provided in ANNEX 2.

B. Results Monitoring and Evaluation

51. Monitoring of project implementation progress and results indicators, as well as progress toward achievement of the PDO, will be the responsibility of BRD as well as participating entities, that is, SACCOs, banks, and private companies engaged in off-grid electrification (mini-grid developers and potentially locally registered OSCs). The PIU will collect data (sex-disaggregated when relevant) and reports from participating entities and present progress in achieving the key and intermediate indicators to the World Bank quarterly. This will be carried out in conjunction with World Bank implementation

and support missions. There will be several mid-term (in-depth) reviews of the project; the first one taking place 18 months after project effectiveness.

C. Sustainability

52. The GoR has demonstrated strong commitment and ownership of the proposed project. The project concept was developed under the GoR's leadership, as well as through an extensive and participative consultation process that started with the preparation of the Rwanda SREP IP, with a particular focus on enhancing the enabling environment for supporting off-grid electrification in a sustainable manner. Moreover, the project is considered by the GoR as the main driver behind the implementation of the RES, which recognizes off-grid solutions as an effective way of providing energy services for a significant proportion of households and identifies the private sector as a key partner for implementing this strategy.

53. While, purposely, there are elements of learning-by-doing and adaptability based on implementation experience to maximize sustainability, the project design also includes key parameters for sustainability of the PDO, including (a) a harmonized funding mechanism that is aligned with the GoR's strategy for the off-grid electrification that could help attract additional funding from donors and/or other sources going forward; (b) capacity building of BRD, SACCOs, and banks to increase their capacity and experience in energy lending, including in building and maintaining mutually beneficial partnerships with locally registered OSCs; (c) enforcement of Lighting Global Quality Standards or equivalent national quality standards[28] for supported solar products, together with ongoing service and appropriate guarantee period to develop a robust market; (d) capitalizing on SACCOs ongoing consolidation reform to enhance the sustainability and financial soundness of SACCOs, to which the GoR is strongly committed; and (e) building upon the GoR's ongoing community awareness campaign on the benefits and availability of quality-verified off-grid equipment and services.

D. Role of Partners

54. The project will work closely with donor-funded programs that provide investment and technical assistance support to off-grid market development in Rwanda. The operation of Window 3 for mini-grid developers will closely collaborate with the EnDev initiative, under implementation by GIZ, which has been supporting the private sector through an RBF program for mini-grids and quality-certified solar lighting systems. Component 2 of the project (technical assistance, capacity building, and implementation support) will be informed and strategically aligned with ongoing and planned work under similar activities, including the BTC-funded Private Sector Participation in the Generation of Electricity from Renewable Sources program. Participation in the Scaling up Off-Grid Energy in Rwanda (SOGER) program funded by SIDA, which is supporting private sector companies for mini-grid pipeline development in rural areas, will be explored.

[28] National quality standards will be applied if those are acceptable to the World Bank, subject to regular independent verifications to ensure alignment with International Electrotechnical Commission (IEC) Technical Specifications.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

55. **This project has been assessed to have an overall implementation risk of substantial.** The key risks, together with key mitigation measures, are summarized below.

56. **Sector strategies and policies risks.** The risk rating is substantial. The RES has made off-grid electrification using stand-alone solar systems and mini-grids integral to the achievement of the mid-2018 electrification targets. The proposed REF project will directly support the implementation of two out of four programs outlined in the RES, Program 2 and Program 3 (risk-mitigation facility targeting the private sector to incentivize private sector participation in off-grid solar space and facilitation of mini-grids development). An inadequate design of Program 1 (mechanism to allow low-income households to access modern energy services through basic solar systems) may lead to the creation of a secondary market for off-grid solar systems (for example, if the GoR decides to heavily subsidize or provide such systems free of charge) and therefore jeopardize the successful implementation of the REF's support for Program 2. To mitigate this risk, the World Bank is in close dialogue with and advising the GoR on the design and implementation of Program 1. In the area of mini-grids, the licensing and permitting process for mini-grid systems has been streamlined under the Simplified Licensing Framework for Rural Electrification. However, the limited experience in developing mini-grids under the new framework poses concerns among stakeholders about the workability of the framework, especially with regard to setting tariffs and negotiating the interconnection to the national grid. Moreover, compatibility of the framework with the new PPP Law is not clear. To mitigate this risk, technical assistance activities under the project will help improve the legal and regulatory framework, as well as streamline the dialogue and coordination among RURA, EDCL, EUCL, and mini-grid developers. A legal opinion provided by MININFRA on the compatibility of the new PPP Law with the framework as it applies to the implementation of the REF is the project effectiveness condition. Additionally, the scaling-up and sustainable development of mini-grids may be affected by uncertainties with grid extension plans. The potential expansion of the national grid into areas identified for mini-grid sites may cause mini-grid companies to have stranded assets that cannot be easily removed or mobilized elsewhere. To mitigate this risk, the Energy Planning Department at EDCL has nominated a focal point for mini-grid companies to clarify site locations before investing in the development of a mini-grid.

57. **Technical design of project risks.** The risk rating is substantial. By having four windows under the REF operating on a first-come, first-served basis, the project will be able to respond and adapt quickly to changes in the off-grid market environment. However, SACCOs and banks have limited knowledge of the off-grid sector and no experience in partnering with locally registered OSCs. Locally registered OSCs need to offer warranty services matching the tenor of consumer loans extended by SACCOs and banks; there is also a risk they may not be able to immediately serve the demand generated by SACCOs and banks due to challenges with raising working capital financing. To mitigate these risks, the proposed project will combine financing support through Window 2 (banks onlending to SMEs) with technical assistance and capacity-building activities. Technical assistance and capacity-building support will be provided to participating entities to enhance their capacity to work with one another (for example, to establish partnerships between SACCOs and OSCs), as well as increase their understanding

of the sector, technologies, and business models to facilitate energy lending and fast project off-take. Direct lending to locally registered OSCs may be activated after an assessment of the other financing windows has been completed.

58. **Institutional capacity for implementation and sustainability risks.** The risk rating is substantial. The project faces substantial implementation risk due to overall limited institutional capacity of participating entities to effectively perform their responsibilities during and beyond the project period. These include, in particular, BRD as the implementing agency for the project which has no previous experience working with the World Bank and SACCOs, banks, mini-grid developers as the participating entities. BRD is an experienced development bank; its risk management functions are well organized, including both financial and operational risks. Its credit appraisal, administration and risk management are adequately organized and policies and procedures are being developed. BRD has a good basis for adequate administration, including accounting and bookkeeping, an effective internal audit function, and functional information systems. However, BRD has no experience in energy lending and monitoring, especially of quality of products and services; its implementation capacity may be stretched by having to work simultaneously with a large number of participating entities. SACCOs are small financial institutions and do not have experience in providing energy lending; institutional capacity enhancements of SACCOs through consolidation reform may occur more slowly than anticipated. Banks lack understanding of renewable energy technologies, business models for stand-alone solar systems and mini-grids, and capacity to appraise and supervise such projects. Mini-grid developers typically do not have adequate technical capacity to develop high-quality, technically sound, and bankable project proposals. However, SACCOs are currently going through a consolidation process, which is expected to improve their internal processes and institutional capacity. The project will establish a competent PIU at BRD, as well as allocate enough resources for technical assistance and capacity-building support to BRD and participating entities to help educate the various actors about the sector and ensure that the risks are surmounted. Such assistance is key to growing the off-grid market.

VI. APPRAISAL SUMMARY

A. Financial and Economic Analysis

Financial Analysis

59. Since the project is an FIL, financial analysis is not presented. A summary of the detailed BRD assessment is presented in ANNEX 5. Assessment of SACCOs and banks are presented in ANNEX 6 and ANNEX 7, respectively. Additional participating institutions will be assessed during project implementation.

Economic Analysis

60. The economic analysis is based on a simple and transparent cost-benefit framework. The main development impact of the proposed project derives from increased access to modern electricity services and a substitution away from lower-quality or more-expensive alternatives. The benefits of improved electricity access, for households and commercial enterprises, are conservatively quantified

based on avoided costs of lower-quality electricity and lighting alternatives. The corresponding costs are the costs of the relevant solar systems and mini-grid projects. Assessing the net benefits over the 30-year project horizon at a 6 percent discount rate yields a net present value (NPV) of US$83.1 million and an economic internal rate of return (EIRR) of 35.3 percent. Including benefits from a reduction in CO_2 emissions from an offset in diesel consumption, the NPV and associated EIRR increase slightly.

Table 2. NPV and EIRR of the Project

	Base Case	With CO_2 Benefits
NPV (US$, million)	83.1	84.8
EIRR (%)	35.3	35.8

61. The full economic analysis is included in Annex 4.

Rationale for Public Sector Provision/Financing

62. While the project takes an approach that largely incentivizes the private sector, the use of public funds is critical to address off-grid market barriers and catalyze nascent markets, especially when encouraging demand is deemed a priority. Further, provision of electricity services to the rural poor generates social benefits not captured by private sector decision making, and thus, public sector funds must supplement private provision.

63. The rationale for public sector financing rests primarily on the fact that, in Rwanda, the market for stand-alone solar systems and mini-grids is still being developed, and the majority of final beneficiaries have low levels of income. Supplying these households is, therefore, deemed risky by commercial lenders, regardless of the potential consumer and societal benefits. Providing designated credit lines for off-grid systems through financial intermediaries, especially SACCOs, on longer tenors would help to address affordability concerns. For mini-grid developers, whose upfront capital costs are high and payback periods are typically long, it is exceedingly difficult to access commercial financing. Even when RBF is available, it could be difficult for mini-grid developers to raise funds that would bring mini-grids to commissioning to unlock RBF. Public sector financing can, therefore, play a valuable role in unlocking markets for such technologies, paving the way for greater private sector participation in rural electrification efforts. The need for public financing is expected to diminish as commercial lenders become more comfortable with these nascent technologies and business models.

64. Finally, there are many competing development demands for public financing and capacity. Public funds used for financial intermediation, targeting private sector provision, can effectively leverage private sector finance and resources in the delivery of development outcomes. This frees up public sector capacity and funds, which are often limited, for other interventions.

Value-added of the World Bank Support

65. The World Bank has extensive knowledge and robust capacity to design customized off-grid programs, as well as designated credit lines drawing from decades of global experience. The World Bank's value proposition rests on its ability to share global knowledge in off-grid electrification based on

experience in financing off-grid solar and mini-grid systems as well as extensive experience designing credit lines worldwide. The World Bank has incorporated into the project design the lessons learned from a number of IDA-supported projects with off-grid solar and mini-grid components, as well as early successes in supporting off-grid solar access under the Lighting Africa program. The World Bank's engagement in the project can also enable the pooling of resources from diverse donors and the private sector for off-grid energy access.

B. Technical

66. The proposed project will address some of the key challenges identified in the RES for increasing off-grid energy access in Rwanda**.** The project will support the implementation of RES Program 2 (risk mitigation facility to incentivize private sector participation in off-grid solar space) and Program 3 (development of mini-grids by private sector) and is expected to increase off-grid energy access in Rwanda, thus contributing to the achievement of Rwanda's mid-2018 electrification goals.

67. Increasing off-grid energy access requires addressing customer affordability and access to finance constraints. The project is, therefore, designed to effectively address those constraints, while seizing on the use of existing country systems and promoting private sector investments to ensure the sustainability of the approach. The project design is informed by lessons learned from similar projects in the region. The project technical design is anchored on the following principles: (a) flexibility of facility design to allow for fast response to changes in the off-grid market; (b) incentivizing multiple market enablers to identify the best approach to facilitate off-grid market response; and (c) strong technical assistance and capacity building for participating entities to facilitate fast adoption of the partnership model and, hence, project implementation.

Assessment of BRD according to OP 10.00 Requirements

68. BRD has recently been reorganized to achieve a better focus on key areas that would further enhance its developmental role. The new business strategy includes energy as one of the five key focus areas. In 2016, BRD started business and functional reorganization, which would ensure effective realization of its new business strategy—to increase resource mobilization, build strong partnerships, and support well-focused investments and growth, which would maximize the development impact. BRD has finalized its business and functional reorganization in early 2017. The next critical step is to complete staffing and improve its technical capacity. Increasing the staff number (from 120 staff in mid-2016 to 195 staff) and building the technical capacity are expected to be completed by mid-2017, ensuring that BRD will be able to successfully achieve targets in the new business areas.

69. BRD generally meets the eligibility criteria under OP 10.00 and has made progress with finalizing its business and functional reorganization to ensure effective realization of BRD's new business strategy. The new organization reflects good banking practices. BRD is in a reasonably good financial condition, with positive income. Its risk management functions are well organized, including both financial and operational risks. Its credit appraisal, administration, and risk management are adequately organized and policies and procedures are being developed. BRD has a good basis for adequate administration, including accounting and bookkeeping, an effective internal audit function, and functional information

systems. BRD is expected to continue to meet the eligibility criteria at all times. Compliance will be reviewed annually. A summary of the BRD assessment is included in ANNEX 5.

C. Financial Management

70. Based on the financial management (FM) assessment of the project carried out in accordance with the 'Financial Management Manual for the World Bank-Investment Project Financing Operations' dated March 1, 2010, OP/BP 10.00, and the *'Guidance Note on the Financial Intermediary Financing'*, BRD has adequate FM systems as required by OP/BP 10.00. The FM risk rating is Moderate. Nevertheless, BRD shall upgrade its Oracle Enterprise Resource Planning to manage the project and officially dedicate FM staff to the project FM. Full details of the FM arrangements are in ANNEX 2.

D. Procurement

71. This project primarily deals with loans made by eligible financial intermediaries, for which the final recipient of loan funds is a private borrower. In line with the World Bank's New Procurement Framework (NPF), Component 1 (Line of Credit and Direct Financing for Off-grid Electrification) is exempted from the use of World Bank Procurement Regulations for IPF borrowers. However, procurement for Component 2 (Technical Assistance, Capacity Building, and Project Implementation Support) will be carried out in accordance with the World Bank's Procurement Regulations for IPF borrowers – *'Procurement in Investment Project Financing, Goods, Works, Non-Consulting, and Consulting Services'*, dated July 2016 and *'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants'*, revised as of July 1, 2016; and the provisions stipulated in the Legal Agreement.

72. Procurable items under Component 2 would include activities related to technical assistance for capacity building, and small goods and non-consulting services under operating costs. The BRD will use their established procurement arrangements for procurement of Goods, Non-consulting Services and Consulting Service.

73. The Project Procurement Strategy for Development (PPSD) has been prepared for Component 2. The project procurement mainly depends upon the critical consultancies envisaged through the project. After careful evaluation of various options for procurement approach and contracting strategy, hybrid contracting mode (lump sum and time based) was found to be the most appropriate approach and fit for purpose for the project. This approach ensures optimal utilization of resources and value for money. Duly considering the nature of capacity building to be provided to SACCOs, a single service provider will be selected to gain the advantage of economy of scale and to make a viable proposition for international participation. To monitor the progress of various initiatives and to ensure smooth coordination between different agencies and resolve issues that may arise during implementation stage, a multi-tiered institutional monitoring mechanism may be set-up through a Project Management Information System.

E. Social (including Safeguards and Citizen Engagement)

74. The project will be operating in areas where the overwhelming majority of the beneficiaries may be underserved, vulnerable, and marginalized. Thus, promoting off-grid solar systems and mini-grids will

bring diverse social benefits for current underserved rural communities in Rwanda. Positive social benefits include provision of cheaper and cleaner sources of energy for lighting, charging phones and other devices, electrifying businesses, helping create employment and village-level jobs/businesses, increasing shelf-life of pharmaceuticals and vaccines, improving socialization, and so on. The preparation of mini-grid subprojects will take steps to ensure that these groups of people are considered during project implementation. Also, it is critical that the project undertakes annual consultations with citizens' groups and consumers to not only assess demand, but also ensure broader stakeholder support, buy-in, and gender-related considerations throughout implementation. Under Component 2, annual citizen/consumer feedback analysis will be conducted in beneficiary areas through focus group discussions to better understand the market and inform future marketing activities. These citizen engagement activities will benefit from consultations that have already been conducted in Rwanda and will inform future marketing efforts to build demand for mini-grid products. To keep feedback channels open with citizens, a summary of each focus group discussion will be publicly disclosed.

75. The installation of solar systems under the project will not lead to land acquisition given that the installation will take place within existing households and public facilities. However, the construction of mini-grid systems may lead to some insignificant acquisition of land. Thus, the World Bank's operational policy on Involuntary Resettlement (OP/BP 4.12) is triggered. Because not all subproject sites for mini-grid systems can be identified in advance, a Resettlement Policy Framework (RPF) has been prepared and disclosed by BRD and the World Bank on April 13, 2017. Based on the RPF guidance, each subproject will be screened, and if Resettlement Action Plans (RAPs) are found to be necessary, these will be prepared, cleared, disclosed, and implemented before the commencement of civil works, in accordance with World Bank OP 4.12. BRD capacity will be strengthened to deal with project approval by including a social safeguards expert. Further capacity strengthening needs identified during appraisal will be incorporated into the Implementation Support Plan (ISP).

76. **Gender.** Providing rural households, social institutions, and productive enterprises with new energy access and improved energy services has the potential to promote gender equality, create employment and business opportunities for women, and improve development outcomes with regard to, for example, education and maternal health. Evidence shows that these benefits are often realized only if gender-sensitive approaches are integrated in the design and implementation of project interventions.

77. Initial analysis on gender gaps related to financial services in Rwanda indicate that female applicants account for 29.3 percent and male applicants for 59.9 percent of the loan beneficiaries by volume (considering SACCOs and banks).[29] For SACCOs, female applicants account for 25.6 percent and male applicants for 63.2 percent of the loan beneficiaries by volume. [30] In addition, onlending by banks to female applicants currently stands at 20.7 percent versus 79.3 percent for male applicants.[31] Due to scarcity of baseline data regarding onlending in the off-grid electricity market, attention will be paid to tracking and attempting to close gaps in access to financial services for male and female applicants and enterprises for the purchase and retailing of off-grid technologies. Various technical assistance activities

[29] Group lending accounts for 10.7 percent.
[30] Group lending accounts for 11.2 percent.
[31] All data from National Bank of Rwanda 2016.

under Component 2 will help ensure that benefits associated with improved energy service provision and gender equality are realized.

F. Environment (including Safeguards)

78. Given that this is a financial intermediary project, the Environmental Category assigned to this project is Category FI. World Bank policies OP/BP 4.01, OP/BP 4.04, OP/BP 4.11, and OP/BP 4.12 are the only safeguard policies triggered by the project in light of environmental and social risks from proposed activities. While it is recognized that undertaking pipeline project development should not result in any environmental risk or social impact per se, the project and the financial intermediaries, and also the off-grid solar and mini-grid developers, will prepare the appropriate site-specific safeguard instruments (for example, Environmental and Social Impact Assessment [ESIA]/Environmental and Social Management Plan [ESMP]/RAP) once the specific locations and subprojects under Components 1 and 2 are determined. These documents will be consulted upon, cleared, and disclosed in-country and by the World Bank. The project will deliver positive environmental impacts because off-grid solar systems and mini-grids would replace lighting systems that are either fossil fuel based such as diesel generators and kerosene lamps or woody biomass, or nonreusable dry cell batteries, which are detrimental to the biophysical environment. The project will install solar PV systems on rooftops or mount them on poles. Lamps and other ancillary equipment will be deployed directly in homes without any construction. There will be no greenhouse gases (GHGs) or air pollutants emitted into the atmosphere during the installation and operation of solar PV systems. The emission of GHG may be limited to the operation of renewable energy-based mini-grids hybridized with diesel generators. Water use is limited to upstream manufacturing and will not be a problem during operation. There are practically no risks to landscapes and ecology during operation.

79. The main environmental, health, and safety concerns are likely to be associated with recycling and disposal of spent batteries at the end of their useful lives, which is usually three to five years after deployment. Rechargeable batteries for storing solar energy may run on nickel-cadmium (Ni-Cad), nickel metal hydride (NiMH), lithium-ion (Li-ion), lead-acid (Pb-A), or lead-gel (Pb-gel). These batteries should not be disposed in standard landfills because they can create long lasting environmental and human health impacts (for example, headaches, abdominal discomfort, seizures and comas, cancers, irritation of skin and respiratory system, burns and damage to skin and eyes, and corrosion) largely due to the heavy metals such as mercury, lead, cadmium, and nickel and acids. The entire management processes including demanufacturing, collection, storage, recycling, transport, and disposal may present a challenge to this project, given the scope of this World Bank operation. In view of anticipated challenges associated with recycling and disposal of spent batteries, the World Bank's OP/BP 4.01, Environmental Assessment, is triggered. Appropriate safeguard instruments have been prepared, consulted upon, and disclosed on April 13, 2017. Because, at this stage of project design, the specific types of subprojects and sites remain unidentified, the Environmental and Social Management Framework (ESMF) has been prepared, consulted upon, and disclosed in-country and at the World Bank on April 13, 2017.

80. As a project implementing agency, BRD will work closely with the Rwanda Environmental Management Authority (REMA) to ensure full compliance with environmental and social sustainability concerns throughout the life of the project. BRD has established a robust social and environmental

policy prepared in 2013 and an Environmental and Social Management System, which is compliant with the Rwandese regulatory framework that pertains to the environment, land use, labor health and safety issues, vulnerable and marginalized groups, and cultural artifacts. BRD is well equipped with professionals who, over the years, have received training in environmental and social risk management and, therefore, should be up to the task under the proposed project. BRD will hire additional environmental safeguards staff to the PIU. BRD will develop a project-specific environmental code of practice (ECOP) as a guidance on the approach for the collection, transport, storage, and disposal of spent batteries, with the aim of ensuring that risks to the environment and human health are prevented or mitigated. Apart from providing approaches to the management of spent PV batteries, such as through ECOPs, BRD will also seek to inform discussion and build awareness of all stakeholders, including rural community members, vendors/suppliers of products, and service providers, around safe management of used batteries. Further capacity-strengthening needs will be incorporated into the ISP.

G. World Bank Grievance Redress

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

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY : Rwanda
Renewable Energy Fund

Project Development Objectives

The Project Development Objective is to increase electricity access in Rwanda through off-grid technologies and facilitate private-sector participation in renewable off-grid electrification.

Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: People provided with new or improved electricity service (Corporate Results Indicator)		Number	0.00	1800000.00	Semi-annual	Project progress reports. Indicator will be estimated based on number of connections achieved under the project multiplied by average household size.	BRD
Of which women		Number	0.00	936000.00	Semi-annual	Project progress reports	BRD

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Description: This indicator measures the number of people provided with new or improved electricity services from stand-alone solar PV or mini-grid systems.							
Name: Enterprises provided with access to electricity		Number	0.00	27500.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the number of micro-, small- and medium-sized enterprises with access to electricity from stand-alone solar PV or mini-grid systems.							
Name: Increased private sector investment in renewable energy electrification		Amount(USD)	0.00	41000000.00	Semi-annual	Project progress reports. Progress reports from banks (contribution from enterprises). Draw-down tranches (own contribution by beneficiaries). Mini-grid project proposals (equity, debt).	BRD
Description: This indicator measures the private co-financing that is leveraged by the REF							
Name: Annual electricity output from renewable energy		MWh/year	0.00	13000.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the annual electricity production (in MWh) from renewable energy from stand-alone solar PV and mini-grid systems.							

Intermediate Results Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Number of districts covered by participating market enablers		Number	0.00	30.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the number of districts with presence of at least one market enabler (SACCOs, banks, mini-grids, solar companies)							
Name: Number of participating SACCOs		Number	0.00	30.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the number of SACCOs participating in the facility. Initially, the indicator will measure participating Umurehe SACCOs, followed by District-level SACCOs once established.							
Name: Total funding drawdown by SACCOs from the facility		Amount(USD)	0.00	20400000.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the total amount of funding that is lent by BRD to SACCOs							
Name: Total funding onlent by SACCOs to households and enterprises		Amount(USD)	0.00	20400000.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the total amount of funding that is on-lent by SACCOs to individuals (households) and enterprises (micro-, small-, and medium-sized)							

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Total funding onlent by SACCOs to female applicants		Percentage	0.00	30.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the total amount of funding (in percentage) that is onlent by SACCOs to female applicants (incl. female-headed enterprises)							
Name: Average NPL ratio of SACCOs portfolio		Percentage	0.00	5.00	Semi-annual	Project progress reports, including progress reports from SACCOs.	BRD
Description: This indicator measures the average Non-Performing Loan (NPL) ratio of SACCOs as the average amount of non-performing loans over total loans, expressed as a percentage.							
Name: Number of SACCOs trained		Number	0.00	30.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the number of SACCOs trained as per activities under Component 2							
Name: Number of participating Banks		Number	0.00	10.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the number of banks (commercial, microfinance) participating in the facility							

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Total funding drawdown by Banks from the facility		Amount(USD)	0.00	13000000.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the total amount of funding that is lent by BRD to banks (commercial, microfinance)							
Name: Total funding onlent by Banks to households and enterprises		Amount(USD)	0.00	13000000.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the total amount of funding that is on-lent by banks to individuals (households) and enterprises (micro-, small-, and medium-sized)							
Name: Total funding onlent by Banks to female applicants		Percentage	0.00	30.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the total amount of funding (in percentage) that is onlent by banks to female applicants (incl. female-headed enterprises)							
Name: Average NPL ratio of Banks portfolio		Percentage	0.00	5.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the average Non-Performing Loan (NPL) ratio of Banks as the amount of non-performing loans over total loans, expressed as a percentages.							
Name: Total funding onlent		Amount(US	0.00	5000000.0	Semi-annual	Project progress reports.	BRD

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
to mini-grid developers		D)		0		Mini-grid project proposals.	
Description: This indicator measures the total amount of funding on-lent to mini-grid developers							
Name: Number of people provided with access to electricity by household connections (mini-grids)		Number	0.00	105000.00	Semi-annual	Project progress reports. Indicator will be estimated based on number of connections achieved under the project multiplied by average household size.	BRD
Description: This indicator measures the number of people provided with new or improved electricity services from mini-grid systems.							
Name: Renewable energy generation capacity in mini-grids constructed under the project		Megawatt	0.00	1.10	Semi-annual	Project progress reports. Mini-grid project proposals.	BRD
Description: This indicator measures the installed capacity from renewable energy sources (excluding diesel-based capacity)							
Name: Total funding onlent to off-grid solar companies		Amount(USD)	0.00	7500000.00	Semi-annual	Project progress reports	BRD

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Description: This indicator measures the total amount of funding that is on-lent to solar companies							
Name: Average NPL ratio of off-grid solar companies portfolio		Percentage	0.00	5.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the average Non-Performing Loan (NPL) ratio of Solar companies measured as the amount of non-performing loans over total loans to solar companies, expressed as a percentage.							
Name: Number of people provided with access to electricity by household connections (off-grid solar)		Number	0.00	1695000.00	Semi-annual	Project progress reports. Indicator will be estimated based on number of connections achieved under the project multiplied by average household size.	BRD
Description: This indicator measures the number of people provided with new or improved electricity services from stand-alone solar PV systems.							
Name: Renewable energy generation capacity from solar home systems under the project		Megawatt	0.00	6.60	Semi-annual	Project progress reports	BRD
Description: This indicator measures the installed capacity from stand-alone solar PV systems							

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Number of knowledge sharing events		Number	0.00	10.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the number of knowledge sharing events as per activities under Component 2							
Name: Number of citizen engagement events		Number	0.00	10.00	Semi-annual	Project progress reports	BRD
Description: This indicator measures the number of citizen engagement events as per activities under Component 2							
Name: Total financing leveraged by the facility from private and other sources		Amount(USD)	0.00	52000000.00	Semi-annual	Project progress report	BRD
Description: This indicator measures the total amount of co-financing leveraged from private and other sources (e.g., multilateral, bilateral, government, etc.)							

Target Values

Project Development Objective Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
People provided with new or improved electricity service (Corporate Results Indicator)	0.00	50000.00	280000.00	620000.00	1050000.00	1400000.00	1800000.00	1800000.00
Of which women	0.00	26000.00	145600.00	322400.00	546000.00	728000.00	936000.00	936000.00
Enterprises provided with access to electricity	0.00	1050.00	5300.00	9300.00	14500.00	20500.00	27500.00	27500.00
Increased private sector investment in renewable energy electrification	0.00	1150000.00	5800000.00	13800000.00	23450000.00	32000000.00	41000000.00	41000000.00
Annual electricity output from renewable energy	0.00	400.00	2000.00	4250.00	7125.00	9800.00	13000.00	13000.00

Intermediate Results Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
Number of districts covered by participating market enablers	0.00	20.00	30.00	30.00	30.00	30.00	30.00	30.00
Number of participating SACCOs	0.00	20.00	30.00	30.00	30.00	30.00	30.00	30.00
Total funding drawdown by SACCOs	0.00	1000000.00	5500000.00	10000000.00	14000000.00	18000000.00	20400000.00	20400000.00

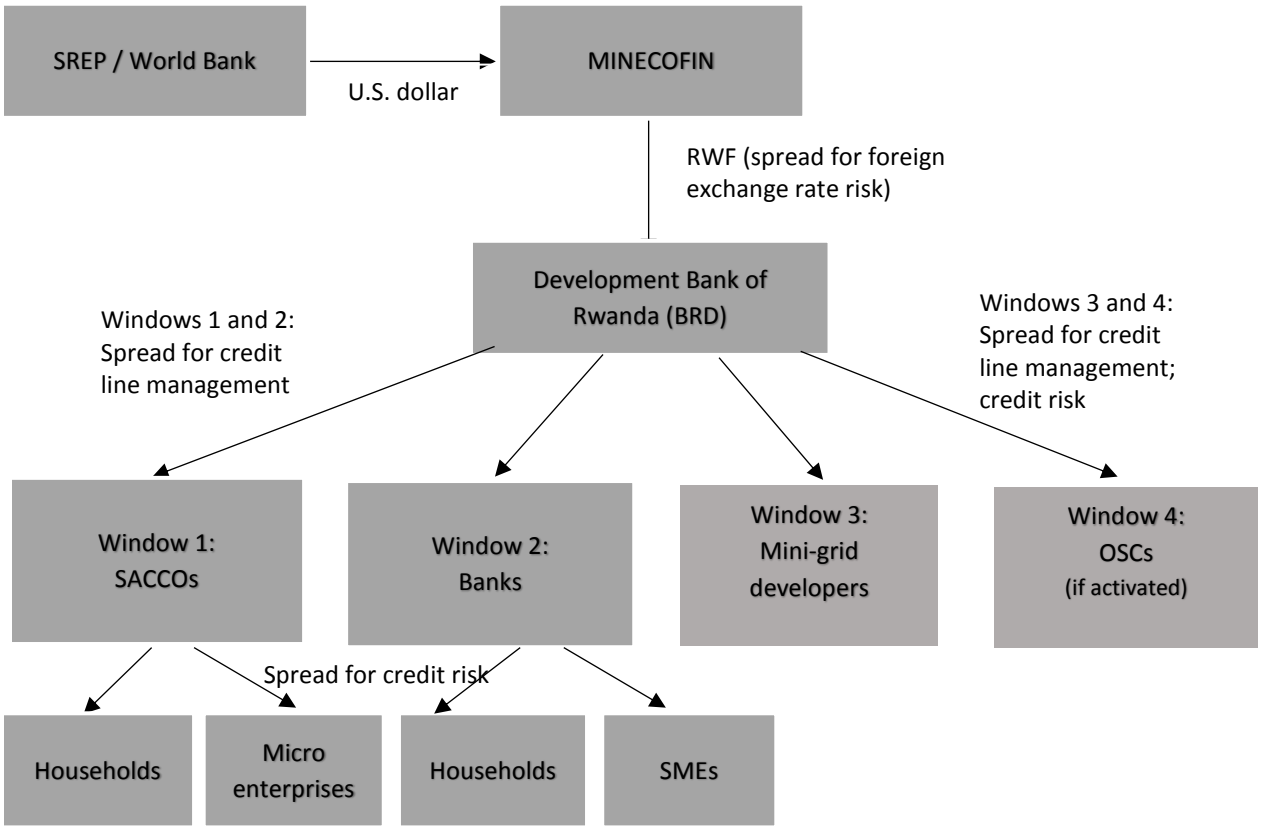
Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
from the facility								
Total funding onlent by SACCOs to households and enterprises	0.00	800000.00	4800000.00	7500000.00	12000000.00	16000000.00	20400000.00	20400000.00
Total funding onlent by SACCOs to female applicants	0.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Average NPL ratio of SACCOs portfolio	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Number of SACCOs trained	0.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Number of participating Banks	0.00	5.00	7.00	10.00	10.00	10.00	10.00	10.00
Total funding drawdown by Banks from the facility	0.00	1000000.00	3000000.00	6000000.00	8000000.00	10000000.00	13000000.00	13000000.00
Total funding onlent by Banks to households and enterprises	0.00	500000.00	2000000.00	4000000.00	6000000.00	9000000.00	13000000.00	13000000.00
Total funding onlent by Banks to female applicants	0.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Average NPL ratio of Banks portfolio	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Total funding onlent to mini-grid developers	0.00	200000.00	1000000.00	1500000.00	2500000.00	3500000.00	5000000.00	5000000.00
Number of people provided with access to electricity by household	0.00	4200.00	21500.00	32000.00	53500.00	75000.00	105000.00	105000.00

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
connections (mini-grids)								
Renewable energy generation capacity in mini-grids constructed under the project	0.00	0.04	0.20	0.30	0.50	0.70	1.10	1.10
Total funding onlent to off-grid solar companies	0.00	0.00	0.00	2500000.00	5000000.00	6500000.00	7500000.00	7500000.00
Average NPL ratio of off-grid solar companies portfolio	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Number of people provided with access to electricity by household connections (off-grid solar)	0.00	45800.00	285500.00	588000.00	996500.00	1325000.00	1695000.00	1695000.00
Renewable energy generation capacity from solar home systems under the project	0.00	0.20	0.90	2.20	3.70	5.10	6.60	6.60
Number of knowledge sharing events	0.00	2.00	4.00	6.00	8.00	10.00	10.00	10.00
Number of citizen engagement events	0.00	2.00	4.00	6.00	8.00	10.00	10.00	10.00
Total financing leveraged by the facility from private and other sources	0.00	2000000.00	7500000.00	18000000.00	30000000.00	41000000.00	52000000.00	52000000.00

ANNEX 1: DETAILED PROJECT DESCRIPTION

1. The REF project is an FIL with the GoR as the Borrower. The World Bank will extend SREP funds denominated in U.S. dollar to MINECOFIN. MINECOFIN will take the currency risk and onlend (for the line of credit and direct financing component) and transfer (for the technical assistance component) the project funds in Rwanda francs (RWF) to BRD. BRD will provide access to local-currency funding through the four lending windows on first-come-first-served basis. Figure 1.1. shows the project design including flow of funds, while the following description details the design and terms and conditions applicable to the four different windows.

Figure 1.1. Project Design and Flow of Funds



2. The project will be structured around two main components—Component 1: Line of Credit and Direct Financing for Off-grid Electrification; and Component 2: Technical Assistance, Capacity Building, and Project Implementation Support.

Component 1: Line of Credit and Direct Financing for Off-grid Electrification (US$45.94 million SREP funds)

3. This component will set up and operationalize the REF, a local-currency line of credit and direct financing facility that will help address access to finance and affordability constraints in Rwanda to accelerate growth of the off-grid market. The REF will provide lines of credit to local financial institutions for sub-loans to households, micro, small and medium enterprises, as well as direct loans to private companies engaged in off-grid electrification (mini-grid developers and potentially locally registered OSCs). The REF will use existing country systems to facilitate access to finance for households and businesses, improve affordability of solar electricity services, and maximize geographic coverage.

4. The REF facility will be administered by BRD. The REF will provide access to local-currency financing through four financing windows. This will facilitate off-grid market development through the mobilization of all key market enablers at the same time: SACCOs, banks (commercial and microfinance), and private companies (mini-grid developers and potentially locally registered OSCs):

(a) **Window 1 – Onlending through SACCOs to households and micro-enterprises:** This window will provide a wholesale line of credit to BRD for onlending to SACCOs that comply with established eligibility criteria. SACCOs will onlend the funds to eligible households and micro enterprises for purchasing of Tier 1 and above solar systems.

(b) **Window 2 – Onlending through banks (commercial and microfinance) to households and SMEs:** This window will provide a wholesale line of credit to BRD for onlending to eligible commercial and microfinance banks, which will the extend sub-loans to households and SMEs for the purchase (and possibly, in case of SMEs, distribution) of solar systems of Tier 1 and above access level. Eligible SMEs will have to make an equity contribution equivalent to 20 - 25 percent toward the purchase of the system.

(c) **Window 3 – Direct financing of mini-grid developers:** This window will provide direct financing to eligible mini-grid developers to finance up to 75 percent of construction of renewable energy based mini-grid systems. The REF will provide 'bridge loan' financing until grant funding from existing RBF programs becomes available, as well as long-term financing beyond commissioning. REF loans will be used to bring a mini-grid project to commissioning, when RBF becomes available from other donor-funded programs. Selection of projects will adopt a technology neutral approach. Hybrid systems, including diesel back-up, will be eligible for support under the condition that the diesel component is financed from sources other than the SREP.

(d) **Window 4 – Direct financing of locally registered OSCs supporting Tier 1 or higher solar systems:** This window will provide direct financing to eligible locally registered OSCs offering Tier 1 and above solar home systems and on-going maintenance services to its clients through delayed payment options. Eligible companies will have to leverage REF financing 2:1.

5. Implementation of Component 1 will commence with Windows 1, 2 and 3 (SACCOs, banks and mini-grid developers), whereas the activation of Window 4 (locally registered OSCs) will be postponed. A detailed assessment of REF Windows 1, 2, and 3 performances will be conducted one year after project effectiveness to inform the activation of Window 4. The detailed performance assessment would look at, among others, the following indicators: (a) total number of off-grid systems supported by the project to date; (b) number of off-grid systems supported by each window to date; (c) number of SACCOs, banks and mini-grid developers participating in the project; (d) amount of project funds disbursed to each window; (e) amount of funds onlent by SACCOs and banks; and (f) performance of project-related loan portfolios of SACCOs and banks. The OM will describe the process for activation of Window 4 in detail.

6. A flexible design of the facility that allows for wholesale windows in parallel with direct lending to private companies (mini-grid developers and potentially locally registered OSCs) is expected to help get the project off the ground quickly and, over time, help create a basis for a competitive and efficient off-grid solar market in Rwanda. Interviews, consultations, and calls for expression of interest revealed strong interest from SACCOs, banks (commercial and microfinance), mini-grid developers, and locally registered OSCs to participate in the facility. Over time, direct lending to OSCs and mini-grid developers will allow them to establish a credit history, which would enable their access to other sources of financing (for example, from commercial banks, and investment funds).

7. Access to financing for all four windows will be on a first-come, first-served basis to allow for flexibility during project implementation. All entities interested to receive REF financing (SACCOs, banks, mini-grid developers and locally registered OSCs) will be required to comply with eligibility criteria, agreed with the World Bank. For Windows 1 and 2, participating SACCOs and banks will be required to enter into service agreements with solar companies to ensure that solar systems supported by these windows are appropriately serviced during sub-loans' tenor; participating SACCOs and banks will extend sub-loans to households and enterprises for solar systems purchases only from companies with whom they have active service agreements. All supported systems will be required to meet the Lighting Global Quality Standards or equivalent national quality standards.[32] The project OM will describe the eligibility criteria and onlending process for each window; summary of those are given in the sections below.

Detailed Description of Windows

Window 1 - Onlending through SACCOs to households, and micro enterprises

8. Window 1 will provide affordable financing to individuals, households, and micro-enterprises in local currency through SACCOs. The financing will be used for buying systems that provide Tier 1 and above level of energy access in Rwanda: principally three-light systems with mobile phone charging, but also larger multi-light systems offering additional power for appliances, for those households that can afford them. There are currently 473 SACCOs operating in Rwanda, at least one in every administrative sector (Umurenge), making SACCOs easily accessible for the majority of households even in regions with low electrification rates and with high incidence of poverty. The GoR recently embarked on a process to consolidate the 416 Umurenge SACCOs at the district level before creating a cooperative bank at the

[32] National quality standards will be applied if those are acceptable to the World Bank, subject to regular independent verifications to ensure alignment with International Electrotechnical Commission (IEC) Technical Specifications.

national level. SACCOs will be merged at the district level and the original 416 SACCOs will become branches of 30 district SACCOs. District SACCOs will ultimately form a cooperative bank at the national level. It is expected that the consolidation will be finalized in 2018. See ANNEX 6 for a detailed description of the SACCO sector and due diligence process for selecting and assessing SACCOs in accordance with OP10.00.

9. This financing window will ultimately be open to all SACCOs that comply with the established eligibility criteria. The World Bank initially selected 30 strongly performing SACCOs in areas with the lowest electrification rates and assessed 20 of them against the eligibility criteria, which were established based on OP10.00 guidance. 10 SACCOs were initially appraised in November, 2016. Another 10 SACCOs were appraised in March, 2017, and the remaining 10 will be appraised after commencement of project implementation. More SACCOs could be added during project implementation.

10. The eligibility criteria for SACCOs interested in participating in the REF include the following:

(a) **Compliance with prudential regulations issued by BNR.** Regular reporting to BNR. The SACCO must be in good standing with BNR at all times and observe all other applicable laws and regulations.

(b) **Adequate organization and governance**. 'Fit and proper' owners; competent management; and adequate organization and institutional capacity for its specific risk profile.

(c) **Capital adequacy**. Compliance with BNR regulations with minimum capital of 15 percent calculated as the ratio of total capital to total assets.

(d) **Adequate liquidity**. Compliance with BNR regulations (that is, liquid assets to total deposits at 30 percent), and well managed or no maturity gaps.

(e) **Adequate profitability**. Positive profitability and stable earnings trend and well-managed cost structure.

(f) **Adequate credit portfolio structure and portfolio quality**. Well-defined lending policies and procedures, acceptable credit portfolio structure, regular loan classification and provisioning[33], low concentration, lending to connected parties within prudential limits, low level of nonperforming loans (NPLs) (that is, an NPL ratio as percentage of total assets not exceeding 5 percent), and effective collection practices.

(g) **Adequate internal controls, overseen by the Audit Committee**. Independent internal control function with defined procedures, annual internal control plans, regular reviews by the Audit Committee, and follow-up on issues raised in internal controls reports.

(h) **Adequate accounting and book-keeping and management information system (MIS), with adequate internal controls.** Must have credible financial statements with chart of accounts as specified by BNR, with at least basic information technology (IT) support

[33] At least four times per year and adequate provisioning.

providing good accounting and bookkeeping, and adequate support for transaction processing and loan portfolio management.

(i) **Appropriate implementation capacity**. For carrying out client and sub-loan appraisals and for supervision of the use of funds and micro-enterprise subproject implementation.

Table 1.1. Standards for SACCOs

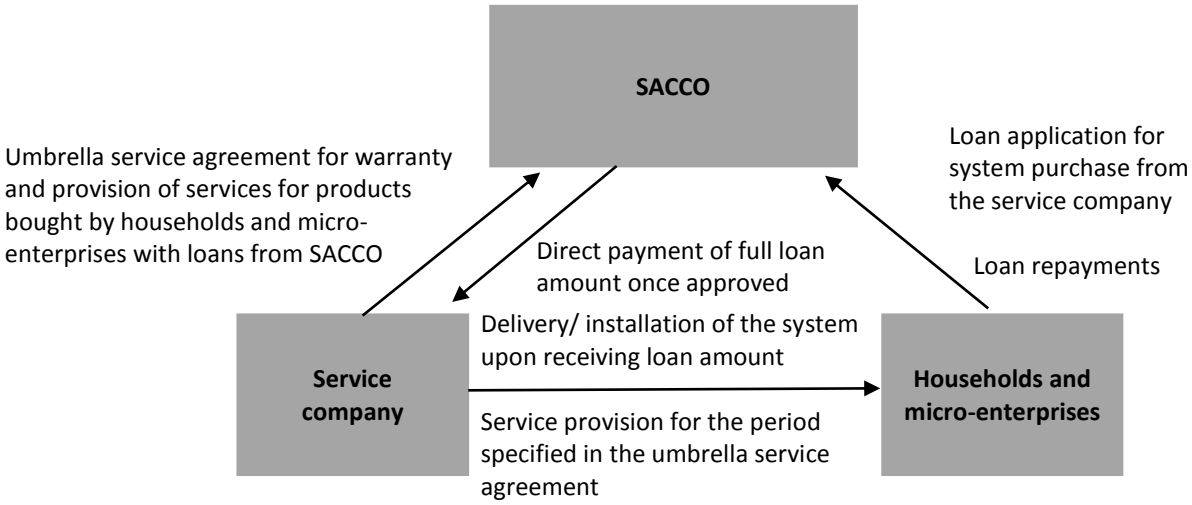
Standard in Current Regulation	Limits
Capital adequacy ratio	≥ 15 percent
Liquidity ratio	≥ 30 percent
Loans/deposits	≤ 80 percent
Fixed assets/equity	≤ 75 percent
Insider loans/equity	≤ 20 percent
Total net loans/total assets	≤ 80 percent
Total equity investments/equity	≤ 40 percent
Single borrowing/total deposits	≤ 2.5 percent
Single borrowing/net worth	≤ 5 percent if NPL is > 5 percent ≤ 10 percent if NPL is < 5 percent

11. BRD will enter into sub-financing agreements with SACCOs, which will specify the terms and conditions applicable to the local-currency financing, as agreed with the World Bank. BRD will lend the financing received from MINECOFIN to SACCOs, charging a spread to cover its costs of administering and managing the wholesale window. [34] This spread will be in addition to the spread that MINECOFIN will charge for taking the currency risk. Sub-financing to each SACCO will be provided in tranches and extended in local currency, with loan maturity of up to 36 months (including three months of grace period) and tranche amounts equivalent to US$25,000. SACCOs will use the financing to extend sub-loans to individuals, households, and micro enterprises based on the drawdown model (see paragraph 15). SACCOs will take the full credit risk in onlending to their customers.

12. Participating SACCOs will enter into service agreements with OSCs. Under the agreement, companies will need to provide product warranty and servicing for the whole duration of loan tenors extended by SACCOs. The project OM will provide a template of the agreement. Figure 1.2. illustrates the partnership model for Window 1.

Figure 1.2. Partnership Model for Window 1

[34] OP10.00 does not allow subsidizing the interest rate from apex (BRD) to participating financial institutions (commercial banks, other financial intermediaries) or when BRD acts as a retail provider. This is also true of the on-lending interest rate from retail financial institution to final beneficiaries (household, business, or another actor). This as one of the principles underpinning the project design.



13. SACCOs will offer sub-loans to buy products from only those companies-partners that they have partnered with at market interest rates. SACCOs will charge rates to their customers, taking into account the cost of funding, operational costs, and an appropriate credit risk premium based on the credit risk assessment of the borrower.[35] The rates will take into account the cost of funding, operational costs and an appropriate credit risk premium based on the credit risk assessment of the borrower. Pricing will effectively cover the cost and risks involved (currency risk and credit risk). As such, the offered rates will not introduce market distortions, and credit cost to final beneficiaries will cover the associated risks and operations costs. Extra care will be taken to improve transparency and ensure that the profit margins are minimal. SACCOs will assume full credit risk for all sub-loans extended. The SACCOs window will include the following types of financing: (a) sub-loans to individuals for up to US$50 equivalent with 18 months' maturity; (b) sub-loans to households for up to US$200 equivalent with up to 24 months' maturity; and (c) sub-loans to micro-enterprises of up to US$500 equivalent with up to 24 months' maturity. It is important to note that the US$50 sub-loan is expected to be utilized for the purchase of solar systems that provide Tier 1 and above level of service. Offering such a product to households represents an important breakthrough with respect to affordability, given that monthly installment payments will be vastly more feasible for households than an outright cash purchase of the system. The first two SACCO tranches will be subject to prior review and no-objection by the World Bank. The OM will specify details regarding the processes, terms and conditions.

14. SACCOs that wish to participate in the facility will need to submit a proposal to BRD outlining the specifics as to how they intend to utilize the sub-financing. More specifically, this proposal shall contain the estimated number and volume of sub-loans that will be provided by the SACCO from the sub-financing, the estimated number of households and micro-enterprises that will receive sub-loans, and the range of interest rates that will be charged by the SACCO, as well as the range of credit risk spreads.

[35] OP10.00 does not allow subsidizing the interest rate from apex (BRD) to participating financial institutions (commercial banks, other financial intermediaries) or when BRD acts as a retail provider. This is also true of the on-lending interest rate from retail financial institution to final beneficiaries (household, business, or another actor). This as one of the principles underpinning the project design.

This proposal will be part of BRD's credit appraisal process and a format for the proposal will be provided in the OM.

15. Under the drawdown model, the approval process will be as follows. The client submits an application to the SACCO for a sub-loan for the purchase of a solar system of Tier 1 and above access level. The SACCO will appraise the eligibility and creditworthiness of the final borrower, as well as the feasibility of the investment in case of micro enterprises. If the SACCO is satisfied that the final borrower is creditworthy and that all applicable eligibility criteria are met, the sub-loan will be approved by the SACCO Credit Committee following applicable credit risk appraisal and management procedures. If the SACCO Credit Committee approves the sub-loan, a sub-loan agreement with the beneficiary (including mandatory clauses, as specified) will be signed and followed by disbursements to the final borrower. The SACCO will submit all required documentation specified in the OM to BRD. BRD may decide to do a post-review of the appraisal and/or lending process and of the related sub-loan documentation.

16. All sub-loans issued by SACCOs can be subject to ex-post reviews, as decided by BRD and/or the World Bank. The OM will specify the processes to be followed in evaluating and approving the applications, monitoring mechanisms on active loans, and reporting and further disbursing to the intermediaries. SACCOs have full responsibility in relation to BRD and the World Bank to ensure that the sub-loan and lending terms are in compliance with the eligibility requirements and all other requirements imposed by the OM and the applicable credit policies. Any sub-loan could be subject to ex-post review of all sub-loan documentation by BRD and the World Bank for verification of compliance.

17. Once a SACCO has fully utilized the tranche, it can apply to BRD for an additional tranche. The maximum financing amount available for one SACCO will be agreed between BRD and the World Bank. Successful SACCOs, which use the facility effectively and have an NPL ratio of less than 5 percent, will be able to receive a higher draw-down amount and a higher loan cumulative amount if approved by BRD and the World Bank.

18. Sub-loans to final borrowers will comply with the following criteria:

(a) Sub-loans to households

(i) National identity card is available for at least one member of the household asking for a sub-loan;

(ii) The person in the household asking for the sub-loan must be a member of the SACCO with a fully paid-in member contribution;

(iii) The person has had an active account with the SACCO for the last six months;

(iv) The person has good credit history with the SACCO and has borrowed from the SACCO and repaid on time; and

(v) The person has capacity to pay back the loan within a period of up to 18 months.

(b) Sub-loans to micro enterprises

(i) The owner/company must be a member of the SACCO with a fully paid member contribution;

(ii) The owner/company has duly licensed and in business for the last 12 months with business address in the respective area in which the SACCO operates;

(iii) The owner/company has had an active account with the SACCO for the last 12 months;

(iv) The owner/company has good credit history with the SACCO and has borrowed from the SACCO and repaid on time;

(v) The owner/company has capacity to pay back the loan within a period of up to 36 months;

(vi) The owner/company has basic book-keeping records such as sales, purchases, receipts, payments, and so on; and

(vii) The owner/company must be in compliance with local tax authorities.

Window 2 – Onlending through banks (commercial and microfinance) to households and SME clients

19. Window 2 will provide local currency financing to households and SMEs. Commercial banks will extend sub-loans to households and SMEs for the purchase of solar systems of Tier 1 and above access level. It is expected that SMEs will use the proceeds of the sub-loans for the purchase of solar systems for business expansion or operating cost reduction, and possibly for further distribution. Eligible SMEs will have to make an equity contribution equivalent to 20–25 percent toward the purchase of the system.

20. The window will be open to all commercial banks that are interested in participating and can meet the established eligibility criteria. MININFRA and BRD announced a call for expressions of interests during project preparation and received responses from eight banks. Two interested banks were assessed against eligibility criteria that were developed based on OP10.00 and one was found to be in compliance with the criteria, making it eligible to participate in the REF. At least two more will be assessed before effectiveness; the remaining banks will be appraised after commencement of project implementation. The appraised banks that almost meet the criteria could still participate in the facility subject to the signing of a Memorandum of Understanding with the REF which confirms the commitment of the bank to remedy the issues identified within a year's time. Other appraised banks that are far from meeting the criteria during time of appraisal could participate in the REF once the issues identified have been addressed. ANNEX 7 contains a detailed description of the banking sector and due diligence process for the banks that were appraised.

21. The eligibility criteria for the commercial banks include the following:

(a) **Compliance with prudential regulations issued by BNR.** The bank must be in good standing with BNR at all times and observe all other applicable laws and regulations.

(b) **Good governance**. 'Fit and proper' owners, adequate board composition and practices, competent management with adequate managerial autonomy, and adequate organization and institutional capacity for its specific risk profile.

(c) **Capital adequacy.** Compliance with BNR regulations with minimum capital of 15 percent calculated as the ratio of total capital to total assets.

(d) **Adequate profitability**. Positive profitability, well diversified income structure and stable earnings trend and well managed cost structure.

(e) **Adequate liquidity**. Compliance with BNR regulations (that is, liquid assets to total deposits at 20 percent), well-diversified funding sources, well-managed or no maturity gaps and regular stress testing.

(f) **Acceptable risk profile**. Effective Asset and Liability Management Committee and well-defined policies and written procedures for management of all types of financial risks (liquidity, credit, currency, interest rate, and market risk, as well as risks associated with balance sheet and income statement structures).

(g) **Adequate credit portfolio structure and portfolio quality**. Acceptable credit portfolio structure including effectiveness of loan underwriting, asset classification and provisioning[36], no concentration, lending to connected parties within prudential limits, level of NPLs (that is, an NPL ratio as percentage of total assets not exceeding 5 percent), and effective collection practices.

(h) **Adequate internal audit**. Independent internal audit function with well-defined procedures, annual internal audit plans, regular reviews of all key risk management functions and follow-up on issued raised in internal audit reports.

(i) **Adequate MIS and well-organized IT support, with adequate internal controls and security policies.** The IT support should be based on a relational database management system providing good accounting and bookkeeping and adequate system-software support for transaction processing and all banking and risk management functions.

(j) **Appropriate implementation capacity**. For carrying out subproject appraisals and for supervising subproject implementation under the credit line.

[36] The bank must classify its assets and off-balance-sheet credit risk exposures (at least four times per year) and make adequate provisions.

Table 1.2. Prudential Standards and Limits

Standard in Current Regulation	Limits
Capital adequacy ratio	≥ 15 percent
Liquidity ratio	≥ 20 percent
Loans/deposits	≤ 80 percent
Fixed assets/equity	≤ 75 percent
Insider loans/equity	≤ 20 percent
Total net loans/total assets	≤ 80 percent
Total equity investments/equity	≤ 40 percent
Single borrowing/total deposits	≤2.5 percent
Single borrowing/net worth	≤ 5 percent if NPL is > 5 percent ≤ 10 percent if NPL is < 5 percent

22. BRD will enter into sub-financing agreements with commercial banks, which will specify the terms and conditions applicable to the local-currency financing, as agreed with the World Bank. Participating banks will be eligible to receive a drawdown tranche of up to US$500,000 equivalent, extended to a bank for up to 72 months, with up to three months of grace period. Commercial banks will take the full credit risk in onlending to their customers.

23. The bank window will include the following types of financing:

(a) Sub-loans in local currency for households that are bank clients for the purchase of solar systems of at least Tier 1 access level for sub-loans of up to US$1,000 equivalent with maturity of up to 36 months and up to three months' grace period.

(b) Sub-loans in local-currency for SMEs that meet the eligibility criteria to purchase/install eligible solar systems to be used in their operations to expand their business or reduce the operating cost (or further distribution) with sub-loans of up to US$500,000 equivalent with maturity of up to 60 months and up to six months' grace period.

24. Sub-loans to households and for smaller SME loans (up to US$10,000 equivalent) will be based on the drawdown model, while larger SME loans will use back-to-back financing. The drawdown facility will be used for the household sub-loans and for SME sub-loans up to US$10,000 equivalent, 60 months' final maturity and up to six months' grace period. SME loans above US$10,000 will be extended by BRD back-to-back to bank loans to the SMEs (see below). Once a bank has fully utilized the drawdown tranche, it can apply to BRD for an additional tranche. The maximum financing available for one bank will be agreed between BRD and the World Bank. Successful participating financial institutions (PFIs), which have an NPL ratio of less than 5 percent, will be able to receive a higher drawdown amount and a higher maximum amount if approved by BRD and the World Bank.

25. The process for sub-loans extended through back-to-back financing will be as follows**.** An application will be made by the SME to the commercial bank for a sub-loan for solar system related investment and the associated working capital finance. The bank will appraise the eligibility and creditworthiness of the final borrower as well as the eligibility and feasibility of the solar system related investment. If the bank is satisfied that the beneficiary is creditworthy and the solar system investment makes business sense, and that all applicable eligibility criteria are met, the bank shall submit the sub-

loan for approval by the bank's Credit Committee, following its own applicable credit risk appraisal and management procedures. Once the Credit Committee approves the sub-loan, the bank will submit an application to BRD to confirm the eligibility of subsidiary finance for the sub-loan. This applies to the first two sub-loans. A specialized BRD credit officer will review and confirm the eligibility of the final borrower and the eligibility of the solar system investment. If the BRD credit officer's review concludes that the bank's request meets all applicable eligibility criteria and the credit risk management aspects, the application will be presented to the BRD Credit Committee for the formal approval of financing for the respective sub-loan.

26. The World Bank will review the first two of the large back-to-back financed loans. Once BRD is comfortable with banks capacity to appraise loans to final beneficiaries, it could establish a free limit for each bank. The loans under free limit would not require prior review and approval. Once the World Bank completes the review and provides the no-objection, the bank sub-loan can be presented to the BRD Credit Committee. If the World Bank has any issues or notes any deficiencies, BRD will be informed, in writing, about details of the World Bank's assessment and any remedial actions required. If any remedial actions are required, BRD shall inform the bank how to address the noted issues or deficiencies. Once the issues have been adequately addressed, the World Bank may be asked for the second review. As for SACCOs, all sub-loans issued by banks can be subject to ex-post review, as decided by BRD and/or the World Bank.

27. Commercial banks will offer sub-loans at market interest rates. BRD will lend the financing received from MINECOFIN to commercial banks, charging a spread to cover its costs of administering and managing the wholesale window. This spread will be in addition to the spread that MINECOFIN will charge for taking the currency risk. Banks will charge the rates to their customers, taking into account the cost of funding, operational costs and an appropriate credit risk premium based on the credit risk assessment of the borrower. Pricing will effectively cover the cost and risks involved (currency risk and credit risk). As such, the offered rates will not introduce market distortions and credit cost to final beneficiaries will cover the associated risks and operations costs. [37] Extra care will be taken to improve transparency and ensure that the profit margins are minimal. Similar to SACCOs, commercial banks that wish to participate in the facility will need to submit a proposal to the REF outlining the specifics as to how they intend to utilize the sub-financing: for example, the estimated number and volume of sub-loans that will be provided by the bank from the sub-financing, the estimated number of households and SMEs that will receive sub-loans, and the range of interest rates that will be charged by the bank as well as the range of credit risk spreads.

28. Sub-loans to final borrowers will comply with the following criteria:

[37] OP10.00 does not allow subsidizing the interest rate from apex (BRD) to participating financial institutions (commercial banks, other financial intermediaries) or when BRD acts as a retail provider. This is also true of the on-lending interest rate from retail financial institution to final beneficiaries (household, business, or another actor). This as one of the principles underpinning the project design.

(a) Sub-loans to households

(i) National identity card is available for at least one household member asking for a sub-loan.

(ii) The household member has had an active account with the bank for the last six months.

(iii) The household member has good credit history and has borrowed from a bank and repaid on time.

(iv) The household member has capacity to pay back the loan within a period of up to 36 months.

(b) Sub-loans to SMEs

(i) Licensed with adequate ownership structure. Companies should be duly licensed for at least 18 months (with identification number assigned by tax authorities) and in compliance with local tax authorities. The owners and managers of the enterprise must be 'fit and proper'.[38] The company must be private (defined as more than 50 percent private ownership or private control).

(ii) Operating experience. Companies should have at least 18 months of operating experience including organization, management, staff and financial and other sources required for the efficient carrying out of its operations.

(iii) Profitable and creditworthy. Companies should be in a sound financial condition. Financial viability of a company will be determined based on its financial history, and its business plan, which should provide current and projected financial position[39].

(iv) Business need. Companies can document the need for solar system to be financed, for example, reduce cost of doing business, enable broadening of business scope or enable expansion to other areas and demonstrate potential for its efficient use.

(v) Good credit history. Companies have borrowed from a bank and repaid on-time.

(vi) Record keeping. Companies should maintain book-keeping records such as sales, purchases, receipts, and payments, and so on.

[38] 'Fit and proper' broadly means that the owners and managers are honest, experienced and qualified to operate the respective business.

[39] The financial position should show that the enterprise is profitable, with *adequate profit margins*. The projected financial position should show that the enterprise will maintain its profitability and adequate liquidity once the bank sub-loan is extended, and that its leverage will remain reasonable.

Window 3 - Direct lending to mini-grid developers

29. Window 3 will provide direct lending in local-currency from BRD to eligible mini-grid developers based on a business plan for a mini-grid project. The facility will provide developers with access to finance that is scarce in Rwanda and especially important to bring mini-grid projects to commissioning, when RBF becomes available from other donor-funded mini-grid programs. Mini-grids commonly require a combination of grant and debt financing for project development and to make electricity services affordable to customers. Current experience in Rwanda reveals that grants of up to 70 percent of capital expenditure of investment are necessary to keep end-user tariffs at affordable levels

30. The REF will provide 'bridge loan' and long-term financing for mini-grids. For example, the EnDev program provides subsidies of up to 70 percent of capital expenditure of mini-grids offering Tier 2 and above service levels, and €20 per connection for Tier 1 mini-grids. Because subsidies from EnDev are only released upon validation of connections at commissioning and within the first year of operations, the REF loan will be used as a 'bridge loan' until the grant funding becomes available, therefore unlocking essential financing that is required at pre-commissioning stages. The REF loan will also provide long-term financing beyond commissioning.

31. BRD will approve loans to developers based on a business plan for the mini-grid project. BRD will appraise the business plan and the eligibility and creditworthiness of the mini-grid developer (borrower), including an assessment of the financial viability of the project and capacity for debt service, in accordance with its normal credit risk appraisal and management procedures. The approval process will also require a prior review and no-objection by the World Bank before the presentation of the developer's loan application to the BRD Credit Committee. For mini-grid developers that would like to request financing from the REF and from any RBF program, an approval letter from the RBF program would be attached to the REF loan application. The letter will not only confirm preliminary approval of RBF grant funding for the mini-grid project, but also specify that grant monies will be paid directly from RBF program to BRD upon validation of connections. The results-based grant funding will be used to directly repay the corresponding amount of REF loan upon results-based grant proceeds and before any disbursement of dividends, or sale of shares.

32. Figure **1.*3*.** illustrates the process for mini-grid developers accessing the REF and RBF program financing.

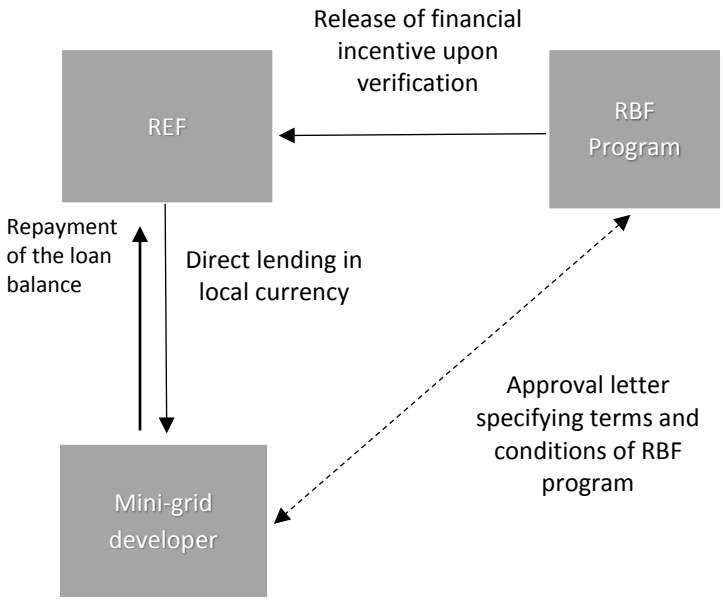


Figure 1.3. Mini-grid Application Process for REF/RBF Financing (EnDev and others)

33. Loans to mini-grid developers will be extended at market interest rates, considering cost of funding and operational cost, as well as an appropriate credit risk premium based on the credit risk assessment of the borrower. Loans will be extended in local currency to cover up to 75 percent of construction and will not exceed US$500,000 equivalent, with loan maturity tied to the individual project business case but probably in the three to eight year range, including up to 24 months' grace period. The REF will take the full credit risk in lending to mini-grid developers, and there will be no penalties for pre-payment of loans.

34. Financing will be provided to eligible mini-grid developers that comply with the following established eligibility criteria. Once pre-qualified, mini-grid developers will be expected to meet the eligibility criteria at all times.

(a) **Licensed with adequate ownership structure**. Companies should be duly licensed for at least two years and with identification number assigned by tax authorities. The owners and managers of the enterprise must be 'fit and proper'.

(b) **Profitable and creditworthy**. Companies should be in a sound financial condition. Financial viability of a company/investor will be determined by BRD based on its financial history, and its current and projected financial position.[40]

[40] The financial position should show that the enterprise is profitable, with *adequate profit margins*. The projected financial position should show that the enterprise will maintain its profitability and adequate liquidity once the BRD loan is extended, and that its leverage will remain reasonable.

(c) **Adequate operating experience**. They should have prior operating experience and organization, management, staff and financial and other sources required for the efficient carrying out of their operations.

(d) **Adequate contribution to cover mini-grid cost**. Companies/investors must be ready to contribute 25–30 percent (or more) in equity,[41] as cash or in kind (fixed assets, properties, and so on), as validated by BRD. A meaningful portion of the contribution must be either first invested in construction or in a bank account, as validated by BRD before disbursement.

(e) **Adequate collateral**. Companies should provide adequate collateral or guarantees for the BRD loan as per BRD requirements.

35. The eligibility criteria for mini-grid projects is as follows:

(a) **Minimum number of customers**. A mini-grid or a portfolio of mini-grids should provide Tier 1 and above electricity access (from Tier 1 to Tier 5) to at least 20 customers per site.

(b) **Renewable energy powered**. At least 75 percent of annual energy production in year 3 must be from renewable energy sources. While hybrid power generation (for example, renewable energy with diesel) are eligible for financing, the investment in non-renewable generation will not be covered by the direct lending window. The investment cost of any non-renewable energy generator should therefore be less than or equal to the amount of equity contributed by the developer plus any third-party finance mobilized by the developer.

(c) **Technically feasible and financially viable**. Technical and financial feasibility of mini-grid projects should be confirmed by a BRD-designated engineer. Mini-grid projects must comply with minimum technical standards or good practice guidelines with respect to performance, quality, and safety according to the OM.

(d) **In compliance with existing regulation**. Mini-grid projects must comply with the provisions of Regulation No. 01/R/EL-EWS/RURA/2015 governing the Simplified Licensing Framework for Rural Electrification in Rwanda and its subsequent amendments.

(e) **In compliance with World Bank safeguards**. Mini-grid projects shall be in compliance with the World Bank's Environmental Safeguard Framework and Resettlement Policy Framework, as well as with all applicable laws and regulations relating to health, safety and environmental protection.

(f) **Area not targeted for national grid supply**. The mini-grid project areas should be confirmed by EDCL as not targeted for national grid supply within five years. This requirement may not be necessary for mini-grids providing a pre-electrification level of

[41] Equity can be provided by investors or third parties before loan application to BRD.

service which will recover investment in a shorter period (loan maturity will be decided accordingly).

36. The REF will collaborate with other mini-grid programs to continue improving affordability of electricity from mini-grids. Besides the US$1.5 million EnDev, the REF will seek opportunities for collaboration with the recently launched SOGER, Energy and Environment Partnership (EEP), and Sustainable Energy for Africa (SEFA) that is being implemented by the African Development Bank (AfDB). Additionally, the BTC-funded Private Sector Participation in the Generation of Electricity from Renewable Sources Program will provide US$2 million technical assistance and capacity building support for BRD and mini-grid developers.

Window 4 – Direct financing of OSCs selling Tier 1 or higher solar systems on pay-as-you-go basis to households (OSCs -electricity services providers).

37. If activated, Window 4 will provide direct lending in local currency from BRD to eligible locally registered solar companies-electricity services providers[42] offering solar home systems to households, including delayed payment options and on-going maintenance services to its clients. A detailed assessment of active REF windows' performance will be conducted one year after project effectiveness to inform the activation of Window 4. The detailed performance assessment would look at, among other indicators: (a) total number of off-grid systems supported by the project to date (including the share of fully operational systems); (b) number of off-grid systems supported by each window to date; (c) implementation status of SACCOs' reform; (d) number of SACCOs, banks and mini-grid developers participating in the project; (e) amount of project funds disbursed to each window; (f) amount of funds onlent by SACCOs and the banks; and (g) performance of project-related loan portfolios of SACCOs and banks. The REF project OM, currently under preparation by BRD, will describe the process that will be followed to inform the decision of whether and when to activate Window 4.

38. If Window 4 is activated, then financing will be provided directly by BRD, based on BRD's credit risk appraisal and due diligence. Interest rates charged to the companies will take into account the rates, cost of funding, operational costs, and an appropriate credit risk premium based on the credit risk assessment of the borrower.[43] Pricing will effectively cover the cost and risks involved (currency risk and credit risk). As such, the offered rates will not introduce market distortions and credit cost to final beneficiaries will cover the associated risks and operations costs. Extra care will be taken to improve transparency and ensure that the profit margins are minimal. BRD's approval process will be as follows:

(a) OSC submits loan application to BRD.

[42] OSCs-electricity services providers are value-chain companies, where services include production/purchase of solar home systems, sales/distribution to interested clients providing longer-term payment options, and subsequent collection or payments on monthly basis for the solar equipment and its maintenance. The monthly payments cover the purchase cost of the solar home system, interest and fees related to maintenance and performance guarantees.

[43] OP10.00 does not allow subsidizing the interest rate from apex (BRD) to participating financial institutions (commercial banks, other financial intermediaries) or when BRD acts as a retail provider. This is also true of the on-lending interest rate from retail financial institution to final beneficiaries (household, business, or another actor). This as one of the principles underpinning the project design

(b) A specialized BRD credit officer reviews and confirms company eligibility and creditworthiness.

(c) If the review/appraisal by the BRD credit officer concludes that the request meets all eligibility criteria, a prior review and a no-objection by the World Bank is needed before the loan can be presented to the BRD Credit Committee.[44]

(d) Once the World Bank completes the review and provides the no-objection, the application can be presented to the BRD Credit Committee for the formal approval of financing.

39. Direct financing for OSCs will be extended in tranches. The draw-down tranche will be up to US$500,000 equivalent, extended to an OSC for up to 48 months, with up to 6 months of grace period. The funding will be used for allowing households to acquire solar home systems based on a delayed payment model. Once the OSC has used the tranche, it should specify to the REF the details on how it has been used and which households have been provided with delayed payment options. Once the report has been reviewed and approved, the OSC could apply for an additional tranche. The REF will take the full credit risk in lending to OSCs, and there will be no penalties for pre-payment of loans.

40. Interest rates charged to OSCs will be according to rates, based on REF credit risk appraisal of these companies and due diligence. The REF will lend to OSCs, charging a spread to cover its risk and costs of administering and managing the fund. This spread will be in addition to the spread that MINECOFIN will charge for taking the currency risk. The rates will take into account the cost of funding, operational costs and an appropriate credit risk premium based on the credit risk assessment of the borrower. Pricing will effectively cover the cost and risks involved (currency risk and credit risk). As such, the offered rates will not introduce market distortions and credit cost to final beneficiaries will cover the associated risks and operations costs. Extra care will be taken to improve transparency and ensure that the profit margins are minimal.

41. Financing will be provided to eligible locally registered OSCs that comply with the following established eligibility criteria. Once pre-qualified, OSCs will be expected to meet the eligibility criteria at all times.

(a) **Licensed with adequate ownership structure**. Companies should be duly licensed for at least 18 months (with identification number assigned by tax authorities) and in full compliance with relevant national regulations pertaining to tax, legal, and accounting norms. The owners and managers of the enterprise must be ‘fit and proper’.

(b) **Profitable and creditworthy**. Companies should be in a sound financial condition. Financial viability of a company will be determined based on its financial history and its business plan, which should provide current and projected financial positions.[45]

[44] If the World Bank has any issues or notes any deficiencies, the PIU will be informed, in writing, about details of the World Bank’s assessment and any remedial actions required.

(c) **Adequate funding**. Companies should have a defined funding strategy with no obvious gaps or constraints on additional funding and at least 18 months of providing financing/delayed payments to local end-users for off-grid solar products.[46]

(d) **Quality of operations**. Companies should have at least 18 months of operations at the functional level, including organization, management, staff,[47] and financial and other sources required for the efficient carrying out of their operations.

(e) **Adequate collateral/warranty**. Companies should provide adequate collateral or guarantees for the BRD loan as per BRD requirements.

(f) **Quality products**. Companies should have been selling Lighting Global quality or national quality standard-verified solar products up to 100Wp and/or solar home systems meeting relevant IEC standards between 100 Wp and 200 Wp with a list price no more than US$1,000.[48]

(g) **Warranty and after-sales service**. Companies must have an established and active after-sales service capability.

(h) **Collections and portfolio management**. Companies should have metrics and procedures to track portfolio quality and adequate collection practices.

(i) **Adequate accounting systems and management information and well-organized IT support**. Companies should have been providing good accounting, bookkeeping, management reports, and adequate system software support covering its delayed payments services.

(j) **Recycling**. Companies must have a policy and a plan for the recycling of system components at end of life, particularly batteries.

Component 2: Technical Assistance, Capacity Building, and Project Implementation Support (US$3.00 million)

42. This component will provide the necessary technical assistance and capacity building to BRD and participating entities (SACCOs, banks, and private companies engaged in off-grid electrification) as well as provide project implementation support to BRD that will host the facility. Technical assistance and capacity building will include, among others, the following activities: (a) capacity building and awareness workshops for SACCOs, banks and private companies engaged in off-grid electrification to facilitate

[45] The financial position should show that the enterprise is profitable, with *adequate profit margins*. The projected financial position should show that the enterprise will maintain its profitability and adequate liquidity once the BRD financing is extended, and that its leverage will remain reasonable.
[46] Consideration will be given to equivalent financing activities at a group level.
[47] Commitment/capacity to deploy skilled staff at the national level.
[48] National quality standards will be applied if those are acceptable to the World Bank, subject to regular independent verifications to ensure alignment with International Electrotechnical Commission (IEC) Technical Specifications.

partnerships between SACCOs, banks and the private sector; (b) technical assistance and capacity building for participating SACCOs and banks to ensure their successful partnerships with the private sector; (c) capacity building of participating SACCOs and banks to manage energy credit lines (including management, operational, and monitoring and evaluation capacities); (d) capacity building of Energy Division of BRD to manage direct energy lending; (e) technical assistance to BRD to develop a pipeline of mini-grids projects; (f) technical assistance and capacity building for BRD and participating entities on quality assurance and enforcement of technical standards for off-grid solar systems; and (g) public awareness campaigns to educate consumers on the benefits and opportunities of off-grid electrification.

43. Technical assistance activities will also cover gender aspects, including (a) monitoring Window 1 and Window 2 for the appearance of gender gaps in access to financial services for male and female applicants and enterprises for purchase and retailing of off-grid technologies to enhance development outcomes and economic opportunities; (b) identification of data sources and information to further understand the issues and barriers to financial services for off-grid technologies by gender, income level (with a focus on low-income households), rural or urban location, household headship, and other social dimensions; and (c) implementation of approaches and methods that off-grid market enablers (for example, BRD, SACCOs, and banks) could adopt and integrate to close gender gaps (for example, gender-sensitivity training for credit officers) related to access to financial services for the purchase of energy technologies in household or enterprise activities.

44. Project implementation support will include, among others, the following activities: (a) establishment of the PIU and provision of operational support to the PIU in the areas of project management, supervision, and monitoring; (b) outreach to key off-grid market enablers-potential direct project beneficiaries; (c) knowledge-sharing events between participating project entities; (d) sector-wide knowledge-sharing and project results dissemination workshops; (e) preparation of required studies related to the project, including impact assessment; (f) preparation of consolidated annual project audits; (g) financing of incremental operating costs; and so on. Cooperation opportunities with other donors (for example, BTC and SIDA) will be explored for co-financing the component.

ANNEX 2: IMPLEMENTATION ARRANGEMENTS

1. BRD will be the project implementing agency. For Component 1, BRD will function as a wholesale institution for Windows 1 and 2, as well as lend directly to mini-grid developers under Window 3 and locally registered OSCs under Window 4, if/when it is activated. BRD was assessed against the criteria put forward in World Bank OP10.00[49] and qualifies to be an intermediary for the credit line as well as a direct lending institution. The OP10.00 assessment is summarized in ANNEX 5. BRD will also be in charge of implementation of Component 2.

2. BRD's REF management functions include: (a) REF administration; (b) approval and supervision of REF subsidiary finance; and (c) fiduciary management. These functions include the following responsibilities.

REF Administration

3. REF administration will be covered by the REF PIU in BRD. The PIU functions include the following:

(a) Maintain relationships with MINECOFIN and the World Bank.

(b) Assist in reappraisal of the eligibility of the beneficiaries.

(c) Coordinate implementation of all active windows.

(d) Maintain relationships with the eligible beneficiaries.

(e) Sign Subsidiary Finance Agreements with eligible beneficiaries.

(f) Sign Sub-Loan agreements with eligible beneficiaries for tranche-based financing

(g) Sign Sub-Loan Agreements for larger sub-loans with PFIs for back-to-back financing of eligible SMEs for eligible solar system investment projects.

(h) Sign Sub-Loan Agreements with eligible Mini-grid Developers for eligible mini-grid projects.

(i) Provide reports to MINECOFIN and the World Bank necessary for the REF implementation reviews and take a lead in the REF impact assessments.

(j) Ensure integrity of procurement process.

(k) Ensure integrity of environmental screening.

(l) Ensure compliance with the World Bank's Anti-corruption Guidelines.

[49] OP 10.00 requires an assurance that all financial intermediaries in a World Bank financed credit line are viable financial institutions determined by: (a) adequate profitability, capital, and portfolio quality as confirmed by audited financial statements; (b) acceptable level of loan collections; (c) appropriate capacity, including staffing, for carrying out subproject appraisal (including environmental assessment) and for supervising subproject implementation; (d) capacity to mobilize domestic resources; (e) adequate managerial autonomy and commercially oriented governance; and (f) appropriate prudential policies, administrative structure, and business procedures.

Approval and Supervision of Subsidiary Finance

4. Approval and supervision of subsidiary finance will be covered by the Credit Line Section. The approval and supervision of subsidiary finance includes the following:

(a) Prepare and disseminate information about the REF credit line, terms and conditions of finance and eligibility criteria for beneficiaries, projects and solar equipment to all interested parties.

(b) Review and approve tranche finance to eligible beneficiaries for financing sub-loans that are below the free limit for each window.

(c) Free limits will be established for each eligible beneficiaries that is considered to be experienced in appraising and managing the credit risk and with adequate capacity to observe the rules in the OM. For subsidiary finance below the free limit, the approval of sub-loans to final beneficiaries will not require prior clearance by BRD or the World Bank. All sub-loans not subject to prior review can be subject to ex-post review by BRD or the World Bank to verify compliance.

(d) Before approving every new tranche for eligible beneficiaries, the Credit Line Section will verify that the approved tranche was used strictly following the OM, including eligibility of individual final beneficiaries, use of funds for solar equipment, following appropriate procurement procedures and observing of the safeguards set by the World Bank.

(e) For mini-grid projects, before approving the sub-loan the Credit Line Section will appraise the creditworthiness of mini-grid developer, the eligibility of the mini-grid project, and the capacity of the mini-grid developer to effectively implement the project following procedures specified in the OM.

(f) For SME projects above the free limit before approving the sub-loan, the Credit Line Section will review the SMEs and project appraisal executed by PFIs ensuring that the PFIs have followed the procedures and eligibility criteria specified in the OM.

(g) Ensure that funds under all four windows are used for eligible expenditures. Funding that is not used for eligible expenditures should be reimbursed.

(h) Monitor that eligible beneficiaries are supervising with due diligence their sub-loans to final beneficiaries.

(i) Supervise that sub-loans under all four windows are made to eligible beneficiaries in accordance with agreed criteria specified in the OM, and that procurement, disbursement, environmental and other requirements are adhered with by all eligible beneficiaries. The supervision responsibilities include all subsidiary finance (fee-limit and non-free limit).

(j) Prepare, in an agreed format, monthly and quarterly written reports to the World Bank on disbursements, sub-loan repayments and compliance with the OM and the legal documents pertaining to the REF credit line implementation.

(k) Prepare, in an agreed format, written reports to the World Bank on progress made in achieving the REF objectives (semiannually or annually, as specified for each item)

Fiduciary management

5. Fiduciary management will be covered by the REF PIU Financial Management Section. Fiduciary management cover the following:

(a) Maintain an FM system in accordance with the World Bank requirements

(b) Maintain the Designated Account, prepare withdrawal applications, maintain the local project account, and maintain summary records of the flow of resources.

(c) Make disbursements to eligible beneficiaries on time against appropriate documents (to evidence the use of funds and procurement aspects).

(d) Arrange and monitor repayments of interest and principal from all participants in all four windows. The Finance Unit should inform the Credit Line Section promptly on any non-receipt or overdue payments from the REF participants requiring further action.

(e) Make arrangements for external audits of the project financial statement and records, including the Designated Account and Statements of Expenditures.

(f) Prepare and submit to the World Bank not later than 45 days after the end of each quarter, unaudited interim financial reports (IFRs) for the REF covering the past quarter, in the form and substance satisfactory to the World Bank.

(g) Prepare other respective quarterly, semiannual and annual FM reports.

(h) Plan and manage the procurement process of activities related to technical assistance and Component 2.

6. BRD will host the PIU to successfully fulfil the functions described above. The PIU will be responsible for monitoring indicators and supervising the credit lines and direct loans, as well as the implementation of the necessary technical assistance to the beneficiaries. This includes collecting necessary information from project beneficiaries, assessing and monitoring SACCOs and bank compliance with the respective eligibility criteria, supervision of withdrawal applications and loan books, and reporting on progress during implementation. BRD will also review annual audited financial statements of the intermediaries and conduct periodic on-site supervision to assess compliance and progress. SACCOs and banks will report to BRD on their sub-loan portfolio on a semi-annual basis. To do so, the PIU will have personnel with experience in off-grid energy, project management, procurement, accounting, environmental and social management. Additionally, the PIU will undertake technical due diligence of proposals for mini-grid financing and, if necessary, direct lending to OSCs with support from specialized technical consultants, institutions with experience in the off-grid energy sector (for example, EDCL) and donor programs (for example, EnDev or other RBF program). BRD will receive capacity building and technical assistance to enhance its performance and project implementation capacity.

7. A Steering Committee will be established for effective coordination and project oversight. MININFRA/REG, MINECOFIN, and BRD will be members of the Steering Committee for the project, with the World Bank as an observer; other key energy sector stakeholders could be invited to the Steering Committee meetings if necessary. The Steering Committee will meet at least every six months, or as needed, during project implementation to review implementation progress, discuss emerging challenges, and identify mitigating measures. Key basic functions of the Steering Committee will include:

(a) monitor project implementation progress; (b) identify and address challenges with participating entities; and (c) approve changes to the project OM. The terms of reference of the Steering Committee, including responsibilities and composition, will be stipulated in the OM. The first meeting of the Steering Committee is expected in October 2017.

Financial Management, Disbursements, and Procurement

8. An FM assessment of the project was carried out in accordance with the 'Financial Management Manual for the World Bank-Investment Project Financing Operations' dated March 1, 2010, OP/BP 10.00 and the 'Guidance Note on the Financial Intermediary Financing'. The objective of the assessment was to determine whether the BRD has acceptable FM arrangements, which will ensure: (a) that funds are used for the intended purposes in an efficient and economical way; (b) the preparation of accurate, reliable and timely periodic financial reports; and (c) safeguarding of the entity's assets. The FM assessment considered the degree to which: (a) the budgeted expenditures are realistic, prepared with due regard to relevant policies, and executed in an orderly and predictable manner; (b) reasonable records are maintained and financial reports produced and disseminated for decision-making, management, and reporting; (c) adequate funds are available to finance the project; (d) there are reasonable controls over project funds; and (e) independent and competent audit arrangements are in place. The assessment concluded that BRD has adequate FM systems as required by OP/BP 10.00.

9. The overall FM risk for the Project is Moderate and the proposed risks mitigation measures are: (a) the training of the BRD FM staff on World Bank FM procedures and (b) the upgrade of the Oracle (Enterprise Resource Planning) to manage the project financial transactions.

Country System and Use of Country System

10. Rwanda's public FM system is anchored in:

(a) The 2003 Rwanda Constitution revised in December 24, 2015, Articles 162 to 166;

(b) The Organic Law No. 12/2013 of 12/09/2013 on State Finances and Property that establishes principles and modalities for sound management of state finances and property. The organic law applied to all budget entities at the central and decentralized levels and sets up fundamental public finance management principles as comprehensiveness, transparency, accountability, uniformity, consolidation and gender balance in public state finance management;

(c) The Ministerial Order No. 001/16/10/TC dated 26/01/2016 on financial regulations that regulates the structure and functioning of public FM, the preparation and implementation of the state budget; the accounting and reporting of all financial transactions, and the financial control. The order applies to the management of public finances of all public entities including the Central Government entities, decentralized entities, public institutions and subsidiary entities;

(d) Government Accounting Policies Manual; and

(e) The Articles 165 and 166 of the Rwanda revised Constitution and the Law No. 79/2013 of 11/9/2013 determine the mission, organization and functioning of the Office of the Auditor General of State Finances.

11. The public FM system has gone through a series of reforms since 2008 guided by the Public Financial Management Sector Strategy Plan (PFM-SSP) 2008–2012 and the PFM-SSP 2013–2018. At the national level, progresses have been made in budget planning, expenditures efficiency, enhancement of the internal audit function, external audit coverage, and financial reporting. The Public Expenditure Financial Accountability Assessment 2015 (2011 methodology) confirmed these strengths. Nevertheless, areas of weaknesses pertain to weak consultative approach in the budget preparation, access to fiscal information, and lack of qualified PFM staff. At the district level, these weaknesses are exacerbated and result in adverse or qualified audit opinions on the financial statements even though some improvements were noted recently at some district level like City of Kigali. To address these weaknesses, policies reforms and initiatives headed by the GoR and supported by development partners (Public Financial Management Basket Funds and PforR Public Sector Governance - P149095) are ongoing to strengthen the public FM system at the central and decentralized levels. The Local Government Public Expenditure Financial Accountability Assessments are ongoing in eight pilot districts, and the conclusions will nurture ongoing and future reform. As result of the above strengths, the project's arrangements will rely on the existing public FM system at the central and decentralized levels with some amendments to take into accounts the project's and the World Bank's FM requirements.

12. The state-owned enterprises generally apply the International Financial Reporting Standards and adopt an accounting information system that meets their specific needs as companies similar to private sector entities.

Table 2.1. Risk and mitigation measures

Risk	Risk Mitigating Measures Incorporated into Project Design	Residual Risk Rating	Implementation
Inherent risk		**Moderate**	
Country level Lack of qualified public FM staff, and adverse or qualified audit opinion at the districts	Implement the public FM reform agenda with the support of the World Bank and others donors. The World Bank-financed project (P149095, Public Sector Governance) is supporting the design of the PFM Learning and development strategy and accountability	Moderate	Implementation
Entity level BRD is not experienced in the World Bank-financed projects management	Develop clear Project Implementation Manual and capacity building plan	Substantial	Implementation
Project level The project involves various beneficiaries and monitoring could be challenging	Describe the role and responsibility of each stakeholder in the OM	Substantial	Implementation
Control risk		**Substantial**	
Budgeting Delay in preparing yearly budget and inappropriate monitoring of budget execution resulting in delay in achieving project's objectives. Unreliable budget forecast	Follow strictly the budget preparation policies and procedures described in the Finance Manual. Ensure that the annual work plan and budget is in line with the funds needs from the beneficiaries and the Procurement Plan to prevent any delays due to the procurement process. Track budget variances and take proactive decisions.	Substantial	Implementation
Accounting Delay in recording the project's transactions BRD's financial statement not directly derived from Oracle without manual retreatment could lead to unreliability	Dedicate FM and accountant to project activities. Provide training on the World Bank financed project FM. Upgrade the Oracle system to record project transactions and produce directly the financial statement.	Moderate	Preparation / implementation

Risk	Risk Mitigating Measures Incorporated into Project Design	Residual Risk Rating	Implementation
Internal controls and internal audit Lack of clear definition of responsibility	Rely on BRD internal control system and ensure that the Project Implementing Manual build on the existing internal control system.	Moderate	Preparation / implementation
Funds Flow Risk of delay in the disbursement of the funds	Open a Designated Account at the Central Bank in U.S. dollar Appoint on time the Designated Account and the Withdrawal Application signatories.	Moderate	Implementation
Financial reporting and monitoring Unreliable IFRs and delay in submitting the IFRs	Agree on the IFR format built on International Financial Reporting Standards financial information presentation characteristics.	Moderate	Implementation
External auditing Delay in submitting the audit report and inadequate audit opinion	Recruit an audit firm reputable internationally and ensure periodic rotation.	Moderate	Implementation
Fraud and corruption Risk of fraud and corruption in the contracts management at the districts	Ensure that the grievance redress mechanism and social accountability are part of the project.	Moderate	Preparation / implementation
Overall risk		**Moderate**	

Strengths in Internal Control

13. Existence of acceptable manual of procedures and qualified FM staff. Existence of an internal audit function with qualified staff and applying the Institute of Internal Audit standards.

Weaknesses and Action Plan to Reinforce the Control Environment

Table 2.2. Significant weaknesses or risks

Significant Weaknesses or Risks	Actions	Responsible Agency	Completion
Inexperienced FM staff in World Bank financed projects FM procedures	Training on World Bank FM procedures	BRD	Before effectiveness and throughout the project implementation

Staffing

14. The BRD FM staff are qualified. The Finance Control Division is endowed with qualified accountants (Association of Chartered Certified Accountants or Certified Public Accountants). An Accountant will be dedicated to the bookkeeping of the project transactions. The review and approval procedures will be according to the BRD procedures as described in the Finance Manual.

Budgeting Arrangements

15. The project budget preparation procedures will build on the BRD budgeting policies. Not later than the third week of September, each budget center prepares its annual budget based on a sound work plan, assumptions and Procurement Plan. This will require a close collaboration between the Division in Charge of Finance, the Division in Charge of Energy investment and the Department in Charge of Strategy and Planning. The project budget will be included in the BRD overall budget approved by the Board of Directors on December 15, 2016. The Annual work plan and budget shall be submitted to the World Bank for no-objection. The BRD Medium Term Expenditures Framework will be updated to include the project expenditures.

16. The approved budget will be monitored on a monthly and quarterly basis by the preparation and analysis of the budget execution report including: (a) budget for the period, and for the year; (b) actual expenditure for the period and to date; (c) future expenditure commitments; and (d) balance of period budget remaining (actual expenditure and commitments together are compared to the period budget).

17. On a monthly, basis not later than the first week of the month following the month monitored, a meeting between the Treasury and Budget Unit/Department of Finance and the budget centers shall be held to analyze and explain any slack or override identified and then agree on, document and report it.

18. The Treasury and Budget Unit / Department of Finance presents the budget monitoring report to the Asset and Liability Committee on a monthly basis by the second week of the month following the

month reported. Quarterly, the management presents the consolidated Budget Monitoring Report and measures taken to the Board of Directors before the end of the month following the quarter reported.

Accounting Arrangements

19. The project FM will comply with the International Financial Reporting Standards. These standards are considered acceptable to record and report the project's financial transactions. BDR Financial Control Division is in charge of ensuring that the standards are well applied with the aim of producing reliable financial information for internal monitoring and accountability and providing timely information for decision making to stakeholders.

20. An Integrated Financial Management Information System (Oracle) is in use and covers all FM cycles (budgeting, accounting, and fixed asset management). Nevertheless, the financial statement is not derived directly from the system without manual retreatments. The proposed project will use the same system that will be upgraded not later than one month after the singing of the Financing Agreement.

Internal Control and Internal Auditing

21. The initiation, review, approval, payment, record and documents classification and archive procedures will be according to the BRD procedures as described in the Finance Manual. These procedures comprise a clear segregation of duties and cover all FM cycles. The procedures will be complemented by the project OM and the World Bank disbursement guidelines.

22. The Internal Audit function uses risk-based audit approach and the Institute of Internal Audit standards. The function is well staffed with qualified accountants (one Chief Internal Auditor and four Internal Auditors). The project will be included in the internal audit work plan following the said risk-based approach. The project internal audit report will be submitted to the Audit Committee for review and decision. The quarterly report will be shared with the World Bank for information and advice. An action plan to address the audit findings shall be designed and monitored by the Internal Audit and the Audit Committee.

Funds Flow Arrangements

23. The flow of funds arrangement (Figure 2.1) will be similar to the ones adopted for the majority of the ongoing projects of a similar nature in Rwanda in that the project will receive funds from IDA. The IFR-based method will be used. BRD will forecast the cash flow need for the next six months and prepare the financial report that will support the request of funds. The World Bank will review the quality of the report and the soundness of the cash flow forecast before providing the approval of the funds release.

24. A Designated Account will be opened at BNR in U.S. dollar to receive funds from the World Bank. MINECOFIN will officially communicate to the World Bank the name and signatures of the BRD staff appointed as signatories of the Withdrawal Application. Payments and on lending shall be made from the Designated Account to the beneficiaries following the BRD procedures and the PIM. For

payment or on lending in Rwanda francs, BRD will request BNR to transfer funds to beneficiaries in Rwanda francs and the equivalent in U.S. dollars will be debited on the Designated Account.

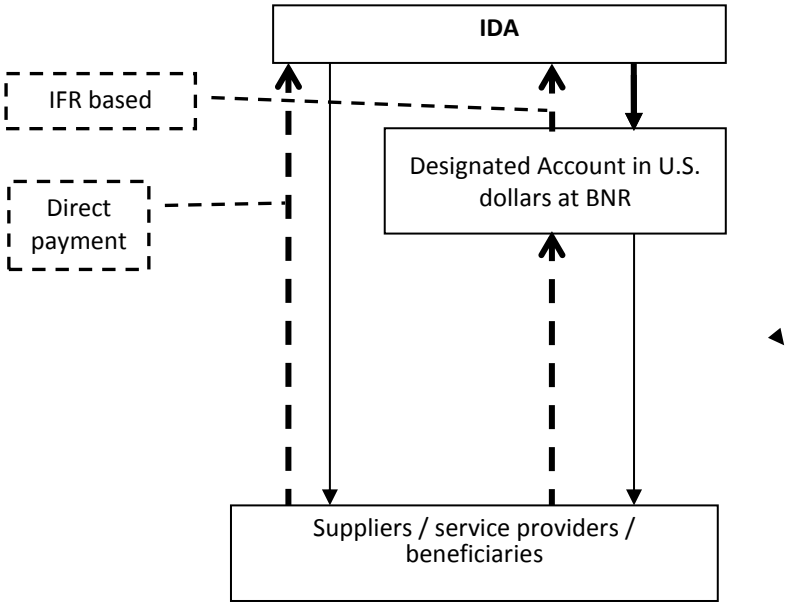
25. Given the short-, medium-, and long-term trend of exchange rate fluctuation and depreciation (U.S. dollar/Rwanda franc), the mission agreed that a project account in Rwanda francs will not be opened at this stage.

26. The methods of disbursement are, advance, reimbursement, direct payment, and special commitment. For reimbursement, funds will flow from the World Bank into a separate account that forms part of the BRD or the GoR treasury account.

27. During the project implementation, repayment of loan by beneficiaries will be done in Rwanda francs in a separate account. The first option is that a portion of the funds will be used by BRD to repay MINECOFIN and any remaining funds will be used by BRD for revolving onlending for the purposes of the facility. The second option is the BRD uses all funds for future onlending and MINECOFIN is not repaid by BRD on funds retroceded. The final decision shall take into account the pros and cons of each option. The final option shall be mentioned in the subsidiary agreement signed between the BRD and MINECOFIN. Independent of the chosen option, BRD commits to using the reflows solely for the purpose of revolving onlending and repayments to MINECOFIN.

28. The Financing Agreement is signed in U.S. dollars; disbursement is made in U.S. dollars. Agreement is reached that funds will be retroceded to BRD in Rwanda francs meaning that MINECOFIN takes the responsibility to bear the exchange rate risk.

Figure 2.1. Flow of Funds



Legend	*Transfers of funds* *Flow of documents* *Payment to suppliers*	

Table 2.3. Cost by Disbursement Category

Category	Amount of the Financing Allocated (Expressed in U.S. dollar)	Percentage of Expenditures to be Financed (Inclusive of Taxes)
(1) Subsidiary Credit Lines and Direct Loans under Part 1 of the Project	45,940,000	100%
(2) Goods, consulting services, non-consulting services, Operating Costs and Training under Part 2 of the Project	3,000,000	100%
Total	**48,940,000**	**100%**

Financial Reporting Arrangements

29. BRD will prepare quarterly financial report submitted to the World Bank within 45 days after the end of the calendar quarter and shall include:

(a) Sources and uses of funds (revenues and expenditures statement);

(b) Financial position statement;

(c) Cash flow statement;

(d) Budget execution report;

(e) Notes on accounting policies; and

(f) Designated Account activity statement.

30. Financial statements shall be prepared in accordance with the International Financial Reporting Standards and will also be consolidated in the BRD quarterly report submitted to the Board and the external auditor.

External Auditing Arrangements

31. The project annual financial statements will be audited in accordance with International Standards on Auditing (ISA). Audit reports will be produced on the financial statements for the project and will be submitted to the World Bank within six months following the end of the accounting year.

32. The audit report should be inclusive of a Management Letter setting out any internal control strengths and weaknesses and external auditor recommendations.

33. The project's financial information shall be also consolidated into the BRD accounts audited by the external auditors.

34. The arrangements for the external audit of the financial statements of the project should be agreed through terms of reference. Appropriate terms of reference for the external auditor were developed and agreed with the World Bank.

35. In line with the new access to information policy, the project will comply with the World Bank disclosure policy of audit reports (for example, make publicly available) promptly after receipt of all final financial audit reports.

Financial Management Conditions and Covenants

36. Financial covenants are summarized as follows:

Table 2.4. Financial Management Conditions and Covenants

Action	Date due by	Responsible
Upgrade Oracle	One month after signing of the Financing Agreement	BRD
Formally dedicate FM staff in charge of project FM management	Before the singing of the Financing Agreement	BRD

Conclusions of the FM Assessment

37. The overall residual FM risk is considered Moderate. The proposed FM arrangements for this project are considered adequate and meet the World Bank's minimum fiduciary requirements under OP/BP10.00.

Procurement

38. This project primarily deals with loans made by eligible financial intermediaries, for which the final recipient of loan funds is a private borrower. However, the project will also provide technical assistance, capacity building, and project implementation support.

39. For **Component 1** (Line of Credit and Direct Financing for Off-grid Electrification), the World Bank's NPF excludes such finance from the use of World Bank procurement framework.

40. For **Component 2** (Technical Assistance, Capacity Building, and Project Implementation Support), procurement for the proposed component of the project would be carried out in accordance with the World Bank's Procurement Regulations for IPF borrowers – 'Procurement in Investment Project Financing, Goods, Works, Non-Consulting, and Consulting Services', dated July 2016 and 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants', revised as of July 1, 2016; and the provisions stipulated in the Legal Agreement.

41. **The Project Procurement Strategy for Development (PPSD)** has been prepared for Component 2. The project procurement mainly depends upon the critical consultancies envisaged through the project. After careful evaluation of various options for procurement approach and contracting strategy, hybrid contracting mode (lump sum and time based) was found to be the most appropriate approach and fit for purpose for the project. This approach ensures optimal utilization of resources and value for money. Duly considering the nature of capacity building to be provided to SACCOs, a single service provider will be selected to gain the advantage of economy of scale and to make a viable proposition for international participation. To monitor the progress of various initiatives and to ensure smooth coordination between different agencies and resolve issues that may arise during implementation stage, a multi-tiered institutional monitoring mechanism may be set-up through a Project Management Information System.

42. **Procurement risk assessment.** A procurement risk assessment of the BRD to implement the proposed activities under Component 2 has been carried out. The overall procurement risk rating is deemed *moderate* on the basis of availability of modern and robust procurement management policy and procedure and adequate internal audit unit.

43. **Operating costs.** Incremental recurrent expenditures incurred on account of project implementation, based on periodic budgets acceptable to the World Bank, including, *inter alia*: travel expenditures and other travel-related allowances such as per diems and reasonable accommodation costs; equipment rental and maintenance; vehicle operation (including fuel); local support to BRD in the areas of project management, financial management, procurement, and social/environmental

safeguards; etc. Operating expenditures may follow the BRD procurement procedures. Operating cost will not include salaries of civil servants.

44. **Post review ratio.** Contracts not subject to World Bank's prior review will be post reviewed by World Bank's implementation support missions and/or during regular post-reviews by procurement assistants on a sampling basis (that is, one out of every five contracts). The post review ratio is 20 percent. Procurement supervision mission would be carried out by the World Bank to include: (a) review of procurement plan; and (b) physical inspection of consultant's reports (outputs). There would be one supervision mission every year to carry out post review of procurement actions.

45. **Filing and records keeping.** The BRD will be in charge of filling and record keeping.

46. **Procurement plan.** A Procurement Plan for Component 2 has been prepared for the first 18 months of the project. The Procurement Plan includes the various procurement or consultant selection methods, the estimated costs, prior review requirements, and time frames. The procurement plan discloses the prior review thresholds.

47. The terms of reference for consulting assignments (individual and firm) and technical specifications of procurement packages are subject to prior review of the World Bank. All cancellation of selection process and/or re-invitation shall be subject to World Bank's prior review. All the contracts where the cost estimate was below the World Bank's prior review threshold are subject to prior review if the financial offer of the selected firm exceeds such threshold at the proposal evaluation stage. Irrespective of the thresholds, the selection of all consultants (firm and individuals) hired for legal work or for procurement activities, as well as the individual hired for long-term technical assistance or advisory services for duration of the project (or most of it) are subject to prior review.

48. The Procurement Plan will be updated at least semiannually or as required to reflect the actual project implementation needs and improvements in institutional capacity. The Procurement Plan and its updates or modifications, shall be subject to the World Bank's prior review and no objection before implementation.

49. In accordance with paragraph 5.9 of the 'World Bank Procurement Regulations for IPF Borrowers' (July 2016) (Procurement Regulations) the World Bank's Systematic Tracking and Exchanges in Procurement (STEP) system will be used to prepare, clear and update Procurement Plans and conduct all procurement transactions for the project.

50. with The Procurement Plan for the Project consists of the descriptive part, along with the tables in STEP. The following conditions apply to all procurement activities in the Procurement Plan. The other elements of the Procurement Plan as required under paragraph 4.4 of the Procurement Regulations are set forth in STEP.

51. **World Bank's Standard Procurement Documents.** The World Bank's Standard Procurement Documents shall be used for all contracts subject to international competitive procurement and those contracts as specified in the Procurement Plan tables in STEP.

52. **National Procurement Arrangements.** In accordance with paragraph 5.3 of the Procurement Regulations, when approaching the national market (as specified in the Procurement Plan tables in STEP), the country's own procurement procedures may be used.

53. All Consultancy Services shall be procured following Procurement Regulations and World Bank's Standard Procurement Documents (SPDs).

54. When the Borrower uses its own national open competitive procurement arrangements as set forth in the Public Procurement Law of Rwanda, such arrangements shall be subject to paragraph 5.4 of the Procurement Regulations and the following conditions: '*In accordance with paragraph 5.3 of the Procurement Regulations, the request for bids/request for proposals document shall require that Bidders/Proposers submitting Bids/Proposals present a signed acceptance at the time of bidding, to be incorporated in any resulting contracts, confirming application of, and compliance with, the World Bank's Anti-Corruption Guidelines, including without limitation the World Bank's right to sanction and the World Bank's inspection and audit rights.'*

55. **Leased Assets** as specified under paragraph 5.10 of the Procurement Regulations: Leasing may be used for those contracts identified in the Procurement Plan tables: **Not Applicable**.

56. **Procurement of Second Hand Goods** as specified under paragraph 5.11 of the Procurement Regulations – is allowed for those contracts identified in the Procurement Plan tables: **Not Applicable**.

57. **Domestic preference as specified under paragraph 5.51** of the Procurement Regulations *(Goods and Works)*: **Not Applicable.**

58. **Hands-on Expanded Implementation Support (HEIS) as specified under paragraphs 3.10 and 3.11** of the Procurement Regulations: **Not Applicable**.

59. **Other relevant procurement information.** The table below depicts the Procurement Arrangements and thresholds for World Bank's review to be used under the REF project.

Table 2.5. Thresholds,[a] Procurement Methods, and Prior Review

Goods, Works, and Non-Consulting Services

Method of Procurement	Thresholds for Method (US$ equivalent)
Open International (Goods)	≥ US$4 million
Open National (Goods) – Open Tender as per Ministerial Order 2014	< US$4 million and > US$2,500
RFQ (Goods)	< US$2,500 or as stipulated in Rwanda Procurement Regulations
Open International (Works)	≥ US$15 million
Open National (Works) - Open Tender as per Ministerial Order 2014	< US$10 million
RFQ (works)	< US$2,500 or as stipulated in Rwanda Procurement Regulations
Open International (Non-consulting Services)	≥ US$2 million
Open National (Non-consulting Services) - Open Tender as per Ministerial Order 2014	< US$2 million
Direct Contracting	No threshold; meet requirements of Bank's Procurement Regulations

Note: a. Shall meet the requirements as stated in Regulations

(Special procurement arrangements like direct contracting, use of SOEs, UN Agencies, third party monitors, local NGOs, Force Account, servants need, results based arrangements. It is not expected that there will need for prequalification in the procurement arrangements under REF project)

60. **Selection methods of procurement of Consultants' Services (Firms).** The Approved Selection Methods as reflected in the Section VII of the procurement regulations.

Table 2.6. Selection of Consultants

Method of Procurement	Thresholds for Methods
Quality and Cost Based Selection (QCBS)	As per requirements of para 7.3 of the Regulations
Quality Based Selection (QBS)	As per requirements of para 7.8 to 7.10 of the Regulations
Selection based on a Fixed Budget (FBS)	As per requirements of para 7.4 and 7.5 of the Regulations
Selection Based on Least Cost Basis (LCS)	As per requirements of para 7.6 and 7.7 of the Regulations
Selection based on Consultant's Qualification (CQ)	As per requirements of para 7.11 and 7.12 of the Regulations
Direct	Must meet the requirements of Para 7.13 to 7.15 of the Regulations, and with prior agreement in PP with the World Bank.

61. The short list may consist of all National consultants in case the estimated cost is less than US$300,000.

62. **Procurement methods for Selection of Individual Consultants (IC).** The Approved Selection Methods as reflected in the Section VII of the procurement regulations.

Table 2.7. Procurement Methods and Thresholds* for Individual Consultants

Method of Procurement	Thresholds for Methods
Open Competitive Selection	As per requirements of para 7.36 and 7.37 of the Regulations
Limited Competitive Selection	As per requirements of para 7.38 of the Regulations
Direct	Must meet the requirements of Para 7.39 of the Regulations, and with prior agreement in Procurement Plan with the World Bank

**Shall meet the requirements as stated in Regulations*

63. **Prior Review Thresholds:** The details of the Procurement review / oversight are defined in the Annex II of the Regulations for borrowers. The following would be subject to Prior review of the World Bank regardless of the Method of selection:

(a) **Consulting Firm**: First procurement under the project irrespective of value and all procurements estimated to cost more than US$1 million; and

(b) **Individual Consultant**: all procurements estimated to cost more than US$0.3 million.

64. Terms of Reference for all consultant contracts shall be furnished to the World Bank for prior review and No Objection.

65. These thresholds are for the purposes of the initial procurement plan for the first 18 months. The thresholds will be revised periodically based on re-assessment of risks. All contracts not subject to prior review will be post-reviewed.

66. Pre-qualification**: Not expected for the packages of works/goods**.

67. Proposed Procedures for CDD Components**: Not Applicable.**

68. Reference to (if any) Project Operational/Procurement Manual**: BRD own Procurement Procedure shall be used.**

69. Any Other Special Procurement Arrangements: **Not Applicable.**

Table 2.8. Procurement Plan for first 18 months

Ref. No.	Description of Assignment	Estimated Cost (US$)	Selection Method	Review by World Bank (Prior / Post)	Expected Proposals Submission Date
01	Capacity building for SACCOs	750,000	QCBS	Post	August 2017
02	Capacity building for banks	50,000	ICS	Post	August 2017
03	Public awareness campaign	500,000	QCBS	Post	March 2018
04	Mini-grids market and technologies advisory	80,000	CQS	Post	December 2017
05	Off-grid solar PV market advisory	80,000	CQS	Post	December 2017
06	Financial management consultant (local expert)	60,000	ICS	Post	September 2017
07	Procurement consultant (local expert)	60,000	ICS	Post	September 2017
08	Social and environmental consultant (local expert)	60,000	ICS	Post	September 2017
09	External audit / others	20,000	LCS	Post	June 2018
10	IT equipment	20,000	ICB	Post	September 2017
11	Software purchase	10,000	ICB	Post	September 2017

Environmental and Social (including Safeguards)

70. World Bank policies OP/BP 4.01, OP/BP 4.04, OP/BP 4.11, and OP/BP 4.12 are the only safeguard policies triggered by the project in light of environmental and social risks from proposed activities. To ensure proper assessment and mitigation of the potential adverse environmental and social impacts of activities under the project, an ESMF and RPF have been prepared for guiding the implementing agency on how to address any environmental and social impacts of project investments. Whereas the subprojects safeguard instrument (RAPs and ESMP) will be prepared and implemented by fund beneficiaries, BRD will be responsible for appraising and approving subprojects, organizing the management and implementation of subprojects, and supervising the implementation of subprojects, including the implementation of safeguards activities.

71. BRD is implementing a robust social and environmental policy prepared in 2013 and an Environmental and Social Management System, which is compliant with the Rwandese regulatory framework that pertains to the environment, land use, labor health and safety issues, vulnerable and marginalized groups, and cultural artifacts. BRD is well equipped with professionals who, over the years, have received training in environmental and social risk management and, therefore, should be up to the task under the proposed project. However, BRD may have to hire additional staff and dedicate them to the proposed project. BRD will appoint social safeguards and environmental safeguards officers who will be responsible for supervising the implementation of safeguards instruments and ensure that activities comply with ESMF/RPF and, if necessary, an ESMP/RAP will be developed as appropriate.

72. The main environmental, health and safety concerns are likely to be associated with recycle and disposal of spent batteries at the end of their useful lives, which is usually three–five years after deployment. Rechargeable batteries for storing solar energy may run on Ni-Cad, NiMH, Li-ion, Pb-A, or Pb-gel. These batteries should not be disposed in standard landfills because they can create long lasting environmental and human health impacts (for example, headaches, abdominal discomfort, seizures and comas, cancers, irritation of skin and respiratory system, burns and damage to skin and eyes, and corrosion) largely due to the heavy metals such as mercury, lead, cadmium and nickel, and acids. The entire management processes including demanufacturing, collection, storage, recycling, transport and disposal may present a challenge to this project, given the scope of this World Bank operation. In view of anticipated challenges associated with recycling and disposal of spent batteries, the World Bank's Environmental Assessment operational policy (OP/BP 4.01) is triggered, and appropriate safeguard instruments have been prepared, consulted upon and disclosed on April 13, 2017. Because, at this stage of project design, the specific types of subprojects and sites remain unidentified, the recommended safeguard instrument was an ESMF, which was prepared and disclosed in-country and at the World Bank on April 13, 2017.

73. The installation of solar systems under the project will not lead to land acquisition given that the installation will take place within existing households and public facilities. However, the construction of mini-grid systems may lead to some insignificant acquisition of land. Thus, the World Bank's operational policy on Involuntary Resettlement (OP/BP 4.12) is triggered. Because not all subproject sites for mini-grid systems can be identified in advance, a Resettlement Policy Framework (RPF) has been prepared and disclosed by BRD and the World Bank on April 13, 2017. Based on the RPF guidance, each subproject will be screened, and if Resettlement Action Plans (RAPs) are found to be necessary, these will be

prepared, cleared, disclosed, and implemented before the commencement of civil works, in accordance with World Bank OP 4.12.

74. While it is recognized that undertaking pipeline project development should not result in any environmental risk or social impact per se, not only the project and the financial intermediaries, but also the off-grid solar and mini-grid developers, will prepare the appropriate site-specific safeguard instruments (for example, ESIA/ESMP/RAP) once the specific locations and subprojects under Components 1 and 2 are determined. These documents will be consulted upon, cleared and disclosed in-country and by the World Bank.

75. BRD also works with REMA, which has experience working in close collaboration with the World Bank and could support with compliance issues. In addition to World Bank support on safeguards, BRD should be able to fully comply with safeguards policies triggered while ensuring due diligence for safeguards in general. Rwanda will develop a project-specific ECOP as a guidance on approach for the collection, transport, storage, and disposal of spent batteries, with the aim of ensuring that risks to the environment and human health are prevented or mitigated. Apart from providing approaches to the management of spent PV batteries, such an ECOP will also seek to inform discussion and build awareness of all stakeholders, including rural community members, vendors/suppliers of products and service providers, around safe management of used batteries.

76. The World Bank task team will regularly include environmental and social development specialists during implementation support missions to supervise the implementation of the safeguards instruments (ESMF and RPF).

Monitoring and Evaluation

77. Monitoring of project implementation progress and results indicators, as well as progress towards achievement of the PDO, will be the responsibility of BRD as well as participating entities: SACCOs, banks and private companies engaged in off-grid electrification (mini-grid developers and potentially locally registered OSCs). The PIU will collect data and reports from participating entities and present progress in achieving the key and intermediate indicators to the World Bank quarterly. This will be carried in conjunction with the World Bank team implementation and support missions. There will be several mid-term (in-depth) reviews of the project; the first one taking place 18 months after project effectiveness.

Role of Partners (if applicable)

78. The project will work closely with donor-funded programs that provide investment and technical assistance support to off-grid market development in Rwanda. Operation of Window 3 for mini-grid developers will closely collaborate with the EnDev, under implementation by GIZ in Rwanda, which has been supporting the private sector through the RBF program for mini-grids and quality-certified solar lighting systems. Component 2 of the project (technical assistance, capacity building and implementation support) will be informed and strategically aligned with ongoing and planned work under similar activities, including the BTC-funded Private Sector Participation in the Generation of Electricity from Renewable Sources Program. Participation in the SOGER Program funded by SIDA, which

is supporting private sector companies for mini-grid pipeline development in rural areas, will be explored.

ANNEX 3: IMPLEMENTATION SUPPORT PLAN

Strategy and Approach for Implementation Support

1. The strategy for implementation support was developed based on the nature of the project and its risk profile. As described in the main text, the overall implementation risk for the project is rated Substantial. Accordingly, the ISP will focus on implementation of risk mitigation measures, taking into account the following factors:

(a) Implementation capacity. The PIU within BRD has no experience in implementing World Bank projects and limited experience in the off-grid electricity sector.
(b) A significant number of SACCOs is expected to participate in the project. These SACCOs have limited institutional capacity and no experience neither in the off-grid sector and technologies, nor on partnering with OSCs. SACCOs will be spread throughout the country.
(c) Participating banks have limited or no experience in providing consumer financing for off-grid electricity services, lack the understanding of renewable energy technologies and business models, and do not have in-house technical expertise to appraise and supervise financing proposals from mini-grid developers. They have no experience neither in the off-grid sector and technologies, nor on partnering with OSCs.
(d) The off-grid market is at early stages with beneficiaries and entities that are not familiar or have limited experience in the sector and/or have not worked with each other in the past. Potential customers have limited knowledge about solar technologies, and are not aware of the opportunities and benefits from off-grid electrification.

Implementation Support Plan and Resource Requirements

2. The proposed implementation support requirements are as follows:

Table 3.1. Implementation Support Plan

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First 12 months	Develop framework for operational capacity building of SACCOs and banks; based on the framework, develop capacity building plan. Initiate capacity building activities according to plan to build institutional capacity of SACCOs and banks. Establish partnerships between SACCOs / banks and OSCs. Conduct outreach and awareness campaigns to potential beneficiaries. Set up Steering Committee. Strengthen overall capacity of PIU. Coordinate implementation with mini-grid window with partner programs.	Project management, rural electrification (solar technologies and mini-grids), institutional capacity, communications, social and environmental safeguards, procurement, and financial	US$500,000	n.a.
12–48 months	Monitor performance of facility. Implementation progress review across technical, safeguards, procurement, FM, monitoring and evaluation, and capacity building aspects. Continue capacity building of direct beneficiaries. Knowledge-sharing workshops	Technical (rural electrification, solar technology and mini-grids), institutional capacity, communications, social and environmental safeguards, procurement, financial, project management, and monitoring and evaluation	US$150,000 per year	n.a.
Other				

Table 3.2. Skills Mix Required

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Team leader	20	15	
Energy specialist	20	15	
Energy specialist	30	10	Country based
Technical specialist (solar, mini-grids)	30	10	

Financial markets specialist	20	5	
Financial markets specialist	30	10	Country based
Environmental specialist	10	5	Country based
Social specialist	10	5	Country based
Gender specialist	5	5	
Procurement specialist	0	0	Country based
FM specialist	5	5	Country based

Table 3.3. Partners

Name	Institution/Country	Role
n.a.	EnDev	Viability gap financing for mini-grids
n.a.	SIDA-funded SOGER	Technical assistance for mini-grid pipeline development
n.a.	BTC-funded Private Sector Participation in the Generation of Electricity from Renewable Sources program	Technical assistance and capacity building

Annex 4: Economic Analysis

1. The REF project seeks to accelerate market growth of renewable off-grid electricity access in Rwanda by improving access to credit for off-grid providers and customers. The project is designed to be implemented through three line of credit windows and one project finance window, all of which will be implemented by BRD. One window will target eligible SACCOs to onlend to end customers of (pre-qualified) solar lighting products; another will target solar companies; and a third will target commercial banks to onlend to enterprises wishing to install solar systems for own consumption of electricity. Utilization of the credit lines is expected to accelerate the sales and adoption of off-grid renewable electricity in areas that are either not served, or underserved, by the grid.

2. The main development impact of the proposed project derives from increased access to modern electricity services and a substitution away from lower quality or more expensive alternatives. The project will particularly target those customers that are located in areas with no grid coverage and are unlikely to have grid coverage in the near future. In doing so, the off-grid electricity solutions supported through the project will accelerate electricity access over and above the ongoing grid expansion efforts in Rwanda.

3. The intended primary beneficiaries of the project are the new customers of stand-alone solar systems and renewable energy-based mini-grids—these include households, and commercial enterprises—that currently have either no electricity access or no other option than to employ costly alternatives. While the majority of benefits are expected to be passed on to end consumers, the project comprises financial intermediation and technical assistance components, and thus government institutions, commercial banking institutions, and the private sector (for example, developers, investors, and solar system purveyors) will also benefit from enhanced capacity and access to finance.

4. The economic analysis is based on a simple and transparent cost-benefit framework.

Benefits and Costs

5. The benefits of improved electricity access, for households, are conservatively quantified based on avoided costs on lower quality electricity and lighting alternatives—typically batteries, kerosene, and candles.[50] For commercial enterprises, the end beneficiaries of the commercial banks credit window, the economic benefits from off-grid electricity are valued at avoided diesel generation expenditure.

6. The burning of kerosene and diesel by households and commercial enterprises causes CO_2 emissions. Therefore, the replacement of these fuels by solar systems engenders a reduction in CO_2

[50] The avoided cost is a proxy for the economic value of improved electricity access. It is based on the assumption that expenditure on kerosene, batteries, and so on will be completely avoided once households adopt higher quality technologies. Because households were spending this money on lighting, charging, and so on, they will be willing to spend at least as much on higher quality substitutes. The main advantage of the measure is that current household expenditures on such items are measureable from various sources. Alternative measures of economic value are based on estimated consumer surplus, or other estimates (or proxies) of the willingness to pay. However, these measures typically require more data and stronger simplifying assumptions.

emissions. However, the case of Rwanda is somewhat unique due to the effective '*Bye Bye Agatadowa*' program of the GoR, which has drastically reduced the use of kerosene lamps in the country. Instead torches and light-emitting diode (LED) lamps based on dry cell batteries are widely used. This implies that for households the solar system does not offset kerosene use significantly. The quantified reductions in CO_2 emissions come from the assumed offset of diesel generation for commercial customers of larger systems.

7. Increased access to modern, reliable, and clean electricity services is often thought to engender other benefits. A switch away from kerosene toward solar lighting improves indoor air quality in households and reduces risks of respiratory illness; improved lighting in the evening hours allows improved productivity in household chores and the ability of children to study; the mobility of some of the solar lighting products allows improved mobility and safety at night, especially for women; a reduction in dry cell battery consumption and thus their disposal reduces the environmental damage caused by hazardous waste and costly cleanup required; and access to higher-quality and cheaper electricity services by commercial entities may increase productivity and revenues. These benefits either are difficult to quantify or do not have sufficient empirical evidence to convincingly quantify and thus are not considered in this analysis. As a result, the calculated NPV and EIRR can be considered conservative estimates of the true economic net benefits accruing from the project.

8. The cost associated with the stream of benefits for each window of the facility, is the corresponding cost of the solar systems or mini-grid projects. While many companies offer solar lighting products on an installment or pay-as-you-go basis, the appropriate economic cost is the one-time cost of the system net of any taxes and duties. Recurrent battery replacement costs are also accounted for.

Assumptions

9. The line of credit windows will increase the access to funds for households and businesses and are expected to spur the off-grid solar market. While the fund allocation between the various facility windows is going to be on a first-come, first-served basis, based on the assessment of the market, the estimated year-on-year connections are presented in Table 4.1. Through the first round of funds utilization, the project is expected to support approximately 445,500 connections within six years.

Table 4.1. Connections under Each Project Window

Loan Window	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
SACCOs	9,041	45,206	30,514	50,857	45,206	50,179
Commercial banks	2,635	7,905	10,540	10,540	15,809	21,079
Mini-grid developers	1,040	4,160	2,600	5,200	5,200	7,800
Solar companies	-	-	39,993	39,993	23,996	15,997
Total	**12,716**	**57,271**	**83,647**	**106,590**	**90,212**	**95,056**

10. The connections under each window will be associated with a different level of access depending on the type of connection or solar system, as defined under the MTF[51]. The end customers

[51] The SE4All MTF initiative launched by the Secretary-General of the United Nations in 2011 aims to achieve universal access to

for each window will also be split between households and commercial entities—such as shops, hairdressers, and other small businesses. Systems offered under the SACCO window are assumed to be those enabling Tier 1 level of service (94 percent sales to households and 4 percent to businesses). Under the commercial bank window, 80 percent of the sales are to households (Tier 2) and the rest to businesses (higher capacity Tier 2). Under the solar companies window, all sales are assumed to be to households with 70 percent sales of Tier 1 systems and the rest of Tier 2. For the mini-grid window 96 percent connections will be for households and 4 percent for businesses.

11. The battery life is assumed to be five years for Tier 1 systems and three years for Tier 2 systems. The difference lies in the use of longer lasting Li-ion batteries in smaller systems and Pb-A batteries in larger ones. Battery replacement costs, roughly one-fifth of the total system costs, are thus assumed every three or five years depending on the size of system sold.

12. Table 4.2 presents the key assumptions and parameter values for the analysis.

Table 4.2. Key Parameter Assumptions

Discount rate (%)	6
Monthly expenditure on alternative lighting/charging (US$ per month) [a]	2
Cost of diesel generation (US$ per kWh)	0.3
Average cost of system (by window)	
SACCO (Tier 1)	US$69
Commercial banks (Tier 2)	US$159
Solar companies (Tier 1 and Tier 2)	US$93
Mini-grid connection cost	US$275

Note: a. The assumed monthly expenditure on alternative lighting is broadly in line with the recently conducted research by Grimm et al. (2016) on solar lighting in Rwanda, and the market study conducted by the One-Acre Fund.

13. The economic net benefits are assessed over a 30-year horizon. As the loan tenor offered by BRD to SACCOs, commercial banks, and solar businesses will be longer than what they offer to their customers, once repaid, the funds are expected to be recycled for additional rounds of loans. The analysis presented here takes a conservative approach and considers only the impact of the first round of funds.

modern energy services by 2030. The MTF was developed to monitor and evaluate energy access under SE4All by following a multidimensional approach (see: https://www.esmap.org/node/55526). The MTF approach goes beyond binary measurement of energy access as 'having or not having an electricity connection' or 'relying or not relying on solid fuels for cooking'. It takes into account a multidimensional view of the energy sector by considering various service levels and attributes such as availability, quality, reliability, health/safety, convenience, and affordability, and it addresses multiple technology options (for example, grid and off-grid electricity). The MTF measures access in the Tiered spectrum, from Tier 0 (no access) to Tier 5 (the highest level of access). Under the MTF, Tier 1 (minimum 12 Wh per day) and Tier 2 (minimum 200 Wh per day) are defined as providing access up to four hours per day and at least one hour at night and can be used for basic applications such as task lighting, radio, and phone charging (http://trackingenergy4all.worldbank.org). Tier 3 has a minimum of one kWh per day and up to eight hours per day and at least three hours at night. Tier 4 has a minimum of 3.4 kWh per day and up to 16 hours per day and at least four hours at night. Tier 5 consists of safe, reliable, unlimited 24-hour service from a grid system. See BEYOND CONNECTIONS: Energy Access Redefined, Energy Sector Management Assistance Program, 2015.

Results

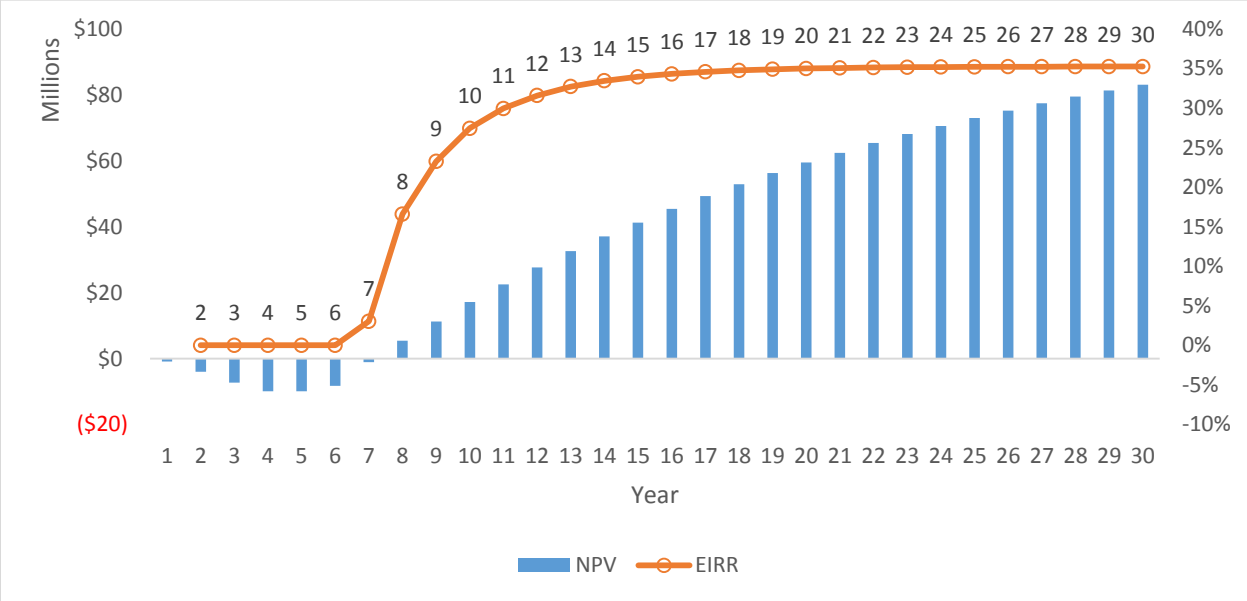
14. Based on the assumptions outlined above, the economic analysis shows that the project is economically viable. As noted earlier this is based on, benefits conservatively valued at avoided cost, only the first cycle of funds utilization for system installations, and exclusion of various potential benefits that have not been quantified. The stream of net benefits accruing to the four loan windows has an NPV of US$83.1 million (at a 6 percent discount rate) and an EIRR of 35.3 percent. Including benefits from a reduction in CO_2 emissions from an offset in diesel consumption, the NPV and associated EIRR increase slightly.

Table 4.3. Summary of Results

	Base Case	With CO_2 Benefits
NPV (US$ million)	83.1	84.8
EIRR (%)	35.3	35.8

15. Figure 4.1 shows how the NPV and EIRR evolves over the 30-year life of the project. Under the base case scenario, the project passes the hurdle rate of 6 percent by year 8; and by year 15, the EIRR starts to flatten out.

Figure 4.1. NPV and EIRR



Sensitivity Analysis

16. Switching value analysis of the key parameters underlying the calculations shows that there is considerable scope for variation in parameter values without the project becoming economically unviable. The two main parameters considered are the avoided cost of the alternative and the cost of

solar home systems. The results show that if the average avoided cost per household was only US$0.39 per month, the project would be on the viability threshold (any value above this would make the project viable). Similarly, a 172 percent increase in the cost of solar home systems (both Tier-1 and Tier-2), or an increase only in the price of Tier-1 systems to US$280 (a 300 percent increase) will put the project on the viability threshold.

Figure 4.2. Switching Values

Switching Values	
Avoided cost (US$ per month)	0.20
Cost of Tier 1 system (US$)	280
All solar home system cost inflation (%)	272

ANNEX 5: ASSESSMENT OF BRD PER OP10.00 REQUIREMENTS

1. BRD has been selected to act as a host for the REF. The REF will consist of several windows of credit lines administered by the host and intermediated by financial institutions, as well as a direct financing window. The REF host must be able to effectively manage the assigned funding and administer the project to ensure that the REF development objectives will be met.

2. Financial institutions responsible for administration and management of the World Bank loans and credit lines are obliged to comply with the eligibility criteria, which follow the guidance provided under World Bank Operational Policy OP 10.00. The due diligence review included the following eligibility criteria:

(a) **Good governance.** 'Fit and proper' owners, adequate board composition and practices, adequate organization, and competent management with adequate managerial autonomy.

(b) **Compliance with prudential regulations issued by BNR.** The bank must be in good standing with BNR at all times and observe all other applicable laws and regulations.

(c) **Capital adequacy.** Compliance with BNR regulations with minimum capital of 15 percent calculated as the ratio of total capital to total assets.

(d) **Good financial condition and adequate profitability.** Good assets/liabilities structure, positive profitability, well diversified income structure, stable earnings trend, well-managed cost structure, well diversified funding sources, and regular stress testing.[52]

(e) **Acceptable risk profile.** Effective Asset and Liability Management Committee and well-defined policies and written procedures for management of all types of financial risks (liquidity, credit, currency, interest rate and market risk, as well as risks associated with balance sheet and income statement structures) and operational risks.

(f) **Adequate credit portfolio structure and portfolio quality.** Acceptable credit portfolio structure including effectiveness of credit risk appraisal and loan underwriting, asset classification and provisioning[53], no concentration, lending to connected parties within prudential limits, acceptable level of NPLs, and effective collection practices.

(g) **Adequate internal audit.** Independent internal audit function with well-defined procedures, annual internal audit plans, regular reviews of all key risk management functions, and follow-up on issues raised in internal audit reports.

(h) **Adequate MIS and well organized IT support, with adequate internal controls and security policies.** The IT support should be based on a relational database management system providing good accounting and bookkeeping, and adequate system-software support for transaction processing and all banking and risk management functions.

[52] This also implies that the bank should not have significant maturity mismatches in its balance sheet and/or that it has a prompt access to funding, if and as needed.
[53] The bank must classify its assets and off-balance-sheet credit risk exposures (at least four times per year) and make adequate provisions.

(i) **Appropriate implementation capacity.** For carrying out subproject appraisals and for supervising subproject implementation under the credit line.

Evaluation Process

3. The BRD evaluation process started with interviews with senior management which addressed governance structure and organization; business focus, business plan, and performance targets; and financial performance. This was followed by a more detailed evaluation including discussions with lower level management and technical staff and reviews of policies, procedures, documentation and related management reporting. More specifically, BRD appraisal was based on:

(a) External audit as of December 31, 2015 prepared by Pricewaterhouse Coopers Rwanda, with standard terms of reference for end-of-year external audits. The auditors issued an unqualified opinion;

(b) External audit as of June 30, 2016 prepared by Ernst&Young Rwanda;

(c) BRD Strategic Operating Plan for 2016–2020;

(d) Internal Audit Strategic Plan 2016–2018;

(e) Latest BNR On-Site Report from Q1 2015;

(f) Review of financial condition and asset/liabilities structure including reviews of audited financial statements (balance sheet, income statement, and sources and uses of funds), income structure and FM capacity;

(g) Organization of risk management function and review of written policy statements and procedures manuals related to key banking functions and management of financial risks (liquidity, credit risk, currency risk, interest rate risk, and market risk)[54] and of operational risk management;

(h) Interviews and detailed review of policies and practices related to credit department and credit risk management—organization, credit appraisal process, structure of the loan portfolio and portfolio management, credit risk classification and level of provisions, and credit administration process;

(i) Internal Audit Manual, internal audit plans for 2016, sample of internal audit reports, sample of internal audit related board reports, and sample of follow-up for internal audit recommendations; and

(j) Organizational chart for the data processing function. Data processing and MIS hardware, software and communication equipment. Interviews and review of summary information related to IT systems and software and information security.

Summary and Conclusions

[54] Detailed review included Asset/Liabilities Management Policies, Credit Policy, Investment Policy, Fixed Assets Management and Administration Policies and Procedures, Procurement Management Policies and Procedures, and Information Security Policy.

4. BRD has recently been reorganized to achieve a better focus on key areas that would further enhance its developmental role. The new business strategy includes energy as one of the five key focus areas. In 2016, BRD started business and functional reorganization which would ensure effective realization of its new business strategy—to increase resource mobilization, build strong partnerships, and support well-focused investments and growth, which would maximize the development impact. BRD finalized its business and functional reorganization in early 2017. The next critical step is to complete staffing and improve its technical capacity. Increasing the staff number (from 120 staff by mid-2016 to 195 staff) and building the technical capacity are expected to be completed by mid-2017, ensuring that BRD will be able to successfully achieve targets in the new business areas.

5. BRD generally **meets the eligibility criteria.** Conclusions of the due diligence review are summarized in Table 5.1.. The new organization reflects good banking practices. BRD is in a reasonably good financial condition, with positive income. Its risk management functions are well organized, including both financial and operational risks. Its credit appraisal, administration and risk management are adequately organized and policies and procedures are being developed. BRD has a good basis for adequate administration, including accounting and bookkeeping, an effective internal audit function and functional information systems.

6. There are also a number of issues that need to be addressed. BRD's management and board are well experienced and aware of the issues, and are already in the process of effectively addressing them. The key points that BRD management is working on include: (a) improving funding structure, which needs to be diversified and based on term-borrowing rather than deposits; (b) providing capital increase that would allow BRD a good growth perspective; (c) ensuring complete and well documented policies and procedures related to all banking functions, risk management and administration; (d) improving IT support with the latest software and technology; and (e) completing staffing and organizing the needed training programs. Given the existing BRD management experience, the necessary training needs would be clearly identified and easy to deliver. BRD is expected to continue to effectively address the noted issues before the World Bank loan effectiveness and to continue to meet the eligibility criteria at all times. Compliance will be reviewed annually.

Table 5.1. Summary of BRD Due Diligence Review and Progress Made

	Evaluation Summary	Advances since November, 2016
Ownership structure	Generally satisfactory. BRD needs to finalize buy-back of the Class B shares held by local private companies and banks.	New shareholding structure is expected to be approved in Q2 2017 and would include four ownership categories (governments, institutional investors and two types of international investors). The shares of the local private shareholders will be paid-out at the same time.
Governance and organization	Generally satisfactory—BRD is well organized with generally adequate governance structure.	New independent board member will be appointed in Q2 2017.

	Evaluation Summary	Advances since November, 2016
BNR compliance	Generally satisfactory—BRD is aware of the issues that need to be addressed. It has made progress and is continuing with efforts to address them.	BRD has introduced measures that are expected to reduce the NPL, including quarterly supervision of large exposures. BRD asked BNR to increase the NPL prudential limit to 10 percent, because BRD is a development bank and does not take deposits.
Capital adequacy	Generally satisfactory—BRD meets BNR capital adequacy requirements, but intends to raise additional capital that would allow further growth.	Negotiations on additional amount and form of capital with potential shareholders will start as soon as the new shareholding structure is approved.
Financial condition and profitability	Generally satisfactory. But the funding structure needs to be addressed. A short-term deposit by one of BRD shareholders accounted in 2016 for about 40 percent of BRD's total liabilities.	BRD already started negotiations with the Rwanda Social Security Board (RSSB) to replace the deposit with a loan of at least 10 years' maturity. BRD expects that the agreement will be reached in Q2 2017.
Financial risk management	Generally satisfactory. While the organization and the basic elements have been in place, it will take some time to finalize the policies and procedures, and to ensure that these are effectively implemented. The technical capacity of risk appraisal and management staff needs to be improved.	Since December 2016 progress included updating terms of reference for Board Committees and aligning them with the new BRD strategy and updating BRD policies and procedures related to banking functions, risk management and administration.
Credit function and portfolio quality	Generally satisfactory. Reasonably well-organized and following BNR standards. The technical capacity of staff needs to be improved. Better IT support is also needed. Of immediate importance is to focus on reducing the NPL level to below 5 percent.	BRD has introduced measures that are expected to reduce the NPL, including quarterly supervision of large exposures.

REF Implementation Capacity

7. BRD already has experience in providing direct lending and onlending, managing loan portfolios and providing services expected to be offered and used under the REF program. However, to get prepared to effectively administer and manage the REF program includes a number of actions including the establishment of the REF Implementation Unit staffed with experienced technical staff and the development of the OM with detailed instructions related to administration and management of the four lending windows. Given that BRD may not have the necessary experience and technical know-how, it is also critical that management identifies areas where technical assistance and training will be needed.

8. More specifically, the REF Implementation Unit should be able to effectively: (a) onlend to the participants of the four financing windows and administer subsidiary financing agreements; (b) provide assistance, consulting and proactive advice to REF participants on all aspects of the Credit Line, including terms and conditions and disbursement; (c) provide, as needed, clearance and approval of PFIs appraisals of eligibility of final borrowers for all subprojects, as well as direct appraisal for the mini-grid financing window; (d) maintain Designated Accounts and make disbursements; (e) maintain summary

records of the use of financing resources; and (f) prepare monthly, quarterly and annual progress reports to the Government and the World Bank.

ANNEX 6: SACCOS: OVERVIEW AND ASSESSMENT SUMMARY

General Overview

1. **There are 473 SACCOs engaged in savings and credit provision in Rwanda.** The overwhelming majority of these institutions are community-based rather than employer-based, which means that they operate with the general public. There is at least one SACCO in each administrative sector (Umurenge) in Rwanda, making SACCOs easily accessible for the majority of the population.

2. **SACCOs can be divided into three groups:** (a) Umwalimu SACCO, by far the largest SACCO and whose nearly 60,000 members are teachers of public and private institutions; (b) the Umurenge SACCOs, a group of 416 community-based institutions created in 2009 under a government program; and (c) the other 56 older, employer-based and community-based SACCOs.

3. **Umurenge SACCOs serve about 100,000 borrowers.** Given their wide spread throughout Rwanda, the project will focus on working with eligible Umurenge SACCOs that are interested in participating in the project. Currently, the 416 Umurenge SACCOs have 119 branches or outlets and 90 percent of Rwandese now live within a 5 km radius of an Umurenge SACCO, and 56 percent within a 3 km radius. The Umurenge SACCOs have over 2 million customers/members and serve about 20 percent of the total population (34 percent of the estimated adult population). As at December 31, 2015, their deposit mobilization was RWF 100.9 billion (US$126.13 million) whereas their mobilization of capital was RWF 8.9 billion (US$11.13 million) in share capital and RWF 17.77 billion (US$22.21 million) in-retained earnings (BNR). The Umurenge SACCOs employ 3,029 staff of which 45 percent are female.

4. **SACCOs are members of the Association of Microfinance Institutions in Rwanda (AMIR)**, the professional umbrella organization of MFIs operating in Rwanda with the core mission of supporting its members to become professional and sustainable. The Rwanda Cooperative Agency (RCA) has a supervisory role of SACCOs, in addition to BNR, looking at the cooperative side of SACCOs.

5. **SACCOS benefit from several capacity building activities** provided by BNR, Rwanda Institute of Cooperatives, Entrepreneurship and Microfinance (RICEM), AMIR, RCA, and Access to Finance Rwanda (AFR). Table 6.1. details the role of each institution in relation to SACCOs.

Table 6.1. Capacity Building Activities for SACCOs

Institution	Role
BNR	• Regulatory and supervisory role for SACCOs • Has harmonized internal policies and procedures as well as reporting guidelines and templates for SACCOs • Conducts on-site inspection of SACCOs to assess their performance and compliance with prudential standards • Spearheads the process of SACCO consolidation and computerization program
RCA	• Provides a supervisory role of SACCOs, in addition to BNR, looking at the cooperative side of SACCOs

Institution	Role
AMIR	• Through its economic arm—AMIR Consult—it provides specialized services on portfolio review, product and market development, business and strategic planning, and financial projection, as well as development of manuals. • Intends to roll out provision of auditing services and risk management to SACCOs • In collaboration with cooperative colleges in the region, intends to provide specialized training services to SACCOs.
RICEM	• Provides training to SACCOs in areas of microfinance, entrepreneurship and cooperative management and organization
AFR	• Provides technical and financial assistance to Umurenge-SACCOs to develop management systems, automate operations, and develop services and products that meet the needs of rural people—particularly those engaged in the agriculture sector

6. **Despite an overall positive development, many Umurenge SACCOs are still facing several challenges:** (a) largely manual processes which leads to reporting challenges and inconsistencies in data; (b) inability to access the national payments system; (c) limited skills of management and staff; (d) weak governance systems; (e) several cases of fraud; (f) weak internal controls; and (g) weak portfolio management (the aggregate reported NPL ratio was 10.7 percent as of December 31, 2015). To address these challenges, the GoR recently embarked on a process to consolidate the Umurenge SACCOs at district level and later on to create a cooperative bank at the national level, but the timeline for this consolidation is not clear at this point.

Regulatory and Supervisory Environment

7. **SACCOs are regulated and supervised by BNR** under the Microfinance Law No. 40/2008 of August 26, 2008 and the implementing regulation No. 02/2009 (both are currently being updated), which govern the organization of microfinance activities. The Microfinance Law and implementing regulation contain specific provisions for SACCOs.

8. **According to the Microfinance Law, all SACCOs need to be licensed by BNR.** SACCOs need to submit an application including, among others, a business plan, proof of financial means to carry out its intended business, list of all management personnel, and proof of payment of the minimum capital of RWF 5 million, which is a requisite for each SACCO. SACCOs are required to prepare financial statements that are externally audited by an auditor approved by BNR. They are also required to have internal control systems.

9. **SACCOs are required to comply with prudential standards as defined in the microfinance regulation**. BNR collects financial information from each of the SACCOs including but not limited to; aging and distribution of the portfolio by economic activity, distribution of loans and deposits by gender, concentration of loans and deposits for the top 10 members, and so on for analysis and decision making.

10. **BNR has a dedicated department for the supervision of microfinance institutions housed within the Financial Stability Directorate and headed by the Director of Microfinance Supervision.** The Microfinance Supervision Department carries out regular off- and on-site inspections. Given the large

number of institutions to supervise, focus is on the largest institutions and those identified to be the riskiest. Full-scope on-site inspections are conducted at least every 18–24 months for each institution according to the Supervisory Manual, but large or risky institutions may be visited more frequently. BNR used PEARLS (a set of financial ratios and indicators that help standardize terminology between institutions and that can be used to monitor financial performance of SACCOs) as part of its supervision process.

Table 6.2. SACCOs Prudential Standards and Limits

Standard in current regulation	Limits	Formula Definition
Capital adequacy ratio	Minimum 15 percent	Total equity/total assets. Every SACCO is required to maintain equity corresponding to a minimum of 15 percent of total assets.
Liquidity ratio	Minimum 30 percent	Cash and cash equivalent/sight deposits and contingent liabilities. SACCOs must maintain a liquidity ratio of at least 30 percent at all times. It must constitute a reserve equivalent to one half of this ratio in the form of treasury bills or term deposits with commercial banks.
Total loans/ total deposits	Maximum 80 percent	Total loans/ total deposits. Total loans are not to exceed 80 percent of total deposits.
Fixed assets/equity	Maximum 75 percent	Net fixed assets/equity. Every microfinance institution, union or federation must at all times, cover the medium- and long-term uses of funds with stable resources. Medium and long-term uses of funds are loans with remaining tenors longer than one year and net capital assets. Stable resources are deposits, borrowings, and other liabilities with remaining terms longer than one year and equity. A SACCO is not authorized to utilize more than 75 percent of its equity.
Insider loans/equity	Maximum 20 percent	Loans to staff and directors and related parties/equity. The total amount of commitments by a SACCO for all its directors and employees may not exceed 20 percent of its equity as established in the most recent financial statements.
Total net loans/total assets	Maximum 80 percent	Total loans/total resources. The total amount of commitments made by a SACCO cannot exceed the minimum of 80 percent of the volume of its resources. Resources are deemed to include equity capital, deposits, subsidies and long- and medium-term borrowings.
Total equity investments/equity	Maximum 40 percent	Equity investment/total equity. A SACCO is requested to: • Hold equity in enterprises up to, for each participation, either 15 percent of the amount of its equity or 20 percent of the capital of the enterprise, whatever limit is lower; and • For all its participations, hold 40 percent of its own equity.

Standard in current regulation	Limits	Formula Definition
Single borrowing/total deposits	Maximum 2.5 percent	Loans to single borrower/total deposits. A SACCO may not grant loans, including overdrafts or credit facilities to the same natural person or legal entity or group for an amount exceeding 2.5 percent of its total deposits.
Single borrowing/total equity	Maximum 5 percent if NPL ratio is above 5 percent; Maximum 10 percent if NPL ratio is below 5 percent.	Loans to single borrower/equity. A SACCO may not grant loans, including overdrafts or credit facilities to the same natural person or legal entity or group for an amount exceeding 5 percent of its total equity as established in its most recent financial statements. The ceiling is set at a maximum of 10 percent for SACCOs whose NPLs are under 5 percent.
Provisioning practices (days)	Overdue up to three months - 25 percent; six months - 50 percent; and 12 months - 100 percent. For overdrafts, SACCOs should make provisions as follows: overdue up to three months - 75 percent and six months - 100 percent.	

Eligibility Criteria

11. **The success of any financial intermediation operation critically depends on the quality of the PFIs.** Given that a large number of Umurenge SACCOs is still facing considerable challenges in their operations, eligibility criteria need to be defined that are cognizant of the nature of these institutions while at the same time ensuring that participating institutions are in stable financial condition, are prudently managed with capacity to appraise and carry credit risk, and are able to effectively report on project activities. The onlending window will start with the initially selected 20 SACCOs; more SACCOs will be added during project implementation.

12. **Interested SACCOs will be obliged to comply with eligibility criteria, which follow the guidance provided under the World Bank Operational Policy (OP 10.00).** Once qualified, a SACCO should be expected to continue meeting the eligibility criteria at all times. Compliance will be reviewed annually. The eligibility criteria include:

(a) **Compliance with prudential regulations issued by BNR**. Regular reporting to BNR. The SACCO must be in good standing with BNR at all times and observe all other applicable laws and regulations.

(b) **Adequate organization and governance.** 'Fit and proper' owners, competent management, adequate organization, and institutional capacity for its specific risk profile.

(c) **Capital adequacy.** Compliance with BNR regulations with minimum capital of 15 percent calculated as the ratio of total capital to total assets.

(d) **Adequate liquidity.** Compliance with BNR regulations (that is, liquid assets to total deposits at 30 percent) and well-managed or no maturity gaps.

(e) **Adequate profitability.** Positive profitability and stable earnings trend and well-managed cost structure.

(f) **Adequate credit portfolio structure and portfolio quality.** Well-defined lending policies and procedures, acceptable credit portfolio structure, regular loan classification and provisioning[55], low concentration, lending to connected parties within prudential limits, low level of NPLs (that is, an NPL ratio as percentage of total assets not exceeding 5 percent), and effective collection practices.

(g) **Adequate internal controls, overseen by the Audit Committee.** Independent internal control function with defined procedures, annual internal control plan, regular reviews by the Audit Committee, and follow-up on issues raised in internal control reports.

(h) **Adequate accounting and book-keeping and MIS system, with adequate internal controls.** Must have credible financial statements with chart of accounts as specified by BNR, with at least basic IT support providing good accounting and bookkeeping, and adequate support for transaction processing and loan portfolio management.

(i) **Appropriate implementation capacity.** For carrying out client and sub-loan appraisals and for supervision of the use of funds and micro-enterprise sub-project implementation.

SACCOs Reform

13. **Umurenge SACCOs are currently undergoing a process to be consolidated at the district level with the aim of ultimately creating a cooperative bank at the national level.** The SACCOs will be merged at the district level, and the original 416 SACCOs will become branches of 30 district SACCOs. The aim is that the district SACCOs will ultimately form a cooperative bank at the national level. The SACCO consolidation process will involve a series of phases including due diligence of all the 416 SACCOs to establish their total equity and assets as well as liabilities; audit to mitigate any possible risk during the merger process; automation of SACCOs and data migration process; and preparation of draft papers for licensing and policy papers to inform amendment of the cooperative law to allow non-equal shareholding of Umurenge SACCOs in the district SACCOs. The process of establishing governance and management structures and organizational systems will take a consultative approach and expert knowledge, which requires ample time to ensure effective transfer of authority and knowledge. The key support institutions in the reform process of SACCOs include BNR as the lead, MINECOFIN, and RCA.

14. **By establishing the district SACCOs and cooperative bank, it is envisaged that the current challenges faced by Umurenge SACCOs will be addressed.** The districts SACCOs will aim to: (a) enhance sustainability and financial soundness of the SACCO network; (b) address limited organic growth due to the small size of the existing market; (c) improve ability to mobilize resources through competitive rates and provide better financial services to their members; (d) attract and retain competent and qualified management needed to oversee the expanded operations; (e) enhance the supervision and monitoring role of BNR and RCA; and (f) address issues of fraud and embezzlement taking place at Umurenge SACCOs.

15. **There is a potential impact of the reform process on the project in the short, medium, and long terms.** In the short term, the management of the selected SACCOs will be heavily involved in the reform process, which may slow down planned awareness activities related to the project as well as loan

[55] At least four times per year and adequate provisioning.

approval processes for customers requesting loans for solar home systems. This could lead to a slow start in project implementation. In the medium term, after district SACCOs and ultimately the cooperative bank are established, it is uncertain how many district SACCOs will be able to meet the revised eligibility criteria and participate in the project. Given the required heavy investments in technology and automation and high administrative costs at the beginning, district SACCOs could see minimal or no profits in the first few years, which would rule out a participation in the project. Eligibility criteria will also need to be reviewed at that point given the need to adjust criteria based on the risk profile of the institution. In the long run, if district SACCOs become financially and operationally stronger as a result of the merger, there could be a positive impact on the implementation of the REF.

Due Diligence

16. **For the initial phase of the project, 30 SACCOs have been identified and 20 SACCOs have been appraised against the established eligibility criteria for possible participation in the project.** Those SACCOs cover different geographic locations, and are mainly situated in rural areas of districts considered to have low percentage of electricity connectivity. The selection process was twofold: (a) best performing SACCOs with regard to compliance with prudential standards and good financial condition; and (b) location in districts with low percentage of electricity connectivity.

Table 6.3. Due Diligence Summary of the Appraised SACCOs

S/N	SACCO	Compliance with Prudential Regulations	Adequate Organization and Governance	Capital Adequacy	Adequate Liquidity	Adequate Profitability	Adequate Credit Portfolio Structure and Portfolio Quality	Adequate Internal Controls Overseen by Audit Committee	Adequate Accounting and Bookkeeping and MIS	Appropriate Implementation Capacity
1	Girubukire Buyoga	X	X	X	X	X	X	X	X	X
2	Imbarutso Musenyi	X	X	X	X	X	X	X	X	X
3	Ganaheza Nyagisozi	X	X	X	X	X	X	X	X	X
4	Imbereheza Ndora	X	X	X	X	X	X	X	X	X
5	Indatwa Muko	X	X	X	X	X	X	X	X	X
6	Rebakure Rusarabuye	X	X	X	X	X	X	X	X	X
7	Umurava Bigogwe	X	X	X	X	X	X	X	X	X
8	Terimbera Bwira	X	X	X	X	X	X	X	X	X
9	Inkingi y'Iterambere Kivu	X	X	X	X	X	X	X	X	X
10	Rebakure Coko	X	X	X	X	X	X	X	X	X
11	COOPEC Ubumwe Nyakarilo	X	X	X	X	X	X	X	X	X
12	Jyambere Gahara	X	X	X	X	X	X	X	X	X
13	Amerekezo Jarama	X	X	X	X	X	X	X	X	X
14	Isunge Ngarama	X	X	X	X	X	X	X	X	X
15	Uruyange Rukoma	X	X	X	X	X	X	X	X	X

S/N	SACCO	Compliance with Prudential Regulations	Adequate Organization and Governance	Capital Adequacy	Adequate Liquidity	Adequate Profitability	Adequate Credit Portfolio Structure and Portfolio Quality	Adequate Internal Controls Overseen by Audit Committee	Adequate Accounting and Bookkeeping and MIS	Appropriate Implementation Capacity
16	Tugane Nyabinoni	X	X	X	X	X	X	X	X	X
17	Isonga Mbazi	X	X	X	X	X	X	X	X	X
18	Kira Buruhukiro	X	X	X	X	X	X	X	X	X
19	Dufatanye Karengera	X	X	X	X	X	X	X	X	X
20	Abesamihigo Gihango	X	X	X	X	X	X	X	X	X

17. Below is the appraisal summary for eight SACCOs.

18. **Girubukire Buyoga SACCO.** As of June 2016, this SACCO had 8,659 members and offered two types of deposit accounts, namely: (a) current accounts and (b) savings accounts. This SACCO is located in the trading center where solar home systems have been tested due to the existence of a power kiosk[56] making it easy to scale up the use of solar home systems in the sector. This SACCO has already provided a loan to one client to purchase and install solar home systems in the client's house. This SACCO provides loans to individual households and groups, and as of June 2016, the number and value of loans outstanding were 424 totaling RWF 131,334,155 spread across five economic sectors of agriculture activities with RWF 52,141,430, construction of residential and commercial houses with RWF 6,925,924, commercial activities of retail trading with RWF 45,881,396, transport facilities (purchase of motorcycles) with RWF 6,454,654, and others including education and advances on salaries with RWF 19,930,751.

19. Girubukire Buyoga SACCO complies with BNR prudential regulations and supervisory requirements. It follows best practice recommendations provided by BNR and RCA on cooperative principles. The financial statements—balance sheet and income statement—are prepared in line with the chart of accounts and following the reporting templates provided by BNR. This SACCO has a good liquidity position with a liquidity ratio of 90.2 percent and capital adequacy ratio of 26.3 percent and loans to deposit ratio of 56 percent. The return on equity (ROE) was 24 percent and return on assets (ROA) 7 percent with NPL ratio of 2.6 percent. The governance and management team as well as credit committee and audit committee are satisfactory and could support the implementation of the REF project successfully through administering sub-loans to individuals, households, and microenterprises.

20. Girubukire Buyoga SACCO expressed its interest to participate in the REF through onlending to its existing and new clients owing to the limited on-grid connectivity in Buyoga sector. The annual estimated demand is RWF 20 million at an average cost of capital of 1 percent per month (12 percent

[56] There is a solar kiosk in Buyoga Trading Center that sells solar panels of different categories and other products. A private dealer called Eco Center owns the kiosk.

per year) and onlending at an interest rate of 2 percent per month. Thus, Girubukire Buyoga SACCO complies with the eligibility criteria and could participate and benefit from the REF.

21. **Imbarutso Musenyi SACCO.** As of June 2016, this SACCO had 5,429 members and offered two types of deposit accounts, namely (a) current accounts and (b) savings accounts. It provides loans to individual households and groups, and as of June 2016, the number and value of loans outstanding were 368 totaling RWF 99,817,127 spread across four economic sectors: agriculture activities with RWF 58,263,131, construction of residential and commercial houses with RWF 7,929,913, commercial activities of retail trading with RWF 28,639,227, and others including education and advances on salaries with RWF 4,984,856.

22. Imbarutso Musenyi SACCO complies with BNR prudential regulations and supervisory and reporting requirements. The financial statements—balance sheet and income statement—are prepared in accordance with chart of accounts following reporting templates provided by BNR. As of June 2016, the capital adequacy ratio was 34.9 percent with a liquidity ratio of 137 percent and the loan to deposit ratio was 58 percent. This SACCO's ROA and ROE were 6 percent and 18 percent, respectively. The NPL ratio was 3.9 percent.

23. The governance and management systems are adequate and supported by an active credit committee and audit committee in the loan appraisal process and audit assessments, respectively. The prevailing internal control systems are satisfactory and overseen by the audit committee. This SACCO uses manual processes to accomplish routine operations. Thus, there are no IT systems or MIS. However, the Government is in the process of rolling out a national computerization program effective 2017 (for pilot SACCOs) that could address the SACCO deficiencies caused by manual processes. The board composition needs to be reviewed to include members with the requisite financial and banking skills. In conclusion, Imbarutso Musenyi SACCO complies with the eligibility criteria and could participate and benefit from the project.

24. This SACCO expressed high interest to participate in the REF facility due to low access to electricity connectivity in the sector. The manager reported that on-grid electricity is accessed by about 10 percent of the population in the area. The purchasing power of its clients in relation to the price of lanterns was estimated between RWF 40,000 and RWF 80,000 because most of its clients belong to Category 3 *Ubudehe*. The estimated demand is RWF 25 million per year disbursed in tranches. Generally, this SACCO offers loans to its clients at an interest rate of 2.5 percent per month (that is, 30 percent per year) with maximum maturity period of two years. The manager and loan officer requested training in the use and application of solar home systems for demonstration purposes.

25. **Ganaheza Nyagisozi SACCO.** As of June 2016, this SACCO had 12,043 members and offered two types of deposit accounts, namely (a) current accounts and (b) savings accounts. It is located within 20 km from Nyanza town, and the majority of members live within a radius of 5–10 km. This SACCO provides loans to individuals, households, and groups. As of June 2016, the number and value of loans outstanding were 264 totaling RWF 92,694,099 spread across five economic sectors: agriculture activities with RWF 17,032,084, construction of residential and commercial houses with RWF 3,831,762, commercial activities of retail trading with RWF 57,548,783, transport facilities with RWF 9,137,735, and others including education and advances on salaries with RWF 5,143,735.

26. Ganaheza Nyagisozi SACCO complies with BNR prudential regulations and supervision and reporting requirements. As of June 2016, the SACCO books of account (balance sheet and income statement) were prepared in line with chart of accounts and following templates provided by BNR. This SACCO has a sound liquidity position with a liquidity ratio of 113 percent, capital adequacy ratio of 36.3 percent, and registered profits of RWF 13,287,443, with an ROA of 4 percent and an ROE of 14 percent as well as an NPL ratio of 4 percent. This demonstrates the sound financial performance of this SACCO.

27. The governance and management systems are adequate and supported by an active credit committee and audit committee in the loan appraisal process and audit assessments, respectively. The prevailing internal control systems are satisfactory and overseen by the audit committee. The SACCO internal controls, systems, and procedures overseen by the audit committee are adequate. This could effectively support the implementation of the REF project through administering sub-loans to individuals, households, and microenterprises. This SACCO uses manual processes to accomplish routine operations. Thus, there are no IT systems or MIS.

28. This SACCO expressed interest to participate in the project on the basis that 90 percent of the population in the area has no access to electricity. Only one cell (Rurangazi) in the sector is connected to on-grid electricity. The solar panels looked familiar to this SACCO because some of its clients had already purchased the equipment from Mobisol. Because the majority of this SACCO's clients belong to Categories 2 and 3 *Ubudehe*, they could afford lanterns in the range of RWF 30,000 to RWF 80,000 maximum. Thus, this SACCO would need at least RWF 10 million in the pilot phase. This SACCO offers loans to its clients at an interest rate of 2 percent per month (that is, 24 percent per year) with maximum maturity period of two years.

29. **Imbereheza Ndora SACCO.** As of June 2016, this SACCO had 7,324 members and offered two types of deposit accounts, namely (a) current accounts and (b) savings accounts. The SACCO offices are located on the main road from Huye town to Gisagara district offices. Most people live within a radius of 5 km of this SACCO, which provides loans to individuals, households, and groups. As of June 2016, the number and value of loans outstanding were 157 totaling RWF 86,871,970 spread across four economic sectors: agriculture activities with RWF 12,534,450, construction of residential and commercial houses with RWF 3,545,852, commercial activities of retail trading (boutique and restaurants) with RWF 50,006,018, and transport facilities (purchase of motorcycles) with RWF 20,785,650.

30. Imbereheza Ndora SACCO complies with prudential regulations and standards with respect to liquidity and capital adequacy ratios. As of June 2016, its capital adequacy ratio was 27 percent, liquidity ratio was 99 percent, and loan to deposit ratio was 55 percent. This SACCO is profitable with RWF 10,689,207; the ROA was 3 percent and the ROE was 13 percent. The NPL ratio was 5 percent.

31. Imbereheza Ndora SACCO maintains proper books of account (balance sheet and income statement) in Excel spreadsheets in accordance with the chart of accounts using reporting templates provided by BNR. The SACCO board and management team supported by the credit committee and audit committee in loan appraisal and audit assessments are adequate. The prevailing internal control systems and procedures in place are satisfactory and overseen by the audit committee. This SACCO uses

solely manual processes, and thus, there is no IT system or MIS in place. This SACCO complies with the eligibility criteria and could participate and benefit from the REF project.

32. Imbereheza Ndora SACCO has expressed interest to participate in the project, and management reported that about 75 percent of the population in the area has no access to electricity connectivity. Demand was estimated at RWF 30 million as the first tranche in 12 months and next tranche would increase as demand increases. This SACCO offers loans to its clients at an interest rate of 1.5 percent per month (that is, 18 percent per year) with maximum maturity period of 24 months (two years). The single obligor is RWF 4 million. The majority of the population in the area falls under Categories 2 and 3, and therefore, members could afford to buy solar home systems ranging from RWF 35,000 to RWF 80,000.

33. **Indatwa Muko SACCO.** As of June 2016, Indatwa Muko SACCO had 4,401 members and offered two types of deposit accounts: (a) current accounts and (b) savings accounts. The SACCO offices are located in a busy trading center of Muko within 24 km from Rukomo trading center on the road to Gatuna in Gicumbi District of Northern Province—an area with good and productive soils favorable for agriculture production. With regard to proximity, the maximum distance of the members from this SACCO is about 17 km. This is mainly because of hilly areas in the region. This SACCO provides loans to individuals, households, and groups. As of June 2016, the number and value of loans outstanding were 163 totaling RWF 100,766,164 spread across five economic sectors: agriculture activities with RWF 18,325,845, construction of residential and commercial houses with RWF 9,000,323, commercial activities of retail trading (boutique and restaurants) with RWF 70,985,800, transport facilities (purchase of motorcycles) with RWF 1,621,624, and others including salary advances and emergencies with RWF 832,572.

34. Indatwa Muko SACCO complies with BNR prudential regulations and standards according to the financial statements of June 2016. It maintains proper books of account (balance sheet and income statement) in Excel spreadsheets in accordance with the chart of accounts using reporting templates provided by BNR. As of June 2016, the capital adequacy ratio was 40 percent, liquidity ratio was 108.5 percent, and loan to deposit ratio was 63 percent. This SACCO's profits were RWF 18,602,907 with an ROA of 7 percent and an ROE of 16 percent. The NPL ratio was 4 percent with the agriculture sector contributing most to NPLs.

35. This SACCO has a well-functioning governance system comprising the board and management team and supported by the credit committee and audit committee to carry out loan appraisal processes and audit assessments, respectively. The prevailing internal control systems and procedures in place are satisfactory and overseen by the audit committee. This SACCO uses solely manual processes, and thus, there is no IT system or MIS in place. This SACCO complies with the eligibility criteria and could successfully participate in the REF project implementation through administering sub-loans to individuals, households, and microenterprises. However, some committee members with primary and secondary school level of education need more training in financial services to appropriately handle their tasks.

36. This SACCO is familiar with solar home systems because two clients had obtained loans to purchase similar equipment from Mobisol—one obtained a loan of RWF 500,000 for lighting a residential house and another one of RWF 100,000 to use in a hair salon and for mobile phone charging

services both at 2 percent interest rate per month payable in 12 months. The majority of the population in the area belongs to *Ubudehe* Category 3; they could afford to buy solar home systems of RWF 80,000 and above. The demand is estimated at RWF 8 million—first tranche for six months. The current interest rate is 2 percent per month (that is, 24 percent per year) with maximum maturity of two years. The single obligor is RWF 4 million, which is normally 2.5 percent of total deposits.

37. **Rebakure Rusarabuye SACCO.** As of June 2016, this SACCO had 4,595 members and offered two types of deposit accounts, namely (a) current accounts and (b) savings accounts. The SACCO offices are located near Rusarabuye sector offices in Burera District, Northern Province. It has a sub-branch in Mubuga Trading Center located within 12 km from the main branch office. The person living farthest from the SACCO offices is within a radius of 20 km largely due to the geographical terrain of the area. Rebakure Rusarabuye SACCO provides loans to individuals, households, and groups. As of June 2016, the number and value of loans outstanding were 200 totaling RWF 119,415,285 spread across five economic sectors: agriculture activities with RWF 37,809,070, construction of residential and commercial houses with RWF 21,650,927, commercial activities of retail trading (boutique and restaurants) with RWF 35,291,331, transport facilities (purchase of motorcycles) with RWF 7,226,095, and others including salary advances and emergencies with RWF 17,437,862.

38. This SACCO works with the Business Development Fund (BDF) and benefits from the SACCO refinancing facility. It also administers several revolving funds (REMA, VUP, and PADSEC). These facilities are similar to the REF, meaning that this SACCO is experienced in the management of externally financed projects.

39. Rebakure Rusarabuye SACCO complies with BNR prudential regulations and standards according to the financial statements (balance sheet and income statement) of June 2016. It maintains proper books of account in Excel spreadsheets in accordance with the chart of accounts using reporting templates provided by BNR. As of June 2016, the capital adequacy ratio was 22.3 percent, liquidity ratio was 90 percent, and NPL ratio was 5 percent. As of June 2016, this SACCO made profits of RWF 19,809,934 and the ROA was 5 percent while the ROE was 24 percent. The governance and management arrangements in place with support of credit committee and audit committee are adequate to support effective implementation of the REF project. They have the required capacity to appraise, supervise, and monitor sub-loans of individual households and microenterprises.

40. The sector population is estimated at 3,749 households, and at least 500 households would sign up for the facility and buy solar home systems of RWF 100,000, which makes it RWF 50 million in the first six months of project implementation. This SACCO provides loans at 2 percent per month interest rate (24 percent per year) with maximum maturity period of two years. The single obligor is RWF 5 million, which is normally 2.5 percent of total deposits.

41. **Umurava Bigogwe SACCO.** As of June 2016, Umurava Bigogwe SACCO had 6,297 members and offered two types of deposit accounts: (a) current accounts and (b) savings accounts. The SACCO offices are located near Bigogwe sector offices on the main road to Rubavu District. The person living farthest from the SACCO offices is within a radius of 15 km largely due to the geographical terrain of the area. Umurava Bigogwe SACCO provides loans to individuals, households, and groups. As of June 2016, the number and value of loans outstanding were 251 totaling RWF 77,207,156 spread across four economic

sectors: agriculture activities with RWF 41,388,571, commercial activities of retail trading (boutique and restaurants) with RWF 19,188,265, transport facilities (purchase of motorcycles) with RWF 4,065,280, and others including salary advances and emergencies with RWF 12,565,040.

42. Umurava Bigogwe SACCO complies with BNR prudential regulations and standards according to the financial statements (balance sheet and income statement) of June 2016. It maintains proper books of account in Excel spreadsheets in accordance with the chart of accounts using reporting templates provided by BNR. As of June 2016, the capital adequacy ratio was 27 percent, liquidity ratio was 83.7 percent, and NPL was 5 percent. In the same period, this SACCO made profits of RWF 4,118,324, and the ROA was 1 percent while the ROE was 5 percent. The governance and management team in place with the support of credit committee and audit committee are adequate and could therefore support effective implementation of the REF project to appraise, supervise, and monitor sub-loans of individuals, households, and microenterprises.

43. It is estimated that at least 200 households would sign up for the facility and buy solar home systems of RWF 80,000 totaling to RWF 16 million in the first six months of project implementation. This SACCO provides loans at 2 percent per month interest rate (24 percent per year) with maximum maturity period of two years. The single obligor is RWF 3 million, which is normally 2.5 percent of total deposits.

44. **Terimbere Bwira SACCO.** As of June 2016, Terimbere Bwira SACCO had 5,026 members and offered two types of deposit accounts, namely (a) current accounts and (b) savings accounts. The SACCO office is located near sector offices and has a sub-branch/counter in Gashubi cell at Bwira Trading Center. This SACCO is located in a sector that has two mining sites. It is a hilly area with landslides, and the soils are not favorable for agriculture production—and thus majority of the population belongs to *Ubudehe* Categories 1 and 2. With regard to distance of members' residence to this SACCO, the person living farthest from this SACCO is within a radius of 7 km. The SACCO provides loans to individuals, households, and groups. As of June 2016, the number and value of loans outstanding were 95 totaling RWF 42,548,468 spread across three economic sectors: agriculture activities with RWF 30,330,420, construction of residential and business houses within their affordable limits with RWF 3,393,400, and commercial activities of retail trading (boutique and restaurants) with RWF 8,824,648.

45. Terimbere Bwira SACCO complies with BNR prudential regulations and standards according to the financial statements (balance sheet and income statement) of June 2016. It maintains proper books of account in Excel spreadsheets in accordance with the chart of accounts using reporting templates provided by BNR. As of June 2016, the capital adequacy ratio was 32.9 percent, liquidity ratio was 89.6 percent, and NPL was 4 percent. In the same period, this SACCO made profits of RWF 3,396,854, and the ROA was 2 percent while the ROE was 6 percent. The governance and management team with the support of credit committee and audit committee are satisfactory and could support effective implementation of the REF project.

46. This SACCO is familiar with solar home systems because Tubura and DASSI, which are involved in the business of solar home systems, are already established in the area. This SACCO estimates RWF 15 million as the first tranche for a period of 12 months, and the next tranche would increase as demand

increases. This SACCO offers loans to its clients at an interest rate of 1.5 percent per month (that is, 18 percent per year) with maximum maturity period of two years. The single obligor is RWF 2.5 million.

ANNEX 7: COMMERCIAL BANKS: OVERVIEW AND ASSESSMENT SUMMARY

General Overview

1. **Rwanda's banking system is becoming increasingly diversified, inclusive, and competitive.** This is a result of both organic growth of established banks and the entry of a number of regional players that have introduced innovative business models, particularly in the retail market. Despite Rwanda's narrow economic base, all banks compete across the spectrum of the corporate, SMEs and retail markets. Banks face relatively high overhead and credit costs, which have contributed to high banking spreads, with lending rates remaining sticky in the face of declining inflation and policy rates. The new business models, which rely on agency and mobile banking, are expanding bank outreach while reducing costs.

2. **Despite considerable progress registered in developing a modern financial sector, a number of challenges still affect the sector.** These include: (a) the small size of the financial system and the narrow economic base it serves; (b) the high operating costs and lack of economies of scale, resulting in continued high lending rates and relatively low profitability for most banks; (c) the need to strengthen the monitoring of cross-border risks to maintain stability given the increasing importance of foreign-owned banks in the system; (d) the lack of qualified personnel with requisite skills, both in the banking sector and supervisory agencies; and (e) the lack of medium and long-term funding required to finance investment, infrastructure and housing.

3. **There has been significant new entry into the Rwandese banking market in recent years, encouraged by a sound and accommodating legal and regulatory framework for banking and an enabling business environment.** The banking sector consists of 12 commercial banks, three of which have entered the market in the last three years (Crane Bank, Atlas Mara, and Bank of Africa). There are, in addition, three microfinance banks, one cooperative bank, and one development bank. The 12 commercial banks are Bank of Kigali (BK), Access Bank, Crane Bank, Ecobank, Equity Bank, Guaranty Trust Bank (GTBank), I&M Bank, Bank of Africa, KCB, Banque Populaire du Rwanda (BPR), BRD Commercial Bank, and Cogebanque (in the process of reaching an agreement with Attijariwafa Bank from Morocco for it to acquire a majority stake in the bank). The microfinance banks were all existing microfinance institutions that converted into licensed banks. Of the 12 commercial banks, 10 are majority foreign-owned. All of the majority foreign shareholders are African banks, largely from the East African Community and Nigeria. Together, these banks had a total of 177 branches and 183 bank outlets as of June 2016, and the share of the three largest banks in loans, deposits, and total assets was 44 percent, 47 percent, and 45 percent, respectively, in June 2016.[57]

[57] BNR, Monetary Policy and Financial Stability Statement, August 2016.

Legal and Regulatory Framework

4. **Banks are regulated and supervised by the National Bank of Rwanda (BNR) under Law No. 007/2008 of 08/04/2008.** Fostering financial stability is one of the main mandates of the National Bank of Rwanda (BNR). BNR achieves this objective through setting policy and regulatory framework aligned with international standards and by regularly monitoring performance of the financial system (i.e. the banking system, insurance sector, the pension, the MFIs and the payment system). In order to safeguard stability of the financial sector and provide room for its growth, the BNR has recently performed a review process of its regulatory frameworks and created new legal instruments that comply with international standards set by Basel 2 & 3. BNR has a dedicated department for bank supervision under the Financial Stability Directorate. The Bank Supervision Department carries out regular off- and onsite inspections of banks. The applicable prudential standards are summarized in Table 7.1.

Table 7.1. Prudential Standards and Limits

Standard in Current Regulation	Limits
Capital adequacy ratio	≥ 15 percent
Liquidity ratio	≥ 20 percent
Insider loans/net worth	≤ 25 percent
Total equity investments/equity	≤ 40 percent
Single borrowing/net worth	≤ 5 percent if NPL is > 5 percent ≤ 10 percent if NPL is < 5 percent
Loan classification and provisioning	Substandard 90–179 days - 20 percent Doubtful 180–364 days - 50 percent Loss ≥ 365 days - 100 percent

Eligibility Criteria

5. **The success of any financial intermediation operation critically depends on the quality of the PFIs.** Eligibility criteria for banks need to be defined that are cognizant of the nature of these institutions while at the same time ensuring that participating institutions are in stable financial condition, are prudently managed with capacity to appraise and carry credit risk, and are able to effectively report on project activities.

6. **Financial institutions interested to participate in the project will be obliged to comply with the eligibility criteria, which follow the guidance provided under World Bank Operational Policy OP 10.00.** This means that an interested bank should be able to meet the established eligibility criteria to become a PFI. Once qualified, a PFI should be expected to continue to meet the eligibility criteria at all times. Compliance will be reviewed annually. The eligibility criteria include:

(a) **Compliance with prudential regulations issued by BNR.** The PFI must be in good standing with BNR at all times and observe all other applicable laws and regulations;

(b) **Good governance.** 'Fit and proper' owners, adequate board composition and practices, competent management with adequate managerial autonomy, adequate organization, and institutional capacity for its specific risk profile.

(c) **Capital adequacy.** Compliance with BNR regulations (that is, minimum capital of 15 percent calculated as the ratio of total capital to total assets).

(d) **Adequate liquidity.** Compliance with BNR regulations (that is, liquid assets to total deposits at 20 percent), well-diversified funding sources, well-managed or no maturity gaps, and regular stress testing.

(e) **Adequate profitability.** Positive profitability, well diversified income structure, stable earnings trend, and well-managed cost structure.

(f) **Acceptable risk profile.** Effective Asset and Liability Management Committee and well-defined policies and written procedures for management of all types of financial risks (liquidity, credit, currency, interest rate, and market risks, as well as risks associated with balance sheet and income statement structures).

(g) **Adequate asset structure and portfolio quality.** Acceptable asset structure including concentration, lending to connected parties, effectiveness of loan underwriting, asset classification and provisioning[58], level of NPLs (that is, an NPL ratio as percentage of total assets not exceeding 5 percent), and collection practices.

(h) **Adequate internal audit.** Independent internal audit function with well-defined procedures, annual internal audit plans, regular reviews of all key risk management functions, and follow-up on issues raised in internal audit reports.

(i) **Adequate MIS system and well organized IT support, with adequate internal controls and security policies.** The IT support should be based on a relational database management system providing good accounting and bookkeeping and adequate system software support for transaction processing and all banking and risk management functions.

(j) **Appropriate implementation capacity.** For carrying out subproject appraisals and for supervising subproject implementation under the credit line.

Due Diligence Summary

7. **For the initial phase of the project, seven banks and one microfinance bank have expressed interest for possible participation in the REF.** The banks include BPR, BK, I&M Bank, Access Bank, GTBank, Cogebanque, KCB, and Urwego Opportunity Bank.

8. **Initially, two banks were appraised against the eligibility criteria, BK, and BPR.** Of the two, BK is eligible to participate in the project. BPR does not meet the eligibility criteria at this point, crucially because of negative profitability, but can be appraised once this issue has been resolved. The detailed appraisal summaries are available in the project files.

9. **BK is the largest bank in Rwanda** by total assets (35 percent market share), net loans (38 percent market share), deposits (32 percent market share), and profitability (61 percent market share) as of September 2016. BK was established in 1966 and has a wide distribution network that includes 78

[58] The bank must classify its assets and off-balance-sheet credit risk exposures (at least four times per year) and make adequate provisions.

branches and self-service channels such as internet banking, deposit-taking automated teller machines (ATMs) and Point of Sale (POS) terminals (89 ATMs and 941 POS) as well as channels that are geared toward promoting financial inclusion such as mobile vans and agent outlets (1,178 agents). BK has a short-term credit rating of A1+ and a long-term rating of AA-, with a stable outlook, from Global Credit Rating. In 2011, BK became the second domestic company to be listed on the Rwandese Stock Exchange. The Government, which owned 100 percent of the bank, diluted its direct shareholding to 29.5 percent in 2013 through the flotation of 45 percent of the shares and the sale of 25 percent to the RSSB.

10. **BK meets the eligibility criteria.** BK has a good governance structure, is well capitalized, and is in excellent financial condition. Its risk management functions are well organized, including both financial and operational risks. It has adequate treasury management and accounting, an effective internal audit function, and excellent information systems. BK is experienced in both corporate lending and retail lending. It is already providing loans and services expected to be offered and used under the REF program.

ANNEX 8: MINI-GRIDS IN RWANDA

Background

1. The term mini-grid (also referred to as a micro-grid) refers to an independently operated and managed, small-scale distribution network (low voltage [LV] or medium voltage [MV]) supplied by one or more energy generation plants, which could include the main-grid, operating as an isolated system with clearly defined physical and electrical boundaries. A mini-grid normally comprises the following parts: (a) electricity generation part (power plant, including storage or an interconnection to the main grid); (b) electricity distribution part (distribution network); (c) electricity connection points (the physical and electrical boundaries); (d) electricity metering part (metering systems, usually at the connection points; and (e) electricity consumers.

2. In a renewable energy mini-grid, most of the electricity generation is to come from renewable energy sources. A renewable energy mini-grid serving ten to hundreds of customers each is proving to be a cost-effective means of sustainably meeting the electricity needs of households, businesses and the community that cannot access grid power. In Rwanda, several mini-grids are operating or being proposed, generally with grant assistance. Likely sources of generation in Rwanda are solar PV, micro-hydro, or these renewable energy sources hybridized with diesel generators. Electricity is distributed at LV (single- or three-phase alternating current [AC], or direct current [DC]).

3. Presently, there are a few companies in Rwanda that have invested in and are providing mini-grid electricity services. Mesh Power operates about 80 micro-grids of 48 V DC, providing basic lighting and other services. Each micro-grid comprises of a 1 kW solar PV with batteries providing electricity to up to 50 households. Mesh Power offers a pre-electrification level of service.[59] NESELTEC is building several larger solar PV mini-grids powered by 25–45 kW of solar PV serving 500–900 customers with grid-quality electricity. Mini-grids powered by micro/mini-hydro are being built that range from 10 kW to 50 kW to provide electricity to several hundred customers. One company, Afritech, which will build and operate mini-hydro plants connected to the national grid to supply power at the bulk tariff, has expressed interest in building a mini-grid adjacent to its generation source and selling electricity to the community.[60]

4. These companies have had to depend on their own equity, donor grants, or angel investors to finance these mini-grids. The pace of development is constrained by the availability of such funding. Access to debt financing that leverages equity and limited grant funds could accelerate the pace of mini-grid development in Rwanda and offer lower cost electricity to communities, sooner than waiting for the grid service to reach them.

[59] Tiers 1 and 2 according to the MTF. In addition, Mesh Power's assets are movable and intended to be displaced by the arrival of the grid.

[60] Afritech intends to set up hydropower plants in Rubavu and Rutsiro Districts. Four hydropower plants (with total capacity of 11.5 MW) will be constructed in Bihongora (5.3 MW), Karambo II (0.7 MW), Gatare-Sebeya (1.3 MW) and Muregeya Cascades (4.2 MW). In addition, Afritech is currently developing a project with the nongovernmental organization (NGO) Practical Action (Rubagabaga, 0.4 MW), which will attach a mini-grid to divert about 10 percent of the mini-hydro power plant's output to serve the local community with approximately 300 connections.

Challenges to Mini-grid Development

5. Some of the key challenges being faced by mini-grid companies in Rwanda[61] are as follows:

(a) **Planning and regulatory challenges.** It is difficult to predict grid extension in Rwanda for the next 10 years, which makes the selection of sites for the development of independent mini-grids risky. While there is a regulatory framework in place (Simplified Licensing Framework) to protect mini-grid investments in case of the main grid arriving, it has not yet been tested, and there is concern about asymmetric negotiating power between the national electric utility (Rwanda Energy Group, REG) and mini-grid operators. In addition, a new law governing Public Private Partnership in Rwanda (No. 14/2016 of 02/05/2016) adds uncertainty, as it suggests mini-grids should be competitively procured by a government contracting authority rather than allowing for unsolicited projects as has been the case up to now.

(b) **Financial challenges.** Mini-grid developers have limited access to finance. This is due to several reasons, including mini-grids being risky investments, developers having limited experience and capability in preparing bankable proposals, and the local financial sector not having the capacity to properly evaluate mini-grid projects. Bank loans are usually not available, due to the risk aversion of local banks. If available at all, the loan terms are typically unattractive, with high collateral requirement, short tenor, high interest rate, and long approval process with an unpredictable outcome. The EnDev program offers RBF for mini-grids (to cover up to 70 percent of initial capital expenditure), but this requires development construction financing, which local developers have found difficult to obtain.

(c) **Currency mismatch.** In general, African currencies are volatile and likely to lose value against the U.S. dollar and the Euro. This creates a serious problem for mini-grid developers who depend on foreign currency financing, as their capital expenditures will be in foreign currency while their revenues are in local currency, and it is difficult for them to pass on the cost of exchange rate losses to their customers. Bank loans in local currency would come, if at all, with the same unattractive terms as hard currency loans, only with the interest rate being even higher. Banks could in some instances benefit from a third party credit guarantee, which could increase their willingness to lend and reduce the collateral required. On the other hand, to bring in a third party guarantor is likely to increase complexity and transaction costs. A developer may have the option to procure currency hedging from the financial market, but such products tend to be expensive and require cash collateral. Both these solutions (guarantee and hedging) would make more sense for transaction sizes that are larger than what is needed for mini-grids.

(d) **Technical and capacity challenges**. Local mini-grid companies have limited capacity to prepare business plans and feasibility studies (for example, conduct resource assessment,

[61] It is worth highlighting that international and local developers face different challenges. While local project developers face financial and technical difficulties, international developers tend to lack knowledge of the local context.

demand assessments and load forecasting and management plans, suitable technical designs). EnDev has noticed this in previous calls for proposals for RBF.

(e) **Uncertainty regarding technical requirements**. Technical requirements differ among stakeholders. EnDev developed their own requirements (based on international best practice and EARP experience) for eligibility for RBF, REG recommends the use of EARP standards (which are not mini-grid specific), while RURA has not yet issued technical regulations for mini-grids. Harmonization of technical requirements among stakeholders is required.

Types of Mini-grids in Rwanda

6. Regulation No. 01/R/EL-EWS/RURA/2015 governing the Simplified Licensing Framework for Rural Electrification in Rwanda provides a typology of mini-grids according to their electricity generation capacity: (a) very small (under 50 kW); (b) small (50 to 100 kW); and (c) medium (100 kW to 1 MW). It also defines small power distributors as operators in the distribution and trade of electrical power in grid-connected rural areas with less than 20,000 active customer connections and a capacity below 1 MW. Given the focus of the REF on off-grid electrification, only renewable energy mini-grids that are not connected to the national grid will be eligible for support.

7. Considering the Rwandese context,[62] most of the mini-grids supported under the REF may fall under the very small (under 50 kW) typology, though larger systems will also be eligible for the REF support. Given its likely relevance of very small systems under the REF, the following categorization for very small (under 50 kW) mini-grids was developed taking into consideration the Tier level of service[63] offered to consumers, as well as technologies employed:

(f) **Type 1: Solar 'pico'-grids.** Also considered 'pre-electrification' solutions, that is, not supposed to compete with the national grid but rather provide a basic service (Tiers 1–2) until the grid arrives. These mini-grids are well below 50 kWp of capacity. Example in Rwanda: Mesh Power.

(g) **Type 2: Small solar isolated mini-grids**. Typically, below 50 kWp, typically LV AC distribution network, higher Tier of electrification than Type 1 (Tiers 1–3 depending on customer category). Example in Rwanda: NESELTEC.

(h) **Type 3: Small hydro isolated mini-grids**. Typically, below 50 kWp, AC distribution network. Higher capacity factor of hydro (versus solar) allows for higher Tier of electrification than Type 2 (Tiers 1–4 depending on customer category). Example in Rwanda: ECOS.

Cost-effectiveness of Mini-grids

[62] Analysis of existing rural electrification surveys (for example, database of EARP priorities 3 and 4 villages [off-grid areas]), interviews with active mini-grid developers, and site visits.
[63] Multi-Tier Matrix for Access to Household Electricity Supply (ESMAP, SE4ALL, 2015).

8. Renewable energy mini-grids can, under certain circumstances, offer lower cost of electricity than solar home systems, diesel mini-grids or the extension of the grid to remote communities. Mini-grids are a cost-effective solution in general, when:

(a) In the isolated mini-grids: (a) peak power and energy demands are expected to be moderate, under 100 kW and supplying less than 400 MWh a year per mini-grid. Sites with higher demands can be justified if EDCL grid is not expected to serve that location within five years; (b) there are many customers per community (for example, 20 or more), so that there is sufficient electricity demand to justify setting up of the mini-grid infrastructure; (c) customers are in denser communities, (for example, 400 customers per km^2 or more[64]) so that distribution network costs are lessened; (d) customers have demonstrated willingness and ability to pay; and (e) distance from the national grid to the community to be served is 2.5-5 km or more. The shorter distance corresponds to mini-grids powered by micro-hydro and the longer distance to solar PV-powered mini-grids;

(b) There are productive/commercial loads, especially during daytime, permitting the mini-grid network and generation assets to be better utilized. This is particularly so for mini-hydro mini-grids where available water is often not used during daytime due to lack of electricity demand. Also, the willingness and ability to pay of productive/commercial customers are higher than domestic customers thus increasing revenues;

(c) Where there is a year-round supply of water and sufficient head drop, mini- or micro-hydro power provides lower cost electricity than solar PV with batteries. It also avoids the high recurrent cost of battery replacement approximately every five years; and

(d) Adding a diesel generation as a back-up power source with solar PV mini-grids is justified as it could be lower cost than increasing capacity of solar PV and batteries to improve year-round electricity availability.

Box 8.1. Cost-effectiveness of Mini-grids versus Competing Technologies

The comparison of mini-grids with solar home systems and grid extension was conducted based on levelized cost of electricity (LCOE), including all capital expenditure (capex) and operational expenditure (opex) (generation, distribution, administrative costs, and so on). For this purpose, a model was built for each type of mini-grid, including variables such as energy demand per customer, density of customers (customers per km of network), distance to the main grid, cost of generation and distribution equipment (different standards), cost of equipment replacement and operation and maintenance (O&M), cost of alternative technologies, and so on. The cost-effectiveness section below contains detailed information on the analysis for each type of mini-grid.

Economic and Financial Viability of Mini-grids

[64] The cost-effectiveness assessment shows that mini-grids are viable in relation to solar home systems when less than 60 m of distribution lines per customer are used (or more than 17 customers per km of distribution line). This approximately relates to 400 customers per km^2.

9. **Economic viability.** Considering the costs of existing mini-grids in Rwanda, versus the cost of alternative lighting sources (kerosene) and payments for mobile phone charging services, the EIRR exceeds 15 percent, even if consumer surplus benefits of improved lighting is not considered. This analysis is based on the mini-grid with the highest generation cost (Type 2) among the three types presented above. Consumer surplus benefits of improved lighting were not considered. Productive uses of electricity would have further improved the EIRR. The EIRR would be higher for micro-hydro mini-grids as the cost of generation is lower.

10. **Financial viability.** Financial models were built for each of the types of mini-grids most likely to be financed under the REF.

(a) **Type-1: Solar 'pico'-grids.** These are currently being installed at a cost of US$160 per connection (total capex) and charging an average tariff of US$3.7 per month per customer for 2.7 kWh per month per customer (on average). Under these conditions, mini-grids are loss-making and would require a subsidy of 69 percent of capex to break even. Type-1 mini-grid companies, however, project drastic cost reductions when achieving scale. EnDev subsidy is, however, fixed at €20 for DC mini-grids (same as RBF for Solar Lighting), which represents about 13-14 percent of capex. Mesh Power is currently being funded by Angel investors who expect returns in the medium term, when the company achieves scaled operations, which is expected to bring drastic cost reductions.

(b) **Type 2: Small-solar isolated mini-grids**. These are estimated to cost US$346 per connection. This cost implies that the distribution network will be constructed with low-cost materials (however compliant with EARP standards) and have a low-cost configuration (for example, three-phase backbone with single-phase distribution). There are subsidies available for this type of mini-grids to cover up to 70 percent of capex (for example, EnDev, SOGER, and EEP). Considering a 70 percent capex subsidy, the required tariff for cost recovery is US$0.69 per kWh. This could, for example, be broken down into a residential tariff (US$3.7 per month) and a commercial/industrial tariff of US$0.40 per kWh.

(c) **Type 3: Small-hydro isolated mini-grids.** These are estimated to cost US$349 per connection. The same subsidies available for Type 2 are available for this type of mini-grids (up to 70 percent of capex). Given that hydroelectricity is cheaper than solar, cost recovery tariffs are lower than for type-2 mini-grids. An average tariff of US$0.54 per kWh allows for an NPV of zero. In an optimistic scenario, if a higher proportion of the energy output of the hydropower plant were used and sold, the average electricity tariff could be reduced to US$0.34 per kWh.

Affordability of Electricity from Mini-grids

11. Electricity from mini-grids would be more expensive than the national tariff because these are small scale projects located in more distant locations. Therefore, grant assistance is needed to make electricity services affordable to customers who are in general, poorer than those in grid-served areas. Based on grants currently available, electricity tariffs may be in the range of US$0.30 to US$1.00 per kWh, if lower cost financing is available. Though high compared with national tariffs, they are affordable

as the quantum of electricity purchased monthly is low, and therefore monthly expenditure is comparable or lower to current levels.

12. Current average energy expenditure for families in Ubudehe categories 1 and 2, which are expected to represent most residential customers served by mini-grids, is reported to range from US$1 to US$4 per month.[65] As described below, monthly tariffs proposed by mini-grids are consistent with this affordability range. With regard to commercial and small industrial users, affordability is assumed to be capped at the cost of running a small diesel generator set, which is about US$0.40 per kWh.

13. With regard to the affordability of mini-grids in relation to solar home systems, the cost-effectiveness analysis shows that, with regard to LCOE, solar home systems are more expensive if the density of customers is sufficiently high. This may also translate into higher tariffs. For example, Mobisol's[66] offer of an 80 W solar home system for RWF 399 per day (US$0.50; three-year lease-to-own) translates into a tariff of approximately US$1.4 per kWh. This is equivalent to the cost-recovery tariff required by solar PV mini-grids (Tier 2) for an equivalent level of subsidy. Given the 70 percent capex subsidy for mini-grids, the cost-recovery tariff is reduced to US$0.69 per kWh, allowing for more widespread affordability. In conclusion, mini-grids would be a more affordable solution in more densely populated villages, while solar home systems would be more suited to sparsely populated villages. Also, given their portability, solar home systems would be a better solution in areas where the grid is likely to reach in less than five years, where a mini-grid investment would not be justifiable (other than pico-grids).

Pipeline of Renewable Energy Mini-grid Projects

14. There is a pipeline of renewable energy mini-grid projects developed with support from several donor-funded initiatives. EnDev has solicited mini-grid proposals and is offering RBF to qualified projects. To-date it has an agreement to provide RBF to 20 projects of Mesh Power and one micro-hydro project of ECOS. Energy-for-Impact (E4I), with funding from the World Bank-funded Energy Small and Medium Enterprises Project has assisted 15 micro-hydro mini-grid developers to prepare projects for financing. Each of these micro-hydro projects serves 50–150 customers. Under the SOGER Program, with SIDA assistance, E4I is supporting an additional 15 micro-hydro mini-grid developers. E4I has submitted a proposal to SIDA seeking grant funding to buy-down the capital cost by up to 50 percent. EEP Africa is providing grant funding for three solar mini-grids of NESELTEC and the electrification of a community tied to one of Afritech's mini-hydro projects.

15. SEFA/AfDB is supporting the GoR in the identification and implementation of mini-grids to be developed as PPP projects. A study is currently being undertaken to identify suitable mini-grid sites, conduct mini-grid feasibility studies for the most suitable 20 sites, and finally aid in the procurement process. The first mini-grids from this initiative are expected to be operational in 2018-2019.

[65] Figures from interview with GIZ EnDev [February 2017]. Related figures based on EICV4, which are consistent with figures reported by GIZ: Ubudehe 1 had electricity expenditure of RWF 2,964 over the last 4 weeks (however only 14 samples). Ubudehe 2 had a monthly electricity expenditure of RWF 1,622 with 115 samples. Total average of RWF 2,683 (US$3.28).
[66] Mobisol is one of the leading lease-to-own solar home system companies in Rwanda.

16. With the availability of debt financing under Window 3 of the REF, the EnDev, E4I and EEP-supported portfolio, as well as the projects to be identified by SEFA could benefit several thousand customers. The availability of debt financing from the REF project, could encourage other developers to consider renewable energy mini-grid investments. Additional projects would be forthcoming with future EnDev, E4I, and other donor support.

Mini-grid Financing Options Considered

17. Several different financial support mechanisms were considered for mini-grids, such as upfront capex grants, RBF (grants on a per connection basis), top-up tariff scheme, equity, debt (direct or through intermediaries), and guarantee mechanisms. A direct-lending window was finally retained. Some of the arguments favoring this solution against other mechanisms are the following:

(a) **Upfront capex grants and RBF per connection.** Limited additionality given other programs (for example, EnDev, SOGER, and EEP) are already active in this area. With regard to RBF, securing 'bridge financing' before receipt of RBF has been challenging for developers. For this reason, a mechanism offering debt financing for project development up to and including commissioning, as well as long-term financing would be preferable. On the other hand, it is important to note that grants are a fundamental part in the financing structure of mini-grids to bring electricity to affordable levels.

(b) **Top-up tariff scheme.** High degree of complexity and continuous (or periodic) need for intervention when tariffs change due to inflation or business model refinement.

(c) **Equity.** Providing a pool of capital for BRD to invest equity into developers could blur the lines between public and private; may require shareholder decision making, could lead to conflicts of interest in case the fund would assume an ownership role in competing companies, and provide limited exit opportunities.

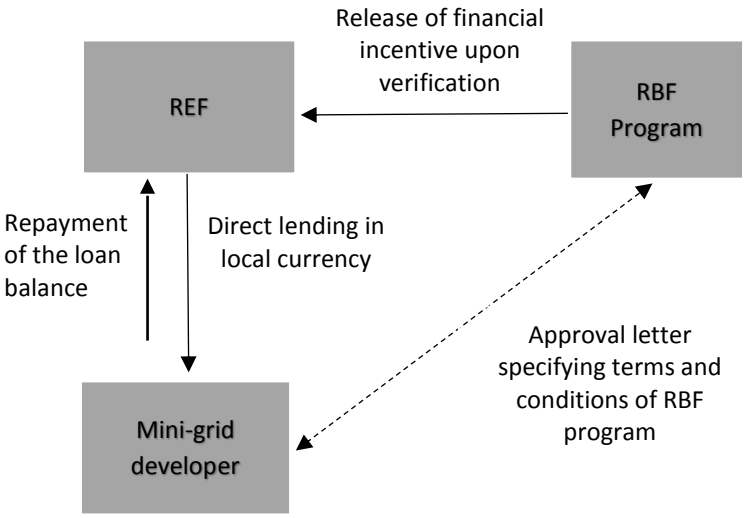
(d) **Guarantee mechanism.** Only needed for support of debt vehicles; market is not ready for debt; alternative sources of guarantees from ATI, SIDA, United States Agency for International Development (SIDA), and others available or proposed. Could be considered at a later stage.

REF and RBF Working Together

18. For example, the EnDev program provides subsidies of up to 70 percent of capex of mini-grids offering Tier 2 and above service levels, and €20 per connection for Tier 1 mini-grids. Because subsidies from EnDev are only released upon validation of connections at commissioning, the REF loan could be used as a 'bridge loan' until the grant funding becomes available, therefore unlocking essential financing that is required at pre-commissioning stages.[67] The REF loan will also provide long-term financing beyond commissioning.

[67] Payments of EnDev's RBF grant are split between commissioning and first year of operation of the mini-grid.

19. For mini-grid developers that would like to request financing from the REF and RBF (from EnDev or other programs), an approval letter from the RBF program would be attached to the REF loan application. The letter will not only confirm preliminary approval of RBF grant funding for the mini-grid project, but also specify that grant monies will be paid directly from the RBF program to BRD upon validation of connections. The results-based grant funding will be used to directly repay the corresponding amount of REF loan upon results-based grant proceeds and before any disbursement of dividends or sale of shares. Figure 8.1 illustrates the process for mini-grid developers accessing REF and RBF financing.



1) Developer submits an application for RBF (from EnDev or others)
2) RBF program issues letter of approval, specifying terms and conditions of financial incentive.
3) Developer submits application to the REF, together with RBF approval letter.
4) The REF extends direct lending to developer in local currency.
5) The developer constructs and operates the mini-grid.
6) RBF program releases financial incentives directly to BRD/REF upon verification of mini-grid construction and connections.
7) Developer repays the REF remaining balance.

Figure 8.1. Mini-grid Process for REF and RBF Financing

Risks assessment for mini-grid development

Table 8.1. Risks and mitigation measures

Risk Type	Risk	Magnitude	Mitigation Measures
Regulatory	Main grid extends into mini-grid area contrary to network expansion plans	H	• EDCL to announce all updates far in advance. • RURA to enforce simplified licensing regulations and to establish transparent compensatory mechanisms when grid arrives. • Developers to only invest in micro-grids with shorter financial returns or RURA to introduce standardized power purchase agreements and rules for interconnection and selling power to national grid.
Regulatory	Projects exempted from licensing (<50kW) are not protected by regulation when main grid arrives	L	• Revise Simplified Licensing Framework for Rural Electrification to offer simple compensatory mechanism for projects under 50 kW. • Developers to minimize investments by using low cost mini-grids and invest in projects with near-term returns.
Regulatory	Application of new PPP Law for the procurement of mini-grids by the Government (as opposed to unsolicited proposals)	H	• Seek legal opinion as to applicability of law to mini-grids. • Make clear public statements on the applicability of the PPP Law to mini-grid businesses • Amend PPP Law where there are conflicts
Regulatory	Requirement for grid network to use EARP standards increases mini-grid costs	M	• The Government to rationalize requirements when EARP standards must be met. • Permit use of lower cost network designs rather than meeting full EARP network standards, including DC networks, if safety standards are met.
Regulatory	Compliance with environmental and social safeguards may increase cost or delay projects	M	• Issue Environmental and Social Safeguards Framework consistent with the likely small impacts of these small mini-grids • Provide clear guidance, training and technical assistance to assist in compliance with environmental and social safeguards.
Institutional	Information on grid expansion plans of EDCL considered unreliable/ variable, making choice of mini-grid development sites risky	M	• EDCL to make latest verified data available online for easy access.

Risk Type	Risk	Magnitude	Mitigation Measures
Institutional	Institutional capability of RURA to enforce regulations according to Simplified Licensing Framework for Rural Electrification, especially in relation to negotiation between developers and REG upon arrival of grid.	M	• RURA to issue clear rules that minimize requirements for negotiations on case-by-case basis. • Revise regulations.
Political	Potential of land or other disputes with local village	M	• Follow REF project resettlement and compensation guidelines. • Improve communication to communities in off-grid areas.
Financial	Limited capacity in the financial sector to evaluate mini-grid investments in Rwanda	H	• REF project to build capacity at BRD and provide training to SACCOS and commercial banks interested in co-financing
Financial	Limited equity investors in this sector, with uncertain expectations of targeted returns	H	• REF project and development partners to support awareness and investment support for prospective equity investors. • Incentivize with technical assistance and investment assistance.
Financial	Limited fund raising experience amongst mini-grid companies	H	• REF project to offer training and capacity building • Development Partners should support transaction advisors to work with mini-grid developers • REF project to support outreach to potential co-financiers/investors
Financial	Developers being start-ups have little or no collateral to offer	M	• Developers provide a pledge of assets of the project company, and its shares in the project company as collateral, with step in rights for default • In lieu of collateral, credit may be enhanced through guarantees from third parties, through sourcing by, or in consultation with BRD, subject to availability and meeting BRD's requirements • REF project to offer training and capacity building to mini-grid developers, such as support from transaction advisors • REF project to support outreach to potential co-financiers/investors

Risk Type	Risk	Magnitude	Mitigation Measures
Financial	Continued dependence on grants to keep tariff affordable and project financial returns acceptable (as for rural grid service)	H	• Focus on projects that are economically justified • Continued dialogue with donors to enhance grant availability • Encourage innovation and low cost designs, including amending requirements to meet full EARP network standards • Consider competitive award of grants to maximize benefits
Financial	Currency - inconvertibility or depreciation	M	• BRD will lend in RWF with the Government bearing the currency risk
Operational	Limited ability or willingness to pay by consumers	H	• Careful demand and ability-to-pay assessment during pre-investment phase • Select technology consistent with ability to pay and meeting priority needs • REF project to offer technical assistance to developers (along with other donors) to improve their planning and project designs • Use grants judiciously to reduce tariffs • Reduce risks through better designs, or guarantees to reduce REO requirements
Operational	Limited awareness of mini-grids by stakeholders	M	• REF project to create awareness on consumers especially in areas designated for off-grid electrification • Explain benefits of mini-grids rather than waiting many years for obtaining grid connections
Operational	Theft or tampering of power or equipment	M	• Developers to improve community relations • Regulators and local government to enable the deterrence of and prosecution of theft of electricity and/or equipment • Developers to use tamper-proof technology
Operational	Technological malfunctions, design problems or engineering challenges	L	• REF project to adopt technology standards and best practice guidelines and offer training and advisory services • Developers to hire qualified and experienced engineers and use proven technology

Risk Type	Risk	Magnitude	Mitigation Measures
Operational	Limited capacity of local developers to prepare bankable business plans and design adequate mini-grids	M	• REF project and other partners to offer technical assistance and training programs regarding mini-grid system design • Developers to seek experienced advisory services • Build capacity of developers • Work with E4I, GIZ and other partners to support through technical assistance and cost-shared funding of investment project preparation
Operational	Construction risk	L	• Developers to seek qualified engineering and construction services and seek advisory services from REF project or other partners
Operational	Operational risk, including revenue collection	M	• REF and partners such as GIZ and E4I to offer training of operators and managers • Developers to improve community relations
Operational	Limited uptake of productive uses of electricity to increase socio-economic development as well as returns of developer	M	• Capacity-building or pilot programs to incentivize productive uses of electricity in rural areas where associated inputs such as raw materials and manpower are available, and access to markets exists • Facilitate access to financing through SACCOs and banks for business investment and working capital

Note: H = High; M = Moderate; L = Low;

Detailed Cost-effectiveness of Mini-grids

20. The parameters used in modelling LCOE for mini-grids and competing technologies are presented below for each type of mini-grid.

Table 8.2. Cost-effectiveness of Type 1 Mini-grids

Mini-grid Type	Type 1 Mini-grids	Solar Home System
Level of service	Tiers 1-2 (25W and 40 kWh per year)	
Technical parameters	• 1 kWp mini-grids serving 40 customers each • Average insolation: 5.5 kWh per m^2 per day • Overall power generation/storage losses at 20 percent • Small battery bank: 0.9 days of autonomy at 80 percent DoD to last two years • Distribution losses at 10 percent	Same technical parameters used, except for: • Batteries sized to one day of autonomy at 50 percent DoD, and therefore lasting longer (five years) • No distribution losses considered
Capex	• Total capex: US$160 per connection, inclusive of power generation and storage (24 percent), distribution (30 percent), and connection costs (46 percent) • Network cost at US$605 per km (including installation, excluding connection cost) • Connection cost at US$73 per customer (line drop, meter, internal wiring, appliances, and so on)	• Cost US$6.6 per Wp including installation and appliances
Opex	• O&M: 3 percent of capex • Sales commissions and other: 3.5 percent of revenue • Admin cost US$20 per customer per year (currently much higher than this for MP)	Assumed similar opex structure to keep the analysis technical rather than related to business model. O&M expenses were considered lower (1.5 percent of capex) due to there not being a distribution network. Commissions and administrative costs were kept equal.
Other	• Same discount rate used in both cases (12 percent) • Subsidies were not taken into consideration in the cost-effectiveness analysis	
Result	Mini-grids have a lower LCOE (20 years, considering replacement of parts) than solar home systems when customer density is such that the length of the distribution network does not exceed 60 meter per customer.	

Note: DoD = Depth of Discharge

Table 8.3. Cost-effectiveness of Type 2 Mini-grids

Mini-grid Type	Type 2 Mini-grids	Solar Home System	Main Grid
Level of service	50W-100W and 80–160 kWh per year per customer on average (Tiers 1-3)		
Technical parameters	• 25 kWp mini-grids serving (a) 500 customers, or (b) 250 customers. The second case represents a higher penetration of productive uses (lower number of customers with higher energy consumption in average) • Average insolation: 5.5 kWh per m^2 per day • Overall power generation/storage losses at 20 percent • Batteries sized to one day of autonomy at 50 percent DoD, and therefore lasting longer (5 years) • Distribution losses at 10 percent	Same technical parameters used, except for: • No distribution losses considered	Distribution grid configuration (and losses) assumed to be the same as in mini-grid.
Capex	• Total capex: US$346 per connection, inclusive of power generation and storage (46 percent), distribution (26 percent), and connection costs (28 percent) • Network cost at (a) US$3,025 per km (low cost single-phase) and (b) 6,050 (low cost three-phase) (both including installation, excluding connection cost) • Connection cost at US$97 per customer (line drop, meter, internal wiring, appliances, and so on)	• Cost US$5.6 per Wp (in average) including installation and basic appliances • This is an average cost of solar home system serving residential customers and commercial/ institutional systems serving Tier 3 customers	• Medium voltage line (33kV) extension at US$9,075 per km (low cost in Rwanda) • US$121 per kVA for transformer • Same distribution capex as mini-grid

Mini-grid Type	Type 2 Mini-grids	Solar Home System	Main Grid
Opex	• O&M: 1.5 percent of capex • Sales commissions and other: 3.5 percent of revenue • Admin cost US$20 per customer	Assumed similar opex structure to keep the analysis technical rather than related to business model	• Lower O&M cost for project (0.5 percent of capex) given that there is no power generation involved • Cost of electricity at MV at US$0.13 per kWh
Other	• Same discount rate used in both cases (12 percent) • Subsidies were not taken into consideration in the cost-effectiveness analysis		
Result	• Base case (80 kWh per customer): mini-grids viable in relation to solar home systems for networks smaller than 22m per customer for single-phase (US$3,025 per km) networks. Three-phase network not viable • When considering productive use (160 kWh per year per customer), viability threshold increases to 65 m per customer		Solar mini-grids viable if MV line further than 9 or 10 km depending on energy consumption scenario

Table 8.3. Cost-effectiveness of Type 3 Mini-grids

Mini-grid Type	Type 3 Mini-grids	Solar Home System	Main Grid
Level of service	~50W-100W and up to 260 kWh per year per customer on average (Tiers 1-3)		
Technical parameters	• 11 kW mini-grids serving 258 customers • Capacity factor: 70 percent • Distribution losses at 10 percent	• Same aggregate capacity with solar PV • No distribution losses considered	Distribution grid configuration (and losses) assumed to be the same as in mini-grid

Mini-grid Type	Type 3 Mini-grids	Solar Home System	Main Grid
capex	• Total capex: US$349 per connection, inclusive of power generation (37 percent), distribution (35 percent), and connection costs (28 percent) • Network cost at (a) US$3,025 per km (low cost single-phase) and (b) US$6,050 per km (low cost three-phase) • (both including installation, excluding connection cost) • Connection cost at US$97 per customer (line drop, meter, internal wiring, appliances, and so on)	• Cost US$5.6 per Wp (on average) including installation and basic appliances • This is an average cost of solar home system serving residential customers and commercial/ institutional systems serving Tier 3 customers	• Medium voltage line (33kV) extension at US$9,075 per km (low cost in Rwanda) • US$121 per kVA for transformer • Same distribution capex as mini-grid
Opex	• O&M: 1.5 percent of capex • Sales commissions and other: 3.5 percent of revenue • Admin cost US$20 per customer	Assumed similar opex structure to keep the analysis technical rather than related to business model	• Lower O&M cost for project (0.5 percent of capex) given that there is no power generation involved • Cost of electricity at MV at US$0.13 per kWh
Other	• Same discount rate used in both cases (12 percent) • Subsidies were not taken into consideration in the cost-effectiveness analysis		
Result	• Base case (only 30 percent of energy output used): Mini-grids viable in relation to solar home system for networks smaller than (a) 48 m for US$3,025 per km network, and (b) 24 m per customer for US$6,050 per km network • If considering productive use (using >30 percent of energy output), solar home systems cannot compete with the hydro mini-grid		Hydro mini-grids viable if 33 kV line further than 2.5 km

Detailed financial analysis

Table 8.4. Financial Analysis of Type 1 Mini-grids

Type 1 Mini-grids	Scenario 1 (Current Costs)	Scenario 2 (Projected Costs at Scale)
Capex	• Base case (US$160 per connection) as in cost-effectiveness analysis • Total for 100 mini-grids: US$638,000	• Base case (US$100 per connection) as in cost-effectiveness analysis

Type 1 Mini-grids	Scenario 1 (Current Costs)	Scenario 2 (Projected Costs at Scale)
Opex	• Base case, same as in cost-effectiveness analysis	• 50 percent reduction in administrative expenses (from US$20 to US$10 per customer per year)
Revenues	• US$3.7 per month (US$1.4 per kWh) (higher tariffs unlikely due to limited ATP), collection rate 80 percent. 3.5 percent of revenue in commissions	• US$2.6 per month (US$0.97 per kWh), collection rate 80 percent. 3.5 percent of revenue in commissions
Financing structure	• Equity/debt: 30/70 with long-term debt at 10 percent interest • Target ROE of 18 percent • RBF subsidy (EnDev) fixed at €20 per connection for DC mini-grids	
Results	• Non-viable without additional subsidies even with RBF • NPV: (-) US$324,000 • 64 percent capex subsidy required for NPV = 0	• Viable with only RBF and without other subsidies • NPV=0

Table 8.5. Financial Analysis of Type 2 Mini-grids

Type 2 Mini-grids	
Capex	• US$346 per connection as in cost-effectiveness analysis • Total: US$173,000 (for 25 kW per 500 connections)
Opex	• Same as in cost-effectiveness analysis
Revenues	• Connection fee: US$37 • Tariff residential: US$3.7 per month (80 percent of customers) • Tariff commercial/industrial: US$0.40 per kWh • Weighted average tariff: US$0.69 per kWh • Collection rate 80 percent • 3.5 percent of revenue in commissions
Financing structure	• Equity: 30 percent • Target ROE of 18 percent • RBF: 70 percent • Cost of debt to cover reimbursement period: 5–7 percent
Results	• Viable with only RBF and without other subsidies • NPV = 0

Table 8.6. Financial Analysis of Type 3 Mini-grids

Type 3 Mini-grids	Scenario 1 (30 percent of Output Used)	Scenario 2 (60 percent of Output Used)
capex	• US$349 per connection, as in cost-effectiveness analysis • Total: US$90,071 (for 11 kW per 258 connections)	

Type 3 Mini-grids	Scenario 1 (30 percent of Output Used)	Scenario 2 (60 percent of Output Used)
opex	• Same as in cost-effectiveness analysis	
Revenues	• Connection fee: US$37 • Tariff residential: US$2.6 per month (80 percent of customers) • Tariff commercial/industrial: US$0.40 per kWh • Weighted average tariff: US$0.54 per kWh • Collection rate 80 percent • 3.5 percent of revenue in commissions	• Connection fee: US$37 • Tariff residential: US$2.4 per month (80 percent of customers) • Tariff commercial/industrial: US$0.40 per kWh • Weighted average tariff: US$0.34 per kWh • Collection rate 80 percent • 3.5 percent of revenue in commissions
Financing structure	• Equity: 30 percent • Target ROE of 18 percent • RBF: 70 percent • Cost of debt to cover reimbursement period: 5-7 percent	
Results	• Viable with only RBF and without other subsidies • NPV = 0	

Detailed Economic Analysis

21. The net benefit (EIRR) of mini-grids (without lighting consumer surplus) has been calculated based on costs of existing mini-grids in Rwanda, versus the cost of alternative lighting sources (kerosene) and payments for mobile phone charging services. A solar mini-grid has been used for this comparison, as a conservative approach. The EIRR would be higher for micro-hydro mini-grids as the cost of generation is lower. A Type-2 mini-grid (comparable to NESELTEC) has been used for the comparison, where each customer uses electricity equivalent to 50 Wp of solar PV. Electricity is used for four LED lamps of 5 W each for five hours per day and charges an average of 2.5 mobile phones two times a week, with 2 kWh per month available for other uses (for example, 15 W television used four hours per day). It is assumed to offset three kerosene lamps used four hours per day and the same total mobile phone charges a week at US$0.11 per charge, and provide far superior and more convenient services.

(a) **Mini-grid costs.** This mini-grid type provides each customer with a level of service of 50 Wp of solar PV at a price of US$6.90 per Wp, resulting in a capital cost per customer of US$346. O&M costs have been estimated with a 1.5 percent of the capex per year plus a flat US$10 administration fee, or US$15.2 per year over a lifetime of 20 years. Besides, three battery replacements have been accounted for every five years.

(b) **Cost of alternatives.** The avoided cost of kerosene is calculated from the equivalent of three lamps used during four hours each day at US$1 per liter of kerosene, which is the commercial cost of kerosene plus an additional 10 percent to account for transport to rural areas. This results in US$43.8 of kerosene per year avoided. For mobile phone charging, surveys in Rwanda show that the average household has 2.5 phones, which are charged twice a week each at US$0.11 per charge, resulting in US$28.10 avoided from mobile

charging. In total US$71.90 per year is avoided just on kerosene lighting and mobile phone charging.

22. Considering savings in kerosene and mobile-phone charging alone, savings over a 20-year lifetime result in an EIRR of 15 percent, which is considered viable.

23. The calculation of the lighting consumer surplus is used by the World Bank to also represent the benefits of rural electrification. The idea behind is that the '*electricity supply lowers the cost of energy to the user, resulting in an increase in consumer surplus, which is the difference between what the consumer is willing to pay and what they actually do pay*.'[68] Because lighting is the main use of electricity that mini-grids provide in rural Rwanda, especially to households, the lighting consumer surplus is used. It compares the costs of the lighting by kerosene lamps, commonly used in Rwanda, with the cost of lighting from mini-grid electricity. The mini-grid electricity provides four LED lamps of 5 W each for five hours per day with a lighting output of 240 lumens per lamp, not counting other services that may be provided such as radio, television or phone charging. The electric lights are assumed to offset three kerosene lamps used four hours per day each with a lighting output of 12 lumens per lamp and a fuel consumption of 0.1 L per hour.

Electricity Pricing and Affordability

24. Electricity pricing required to recover investment given the proposed financing conditions and existing grant funding (for example, EnDev) mechanisms is shown below for different types of mini-grid projects.

Table 8.7. Affordability

Mini-grid Type	Type 1 (Pre-electrification)	Type 2 (Solar PV)	Type 3 (Hydro)
Electrification Tier	1	1–2	1–3
Connection fee (US$)	0	37	37
Average tariff (US$ per kWh) [a]	0.97 [b]	0.69	0.54 at 30 percent utilization 0.34 at 60 percent utilization (with productive uses)
Average consumption (kWh per month)	2.7	5.7	5.7 - 11.4
Monthly payment (US$ per month)	2.6	3.9	3.1 – 3.9
Affordability (US$ per month)	Residential (Ubudehe categories 1 and 2): US$1-4 per month	Residential (Ubudehe categories 1 and 2): US$1-4 per month Commercial: <US$0.40 per kWh (cost of small diesel generators)	

Note:
a. Calculated cost-recovery tariff considering proposed financing conditions (70 percent RBF grant, debt at 7 percent interest). Not applicable for pre-electrification (type 1) projects. EnDev RBF is currently fixed at €20 per connection for this type of projects.

[68] The World Bank (2009). The Welfare Impact of Rural Electrification, Appendix H.

b. Tariff based on capital cost projected by Mesh Power of US$100 per connection when operating at scale (after 10,000 connections).

ANNEX 9: RWANDA STAND-ALONE OFF-GRID SOLAR SYSTEM MARKET

1. **During the last 10 years, the Rwandese market for stand-alone off-grid solar systems has become one of the most active in Sub Saharan Africa.** A decade ago, small local companies identified the opportunity to sell Rwandese off-grid households simple solar lanterns and home systems that could provide light and power more cleanly than kerosene lamps and diesel generators. While these early companies often received financial support in the form of grants and concessional loans from funders such as the World Bank, BRD, and various NGOs and donors, product costs were nevertheless high and only a small share of off-grid households could afford to purchase lanterns and systems outright. The market therefore remained relatively small and off-grid systems did not play a significant role in the country's national electrification plans.

2. **Over the last five years, the cost of off-grid solar systems has dropped significantly and new technology has fostered the emergence of pay-as-you-go business models.** As a result, products—particularly solar home systems—have become far more accessible for off grid Rwandese households. The market has expanded and local companies have been joined by larger regional companies and NGOs. In 2012, One Acre Fund began selling solar lanterns to its 150,000-strong customer base of seed and fertilizer customers. In 2014, Mobisol, BBOXX, and SOLARKIOSK launched operations in Rwanda, followed by Off-Grid Electric in late 2015 and Ignite Power in the summer of 2016. Together, these firms and others are selling upward of 30 different off-grid solar products, many on a repayment basis for instalments of as little as US$3-10 per month. As a result, the market has moved from being principally lanterns to where multi-light point systems will likely represent over 50 percent of solar equipment sales in 2017.

3. **Regional expansion has begun delivering the backbone of a competitive country-wide solar distribution.** In the market entry stage, most companies began by focusing on a single province or even a few districts. Mobisol, Off-Grid Electric, SOLARKIOSK, and Ignite Power, all launched in the Eastern Province, due to the higher average incomes of farmers in the region but also strong transportation linkages to Kigali. BBOXX is the only player to have initially focused on the Northern Province, while One Acre Fund was able to leverage its existing network to serve customers in Southern, Eastern, and Western Provinces. In 2016, many of the larger companies have begun expanding into the remaining provinces. As a result, there are now at least three large retailers of off-grid solar systems in every province, suggesting that a relatively small number of the country's 30 districts remain underserved.

4. **The GoR's Renewable Electrification Strategy has defined a clear role for off-grid solar that complements the national grid, and results in a potential customer base of up to 2 million off-grid households.** Further analysis suggests that while a share of these households will not be able to afford even a simple Tier 1 multi-point lighting system in the short to medium term, there still remains a sizeable market that will not be saturated by a single supplier. Moreover, as the cost of system components and appliances (such as televisions) drops, households will likely upgrade to Tier 2 or higher systems, ensuring ongoing demand for products.

5. **Competition is increasing in the Rwandese market, and there is a likelihood that, going forward, a high-quality off-grid energy service will be available to customers in all districts at competitive prices.** Solar companies in Rwanda are already looking to expand their product offerings to capture larger market shares in any given region, either by offering simpler, cheaper multi-point lighting systems or larger solar home systems capable of powering more demanding appliances. Indeed, companies will likely differentiate themselves on price, by offering superior appliances (for example, larger televisions or brighter lights), providing highly regarded customer service, or engaging in clever marketing. Those that are most successful will benefit from improved economies of scale, including an increasingly low marginal cost of customer acquisition and retention. However, at this point, any further reductions in consumer prices will be closely tied to the cost of and tenor of capital available to companies and their customers.

6. **International funding has been key to the emergence of pay-as-you-go offerings regionally and in Rwanda.** PAYGO financing requires substantial up-front funding to purchase stock and bridge the gap to repayments from customers. Local funding has not been available for PAYGO businesses, and the entry of such companies to the Rwandese market has depended on external funding. Financial flows to date include venture capital, concessional loans (for example, Overseas Private Investment Corporation's support of One Acre Fund), grant monies (for example, €6 million from the European Union for Mobisol's expansion), and debt financing (for example, US$7.5 million for Off-Grid Electric from impact investment manager Developing World Markets). However, scaling and systematic price reductions will depend on expanded local sources of funding in local currency.

ANNEX 10: SCALING-UP RENEWABLE ENERGY PROGRAM (SREP)

Indicator	SREP-funded REF Project	Transformational Scale-Up RES (2016–2020) [a]
Number of women and men, businesses and community services benefiting from improved access to electricity and as a result of SREP interventions	1.8 million people (52% women) and 27,500 enterprises	4 million people (52% women, 1 million households), of which: • 2.2 million people with Tier 1 off-grid energy access (550,000 households) • 1.8 million people with Tier 2 off-grid energy access (325,000 - 425,000 households)
Annual electricity output from RE as a result of SREP interventions (MWh per year)	13,000 MWh per year	45,000 MWh per year
Tons of GHG emissions reduced or avoided [b] - Tons per year (tCO_{2eq} per year) - Tons over 10-year lifetime (tCO_{2eq})	10,314 tCO_{2eq} per year 103,145 tCO_{2eq} per year over 10-year lifetime	35,000 tCO_{2eq} per year
Financing leveraged through SREP funding (US$ million, cumulative)	Total estimated cost of US$52 million of which: • IDA - US$7 million • Private sector - US$41 million • EnDev - US$1.5 million • BRD - US$0.5 million[c] • BTC - US$2 million	n.a.
SREP leverage ratio	1:1	n.a.
Co-benefits: • Strengthened private sector role and participation in off-grid electrification • Enhanced institutional capacity and off-grid sector knowledge of SACCOs and banks • Improved consumer awareness on the benefits of off-grid equipment and services • Fostered economic development through job creation and income generation, especially in rural areas • Enhanced energy security from reduced dependence on imported fossil fuels • Improved quality of health services, education, and public safety conditions in rural areas, especially for women and children • Improved gender equality and women's socioeconomic status • Promotion of low-carbon development pathway		

Note:

a. Republic of Rwanda, Rural Electrification Strategy, MININFRA, June, 2016

b. CO_{2eq} savings were estimated applying a proxy-based method, which was approved by the SCF-SREP sub-committee and proposes and emission equivalent factor based on diesel-generated electricity: 793.7 tCO_{2eq} per GWh.

c. In-kind contribution from the recently established Energy Division (for example, staff cost, transportation, office), as well as workshop and consultation expenses.

Introduction

1. **Country and sectoral context.** See sections I-A (Country Context) and I-B (Sectorial and Institutional Context) of the Project Appraisal Document.

2. **Problem Statement.** Rwanda has made impressive progress in economic, environmental, human, and social development after the 1994 genocide. Rwanda's population is 11.6 million, of which 52 percent are women. It also has one of the highest population densities in Africa at an estimated 460 people per square kilometer. In the late 1990s, the country was characterized by deep and widespread poverty, abysmal health indicators, and pervasive food insecurity. Government policy has focused on building institutional capacity, good governance, and a business-friendly environment, resulting in an annual gross domestic product growth rate of 8 percent between 2000 and 2013—a 170 percent increase in real GDP—making the country among the 10 fastest-growing economies in the world. Poverty decreased from 59 percent in 2001 to 45 percent in 2011, while extreme poverty fell from 40 percent to 24 percent in the same period. In-spite of a recent slow-down in economic growth Rwanda's economic outlook for the medium-term remains strong. As a result of deterioration of the external environment and lower prices for Rwandese exports, growth slowed in 2016.

3. **Despite significant development progress in recent years, the Rwandese electricity sector faces significant challenges.** Low access to electricity and high electricity cost, exacerbated by limited generation capacity, low efficiency of electricity supply, low household demand, and affordability, are primary constraints to attracting and further scaling up investment flows. Consumer affordability and access to finance are particularly hindering the expansion of off-grid electricity services.

4. **The total share of population with access to electricity has risen from about 110,000 households in early 2009, to about 600,000 households by mid-2016.** However, the electrification rate reflects primarily grid-connected users in urban areas and remains largely concentrated in the top quintile. For example, within the districts of Kigali connectivity is 65 – 75 percent, whereas the districts outside Kigali are characterized by lower grid access, with 10 districts having connectivity between 6 and 15 percent. Off-grid access remains low. According to the 2012 census, 0.48 percent of households had access to off-grid solar services and 0.17 percent to 'hydroelectric or other private sources.' In 2016, off-grid access was estimated at 2.6 percent.[69]

5. Rwanda is particularly hit by high electricity costs. Cost of service delivery is about US$0.30 per kWh, while average electricity tariffs at US$0.21 per kWh, are not cost reflective and are relatively high compared to other countries in the region. Additionally, the average cost of a grid connection is heavily subsidized: out of about US$560 connection cost per household, consumers pay about US$75 as connection fee over a two-year period. About 46 percent of Rwandese households are considered poor.[70] Consequently, despite significant subsidy, low residential electricity demand in Rwanda affects the ability of a large part of the population to afford their grid connection.

[69] Estimated Tier 1 access per MTF as suggested by recent evidence from solar companies' sales.
[70] In Rwanda, all households are categorized into 'Ubudehe' categories. There are four Ubudehe categories, with Ubudehe 1 (16 percent of Rwandese households) being the poorest/most vulnerable and Ubudehe 2 (30 percent of households) – poor.

6. **The GoR has an ambitious target to increase access to electricity to 70 percent by mid-2018, of which at least 22 percent will be provided through off-grid solutions.** [71] The REP defines the overall vision and policy framework, while the ESSP translates the policy directives and principles into concrete measures necessary to reach medium-term targets. The high cost of reaching rural households through the grid because of difficult terrain, together with low residential electricity demand and poor affordability, affects the financial sustainability of grid-extension investments in rural areas. Given the available funding, grid access is expected to reach 32 percent (763,000 households) by mid-2018 and 37 percent (870,000 households) by 2020. In view of this, the Government is promoting off-grid access to electricity to areas, where extending the grid is not financially viable in the short term. The RES (2016) aims at integrating grid and off-grid solutions and promoting private sector investment.

7. **RES targets entail connecting almost 1 million households with off-grid systems of different tier-level of energy access by 2018.** Since 2010, the off-grid industry has grown substantially in Rwanda, though the market remains at an early stage given the limited market penetration reached to date. Over 200,000 Rwandese households have access to solar services, but mostly through small solar systems such as solar lanterns. Increasing off-grid energy access will require addressing issues of affordability and access to finance in Rwanda.

8. **SREP Rwanda IP.** The SREP IP for Rwanda was endorsed by the SREP Sub-committee in November, 2015 with an allocation of US$50 million. The Rwanda IP was developed under the leadership of the GoR, through a technical team led by MININFRA with support from the World Bank Group and AfDB. The preparation of the Rwanda IP benefited from extensive consultation with key stakeholders in Rwanda's energy sector, including renewable energy developers, renewable energy associations, financial-sector stakeholders, implementing agencies and development partners. The objective of the Rwanda IP is to develop financially sustainable long-term markets for the private sector provision of off-grid electricity services through stand-alone solar systems and renewable energy-based mini-grids.

9. Under the Rwanda IP, SREP funds will be utilized to establish the REF, which is part of the wider Government strategy to support private investments in off-grid energy services. The REF is expected to increase off-grid energy access in Rwanda through effectively addressing consumer affordability and access to finance challenges, thus facilitating the achievement of the GoR's off-grid access targets. The GoR envisions the proposed project as a pilot that could be scaled up into a primary mechanism for directing funds and technical assistance to the off-grid electricity sector, eventually attracting additional financing for rural electrification from other development partners and the private sector.

10. **Project description.** The project development objective is to increase electricity access in Rwanda through off-grid technologies and facilitate private sector participation in renewable off-grid electrification. The REF project will be structured around two components designed to address consumer affordability and access to finance for off-grid electricity services, while seizing on the use of

[71] The ESSP also targets that 100 percent of schools and hospitals will have access to electricity by 2018. Given the projected rate of population growth and decreases in average household size estimated by the National Institute of Statistics Rwanda, the number of households is expected to increase by over 100,000 annually over the short to medium term. This, in effect, makes the 70 percent electrification goal a 'moving target'.

existing country systems and promoting private sector investments to ensure sustainability of the approach. A detailed description of the project is presented in ANNEX 1.

(a) **Component 1: Line of credit and direct financing for off-grid electrification,** which will set up and operationalize an REF, a local currency line of credit and direct financing facility that will help address access to finance and affordability constraints in Rwanda through four financing windows using key market enablers: SACCOs, banks (commercial and microfinance), and private companies (mini-grid developers and potentially locally registered OSCs).

(b) **Component 2: Technical assistance, capacity building, and project implementation support,** which will provide necessary technical assistance and capacity building to the implementing agency and participating entities, as well as increase public awareness on the benefits and opportunities of off-grid electrification.

11. **Transformative impact.** The transformative impact of the proposed SREP-funded project stems from its contribution to the mobilization into the off-grid electricity sector of all key market enablers, including SACCOs, banks, mini-grid developers, and locally registered OSCs. The project will improve the overall enabling environment in the off-grid sector, supporting the capacity and ability of local institutions to support off-grid electrification, as well as fostering growth of private sector-led initiatives that provide reliable, cost-effective, and scalable renewable energy solutions for off-grid electricity access. The project will initiate the sustainable development of the sector by improving the enabling environment for private sector investment and strengthening the overall capacity of country systems, which is crucial for ensuring the sustained and long-term transformation of the sector. The successful implementation of the SREP-funded project will make off-grid electricity services affordable to consumers, which will, in turn, provide critical mass to ensure subsequent private sector engagement in the sector. The project's contribution to consumer awareness on the benefits of quality-verified off-grid equipment and services, together with capacity building and technical assistance to participating SACCOs, banks, and private companies will guide the sector toward maturity. The REF facility will further support the expansion and transformation of the off-grid sector by becoming a coordinating mechanism that attracts additional funding from other sources to help streamline the growth of privately-led off-grid electrification markets beyond the initial five-year period envisioned under the SREP-funded project.

12. **Rationale for SREP financing.** The SREP-funded project support Rwanda's national and energy sector priorities, namely increasing access to reliable and affordable energy services through a combination of on-grid and off-grid solutions. In particular, the proposed project will support the implementation of the RES, which recognizes an important role for stand=alone solar and mini-grids in achieving electricity access targets. The Rwandese off-grid market is at early stages despite strong potential for stand-alone solar systems that are particularly cost-effective for low-energy usages of the traditional Rwandese households, as well as for mini-grids that can provide a cost-effective and scalable solution for increasing access to electricity. Moreover, consumers are generally unaware of the benefits and opportunities from off-grid electrification. The market for off-grid solar systems is promising in Rwanda, but the presence of consumer affordability and access to finance barriers has hindered private sector expansion in the sector. Few developers are providing mini-grid electricity services despite the existence of an encouraging legal and regulatory framework, mainly owing to the lack of adequate

commercial financing for mini-grid development, as well as limited grant funding to improve the affordability of electricity connections. In this context, the SREP support will be crucial to establish the REF facility that is designed to overcome the barriers hindering the growth of off-grid electricity markets in Rwanda. The REF will use existing country systems to facilitate access to finance for households and businesses, improve affordability of solar electricity services, and maximize geographic coverage. Coupled with other sources of financing, SREP support will also demonstrate that renewable energy-based mini-grids are indeed an economically viable and scalable option for off-grid electrification. SREP funding will provide upfront financing that is essential for bringing the mini-grid projects to commissioning. SREP funding will also be utilized for technical assistance and capacity-building activities aimed at strengthening stakeholder capacities for off-grid electrification.

Assessment of REF Project with SREP Investment Criteria

13. **Increase installed capacity from renewable energy sources.** The country's installed capacity by April 2017 was 213 MW (with available capacity of 190 MW and peak demand of about 170 MW), of which 45 percent is hydro and 27 percent is thermal power generation, mostly based on imported oil products such as expensive diesel transported to the country by truck. The SREP-funded REF project will facilitate the deployment of 7.7 MW renewable energy capacity, of which 6.6 MW is from stand-alone solar systems and 1.1 MW from renewable energy based mini-grids.

14. **Increased access to energy through renewable energy sources.** The proposed SREP-funded project will provide access to off-grid electricity services to Rwandese households and enterprises through stand-alone solar systems or mini-grids. It is estimated that the project will facilitate the deployment of 445,500 off-grid connections, providing access to off-grid electricity services at different tier levels to 1.8 million people, 52 percent of whom are women. Additionally, the deployment of stand-alone solar PV and mini-grids will provide electricity to 27,500 micro, small and medium enterprises.

15. **Low-emission development.** Rwanda's energy mix consists of 45 percent hydro and 27 percent thermal power generation. Electricity supply from hydropower sources is severely affected by variations in hydrology, which together with inadequate grid interconnection capacity, leaves Rwanda exposed to energy security issues. The proposed SREP-funded project will promote and scale-up the deployment of stand-alone solar systems and renewable energy-based mini-grids, which will not only improve access to electricity and energy security, but also contribute over the long-term to placing Rwanda on a low-carbon development pathway. The distributed renewable energy technologies deployed under the project will support Rwanda's efforts for low-carbon development by contributing to the expansion of rural electrification using renewable energy resources. The application of the proxy-based method agreed for the SREP, which applies an emission factor based on diesel-generated power, helps estimate CO_{2eq} savings for this project. Based on the proxy 793.7 tCO_{2eq} per GWh, the proposed SREP-funded project would help avoid 10,314 tCO_{2eq} every year and 103,145 tCO_{2eq} over the lifetime of investments, hereby estimated at 10 years.

16. **Affordability and competitiveness of renewable sources.** Rwanda's Vision 2020 program seeks to transform the country from a low-income, agriculture-based economy to a knowledge-based and service-oriented, middle-income economy. The country's five-year EDPRSs operationalize this development vision. The second EDPRS covering 2013-2018 aims to achieve a double-digit annual

average economic growth and reduce poverty to less than 30 percent. In view of the Government's recognition of the importance of providing 'appropriate, reliable, and affordable energy supplies for all Rwandese' if the country is to achieve middle-income status by 2020, half of the thematic areas identified to achieve the goals of the second EDPRS—economic transformation and rural development—are intended to address the primary constraints to scaling up investment flows, including access, reliability, and cost of energy. The strategy entrusts a primary role for the private sector during this period, serving as the engine of economic growth and poverty reduction.

17. The privately led provision of decentralized electricity services using stand-alone solar systems and renewable energy-based mini-grids portray a cost-effective approach compared to alternatives or grid extension, especially due to the low consumption levels found in rural households. The economic analysis for the proposed REF project suggests that the main impact of the project derives from increased access to modern electricity services for new customers of stand-alone solar systems and renewable energy-based mini-grids, who currently do not have electricity access or who have no other option that to employ more expensive alternatives (for example, diesel for electricity generation, and candles/kerosene for lighting). Moreover, low household affordability and, hence, low demand for electricity have resulted in that almost half of the EUCL—Rwanda's utility company—uses less than 20 kWh per month, against a minimum of 130 kWh per month to make the grid connection financially viable. A large proportion of the population cannot afford the connection cost. In this context, the deployment of decentralized systems such as stand-alone solar systems and mini-grids provide an opportunity to service these customers more cost-effectively. Over the last five years, significant reduction in the cost of off-grid solar systems—particularly solar home systems—and the emergence of pay-as-you-go business models have enabled the provision of affordable solar-based electricity services to off-grid Rwandese households. Besides off-grid solar likely to be the lowest cost solution for consumers with low energy consumption, the deployment of off-grid solar systems can provide a competitive solution especially in areas where extension of the grid is particularly costly, for example due to remoteness of settlements or difficult terrain, or where settlements consist of scattered households with relatively low population density. Compared to grid extension, renewable energy based mini-grids can reduce the cost of electrification in particular circumstances primarily based on energy demand, location and density of customers, because localized distribution systems minimize the need for long-distance transmission systems and substations for transforming high to low voltages. Mini-grid investments under the proposed project will be located in areas that are financially attractive compared to the alternative of grid extension.

18. **Productive uses of electricity.** Increased energy access from solar home systems and mini-grids will harness rural infrastructure services for the promotion of productive uses, maximizing the economic benefits of energy-sector investments and stimulating economic growth. Solar home systems and mini-grids will support and stimulate domestic, commercial, and light industrial income generating activities in rural areas. While stand-alone systems can be sized for small productive uses (for example, lighting for studying and small businesses requiring small loads), the productive use element of the program is expected to be a greater focus of the mini-grids component. Households and small business owners' beneficiaries will be able to run (or extend the running hours of) activities such as phone and lantern charging stations, barber shops, tailor shops, grocery stalls, saw mills, grocery shops, poultry farms, and electronic repair shops. Besides serving communities, mini-grids have the advantage of being able to provide high levels of power to support productive loads in remote areas (for example, commercial, light

industrial, and agricultural processing), while stimulating employment and providing added value for local economic development. Experience has shown that rural electrification can lead to economic and social development, but targeted technical and financial assistance may be required to encourage beneficiaries to take advantage of electricity access for productive uses. The proposed REF project will conduct campaigns to increase awareness among beneficiaries of the benefits and different uses of electricity. SACCOs may facilitate access to financing for the purchase of equipment encouraging productive uses of electricity.

19. **Economic, social, and environmental development impact.** The project is expected to have a positive impact on rural economies. Electricity access for households is expected to lead to educational and health benefits from the improved level and quality of lighting and reduced indoor air pollution from reduced use of kerosene. Economic benefits are expected to accrue from reduced monthly expenditure on energy, as well as the potential to support local micro-business opportunities and improved access to telecommunications and media. To ensure proper assessment and mitigation of the potential adverse environmental and social impacts of activities under the project, an ESMF and RPF will be prepared for guiding the implementing agency on how to address any environmental and social impacts of the project investments.

20. **Economic and financial viability.** The economic analysis, including methodology and assumptions, is presented in Annex 4. The EIRR of the project is 35.3 percent at 6 percent discount. Financial analysis is not required according to the World Bank guidelines for FILs. Assessments of SACCOs and Banks are presented in ANNEX 6 and ANNEX 7, respectively; additional participating institutions will be assessed during project implementation. The economic and financial viability for different types of mini-grids is described in ANNEX 8.

21. **Leveraging of additional resources.** The SREP will provide the initial capital for the REF facility, while crowding-in funding from others sources, including IDA, BRD, EnDev, SEFA, and the private sector. The GoR is planning to request US$7 million from IDA to further scale up rural electrification investments once the initial learning phase of the REF has been completed. Funding from IDA will be secured in the form of additional financing to the project from the IDA18 cycle. BRD will contribute US$0.5 million in the form of in-kind contribution to the REF project from the recently established Energy Division (for example, staff cost, transportation, and office), as well as workshop and consultation expenses. The SREP will also leverage US$2 million from the BTC-funded Private Sector Participation in the Generation of Electricity from Renewable Sources Program for technical assistance and capacity-building support for BRD and mini-grid developers.

22. Under Window 1, 2, and 4, the SREP funding will leverage US$41 million from the private sector (including households), representing over 30 percent of total funding needs of the off-grid market.[72] The co-financing amount is conservative because it does not account for the potential revolving nature of the REF facility. Crowded-in private sector financing will result primarily from a variety of equity investments made by OSCs that allow them to serve demand in all 30 districts of Rwanda. These include

[72] Based on off-grid targets outlined in the RES, and assuming average unit costs for Tier-1 and Tier-2 systems, the funding requirements to fulfill the RES's off-grid targets are US$120 million, of which US$40 million for Tier-1 and US$80 million for Tier-2 solar systems.

investments in warehouses, logistics and supply chains, marketing, installation, after-sales service, and so on. Households themselves will make additional contributions to cover the cost of system financing. Overall, a total of US$79.8 million in off-grid solar investment is forecast to be made under the REF, with some 49 percent of that amount leveraged from third parties. Under Window 4, eligible solar companies will be required to leverage REF financing 2:1, contributing US$1 for every US$2 borrowed from the facility. Table 10.1. illustrates private sector leveraged co-financing for the different financing windows.

Table 10.1. Co-financing from the Private Sector under Windows 1, 2, and 4 (US$ million)

REF Window	All-In Cost of Delivery	REF Facility	Private Sector Leveraged Co-Financing
Window 1	36.8	20.4	16.4
Window 2	23.2	13.0	10.2
Window 4	19.8	7.5	12.3
Total	**79.8**	**40.9**	**38.9**

23. Under Window 3, SREP funding will leverage RBF from the EnDev program. Assuming that the financing structure of mini-grid projects financed under the REF consists of 30 percent private equity, 50 percent EnDev grant, and 20 percent REF loan, the REF will leverage US$2.1 million from private (US$2 million) and EnDev (US$1.5 million) financing for mini-grid investments. The REF project will also seek opportunities for collaboration with the recently launched SOGER, EEP, and SEFA program that is being implemented by AfDB.

24. The **financing leverage ratio** for this project is estimated at 1 : 1 (US$1 from the SREP leverages an additional US$1 from other sources). Over time, the REF facility will become the main mechanism for directing funds and technical assistance for off-grid rural electrification, attracting additional financing for rural electrification from development partners and the private sector at levels that would be more aligned with the contributions anticipated in the Rwanda IP.

25. **Gender.** Off-grid electrification has the potential to improve equality and women's socioeconomic status. The proposed project will have considerable impacts on improved livelihoods of men and women, and particularly women's organizations that may be using manual labor or time intensive activities that can benefit from mechanization. Further positive impacts include improved quality of lighting and indoor air quality, which are expected to lead to better education, health and public security, especially for women and children, as well as improving women's access to IT and communications. The REF project will implement approaches to maximize gender benefits and other socioeconomic benefits during project implementation.

26. **Co-benefits of renewable energy scale-up.** The proposed SREP-funded project is expected to have a number of environmental, economic, health, and educational co-benefits, which will provide both global and local benefits, including the following:

(a) ***Sustainable expansion of the off-grid sector through private sector participation.*** The project will address major constraints to engaging the private sector to provide off-grid electricity services through stand-alone solar systems and mini-grids. The important role

that SACCOs and banks will play improving consumer affordability and access to financing will enhance private sector confidence and engagement in the sector, which is indispensable for the sustainable growth of the off-grid sector.

(b) ***Involvement of SACCOs and banks in off-grid electrification.*** The project will help mobilize key market enablers such as SACCOs and banks by enhancing their knowledge and strengthening their capacity to providing consumer financing for off-grid electricity services. The active engagement of SACCOs and banks, together with private sector investments, will help ensure increases in access to electricity in a sustainable manner.

(c) ***Economic benefits.*** The economic benefit of the proposed project derives from increased access to modern electricity services and a substitution away from lower-quality or more expensive alternatives. The project will particularly target those customers that reside in areas with no grid coverage and are unlikely to have grid coverage in the near future. In doing so, the off-grid electricity solutions supported through the project will accelerate electricity access over and above the ongoing grid expansion efforts in Rwanda. Employment opportunities will also be generated by the project through developing off-grid lighting as well as energy efficiency markets—for instance, by making solar home systems more affordable to customers. A new market for consumer electronics might potentially also be created as families with solar systems demand more consumer electronics. The stand-alone solar systems will also enable families to allot more time in the evening, particularly women, to income generating activities. Further, solar systems will lead to better integration of rural households with markets (such as farmers) by facilitating communications using cell phones and access to information (on weather, prices, demand, and so on) derived from radio and television use.

(d) ***Educational benefits****.* More (reliable) hours of service as well as solar home systems use will also lead to improved educational outcomes by enabling children to study for additional hours in the evening aligned with Lighting Africa. Improved lighting in the evening hours allows improved productivity in household chores and the ability of children to study.[73]

(e) ***Community and safety benefits.*** With available public lighting, villagers will be able to carry out a whole range of activities that were previously limited. Shops and markets can be open in the evening for business, and social ceremonies and events can be extended to the nighttime. In addition, public lighting could result in improved public safety. Solar lighting products allow improved mobility and safety at night, especially for women. Increased access to electricity will boost the use of communications through mobile phones, televisions, and the Internet, improving access to information and empowering local communities.

[73] Empirical evidence from the impact assessment of solar home systems in Bangladesh reports about 10-12 minutes' extra study time for boys and girls and higher completed years of schooling in homes with solar home systems (World Bank, 2013).

(f) ***Low-carbon development*.** As stated above, the project will avoid over 103,145 tCO2eq over the lifetime of investments, hereby estimated at 10 years. This number is conservative because it underrates the actual fuel consumption of inefficient diesel generator sets and does not consider the substitution of kerosene. In addition, a reduction in dry cell battery consumption and thus their disposal reduces the environmental damage caused by hazardous waste and costly cleanup required. The project will also improve health by avoiding the use of kerosene for lighting which produces indoor air pollution caused by particulate emissions that can increase the incidence of general ailment and respiratory disease.

Monitoring and Evaluation

27. Overall monitoring and evaluation of project activities will be BRD's responsibility. In BRD, the required data will be furnished by the PIU. The PIU will collect data and reports from participating entities and present progress in achieving the key and intermediate indicators on a quarterly basis. This will be carried in conjunction with the World Bank implementation and support missions.

Implementation Readiness

28. **Country/sector strategies.** The proposed SREP-funded project is fully aligned with Rwanda's national and energy sector priorities. Increased access, reliability, and cost of energy services are among the GoR's main objectives under the country's Vision 2020 and the second EDPRS, which supports the implementation of the Vision 2020. The EDPRS identifies rural development as a key thematic area and sets a target of increasing electricity access to 70 percent by mid-2018 through a combination of on-grid and off-grid solutions. Furthermore, the project will support the implementation of the RES, which recognizes a prominent role for off-grid technologies in achieving the 70 percent access target.

29. **Institutional arrangements.** BRD will be the project implementing agency. To implement Component 1, BRD will function as a wholesale institution for Windows 1 and 2, as well as lend directly to mini-grid developers under Window 3 and locally registered OSCs under Window 4, if it is activated. BRD was assessed against the criteria put forward in the World Bank OP 10.00 and qualifies to be an intermediary for the credit line as well as a direct lending institution. BRD will host the PIU and will be responsible for monitoring indicators, supervising the credit lines and direct loans, as well as the implementation of the necessary technical assistance to the beneficiaries. A Steering Committee will be established for effective coordination and project oversight. The Steering Committee will meet at least every six months, or as needed during the project implementation to review implementation progress, discuss emerging challenges, and identify mitigating measures.

ANNEX 11: AFFORDABILITY OF SOLAR LIGHTING IN RWANDA

1. The REF project seeks to spur the market for off-grid solar lighting products with the objective of increasing electricity access in areas that are not adequately served by the national grid. The project will inject liquidity into the growing market for solar lighting systems through multiple credit windows at relatively favorable loan tenors for consumers and private sector suppliers of solar off-grid products.[74]

2. Given the market-driven approach, an assessment of the demand for solar lighting products is critical. Consumer demand, especially in rural areas, is often constrained by low household budgets and credit market constraints. Business models such as pay-as-you-go, lease-to-own, and fee-for-service overcome some of the credit market constraints facing consumers by allowing them to pay in small installments over time. This eases the affordability constraint to a large extent. Numerous companies in Rwanda have adopted this model with some success. These companies have seen a substantial growth in sales over the past couple of years—showing that the market for these products does exist and can be grown (see Box 11.1). However, while the growth in sales of these companies is a signal for market growth potential, the customers seem to be largely concentrated in peri-urban areas (some using solar as a backup to their grid connection) or in specific geographical areas. As the REF project specifically targets customers that are not likely to be served by the national grid, an assessment of prospective market size must rely on additional sources of information.

[74] An associated window also supports the development and implementation of mini-grid projects.

Box 11.1. Affordability

It is clear that a relatively small proportion of households without access to electricity in Rwanda can afford a one-time payment of US$35 for a Tier 1 solar kit. For this reason, many companies operating in the country extend credit to customers, typically providing lease-to-own offerings of 12-36 months. In doing so, off-grid solar products in the 3-50 Wp range can be purchased for US$3-10 per month.

A 2013 study by One Acre Fund, an agricultural extension services NGO, suggests that smallholder farmers spend, on average, nearly US$5 per month on energy services. Since publishing these findings, the organization has sold over 160,000 lanterns with phone charging capabilities to their members on repayment plans of approximately US$3 per month for 12 months. Due to the high demand for the lighting products, the NGO is now scaling up to solar kits. A similar installment-based arrangement with a longer payback period is expected for solar kits.

Other commercial pay-as-you-go companies in Rwanda have sold in excess of 50,000 Tier 1 and Tier 2 solar home systems to relatively well-off customers, and are bullish on the future scale-up of the market. Well targeted consumer-financing mechanisms will help unlock greater private financing to catalyze this.

3. There are a few different sources of data that are available to measure the affordability of households in Rwanda.

(a) The *first* is the official national household survey—EICV4. The survey was carried out in 2014 and collected extensive data on household expenditure and specifically expenditures on lighting and charging.

(b) The *second* is a study carried out by Grimm et al. (2016)[75] that relies on an experimental design to conduct a randomized control trial of the impact of solar kits on household outcomes. As a part of their survey they collect information on expenditure on lighting alternatives by households with and without solar kits.

(c) The *third* source is a market study conducted by the One-Acre Fund that looks at the willingness to pay for solar lighting systems. This study focuses on farmers—their core customer base—and assesses their willingness to spend on the purchase of a solar lighting system.

(d) The *fourth* source is a recently completed draft impact evaluation of a World Bank-funded grid connection project in Rwanda, Electricity Access Scale-up and SWAp Development Project (P111567).[76] The evaluation relied on a quasi-experimental design to try and ascertain the impact of grid connections at a household level. Information on expenditures

[75] Grimm, Michael; Munyehirwe, Anicet; Peters, Jorg; Sievert, Maximiliane. 2016. A first step up the energy ladder? Low cost solar kits and household's welfare in Rural Rwanda. Policy Research working paper; no. WPS 7859. Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/966011476292381076/A-first-step-up-the-energy-ladder-low-cost-solar-kits-and-households-welfare-in-Rural-Rwanda.

[76] Impact Evaluation of Rwanda Electricity Scale Up (EARP) and Sector Wide Approach (SWAp) Development Project. Follow up Survey Draft Report, December, 2016.

on lighting and charging were collected as a part of the survey both for households with a grid connection and those without.

(e) The *fifth*, and the most recent source, is the energy survey undertaken by the World Bank in collaboration with MININFRA. The survey measures electricity access in urban and rural areas of Rwanda using the MTF. The survey was completed in February 2017 and collected extensive household data on electricity use and expenditures.

4. Each source has certain limitations in how representative the information is, but the wealth of different sources allows for the triangulation of the information and to estimate a range for the affordability. Furthermore, despite the limitations, the amount and variety of data available on electricity expenditures in the case of Rwanda is considerably more than most other countries in the region.

5. Current lighting and charging expenditures of households that are coping without access to modern electricity services reveals how much such households would be willing to pay for improved electricity services. Quality-certified solar products (or other forms of modern electricity) deliver much greater and more reliable service levels compared to traditional means that households otherwise rely on. Thus households must be willing to spend at least as much they are now spending for a higher level of electricity service. This, the avoided cost, is a lower bound for the estimated willingness to pay (and ability to pay) for solar lighting products. While this is a conservative estimate of the willingness to pay for increased quality of lighting, it is much more straightforward to estimate from survey data compared to true willingness to pay, which often relies on hypothetical questions.[77] Table 11.1 shows the estimated mean of the avoided costs from the surveys mentioned above.

Table 11.1. Estimated Expenditures on Lighting and Charging for Households with Access to Electricity in Rwanda

Source	Mean Expenditure on Lighting and Charging (US$ per Month)	Note
EICV4 (2014)	2.5	Nationally representative data. This is the calculated as 5 percent of the aggregate household expenditure. The data on actual lighting and charging expenditure showed much lower: about US$0.5-0.6 per month. The figure seems unrealistically low; thus, the percentage of aggregate consumption is considered here.

[77] Technically, the budget and price effects with increased lighting quality will both work in the positive direction to allow the household to spend more on lighting (think of it as a decrease in the price of lumens).

Source	Mean Expenditure on Lighting and Charging (US$ per Month)	Note
Grimm et al. (2012)	2.31	This is the non-cooking energy expenditure of the 'control group' households (kerosene, candles, dry-cell batteries, and phone charging). Estimated at RWF 1,662 per month in 2011, converted using rural CPI for 'housing, water, electricity, gas and fuels' and current exchange rate (RWF 820 per U.S. dollar). Difference with treatment: RWF 557 (US$0.92). Using rural CPI and converting to 2017 prices and using current exchange rate, results in control: US$3.17 and treated difference: US$1.06
One-Acre Fund (2013)	3.7	This is the amount that households were estimated to spend on traditional lighting and charging means. The value is adjusted for 2017 prices using the rural CPI for 'housing, electricity, gas, and fuels'. The difference-in-difference estimate of net savings from solar lantern adoption was US$2.4 per month. Estimated from a difference-in-difference between treatment and control households.
EASSDP IE (2016)	3.7	This is the difference in expenditure between control and treatment households on non-biomass energy consumption—including liquefied petroleum gas and possibly very few solar PV. Subtracting the treatment household expenditure should remove the cooking related expenditures, but the expenditure may be slightly over estimated due to households with solar—but this impact is not expected to be large.
MTF Survey (2017)	1.25	Nationally representative. This is the mean expenditure on lighting and charging of households without access to grid or off-grid electricity.

Note: CPI = Consumer Price Index

6. Grimm et al. results are based on a randomized experiment of 300 households spread across four districts in Rwanda.[78] The average household expenditure in their data is US$0.45 per person per day (equivalent to approximately US$61.5 per household per month), while the cash expenditures for the bottom 25 percent is only US$0.07 (US$9.5 per month per household).[79] The households surveyed consume only three hours of artificial lighting per day. The results also find that households spend about 5 percent of their overall expenditure on kerosene, candles, and dry-cell batteries.

7. The MTF survey is the most recent data source available for the calculation of household expenditure. The results are based on a nationally representative sample of 3,000 households. The estimated mean expenditure is US$1.25 per month and a median value of about US$0.75 per month. These estimates are relatively low compared to current installments for solar lighting products—keeping in mind that these are conservative estimates and that installments may actually reduce with market growth induced by the REF project. The viable market size is better understood by examining the distribution of expenditures from the MTF data. The data shows that 40 percent of off-grid households

[78] These are Gicumbi, Gisagara, Huye, and Rusizi.
[79] Assuming a HH size of 4.5.

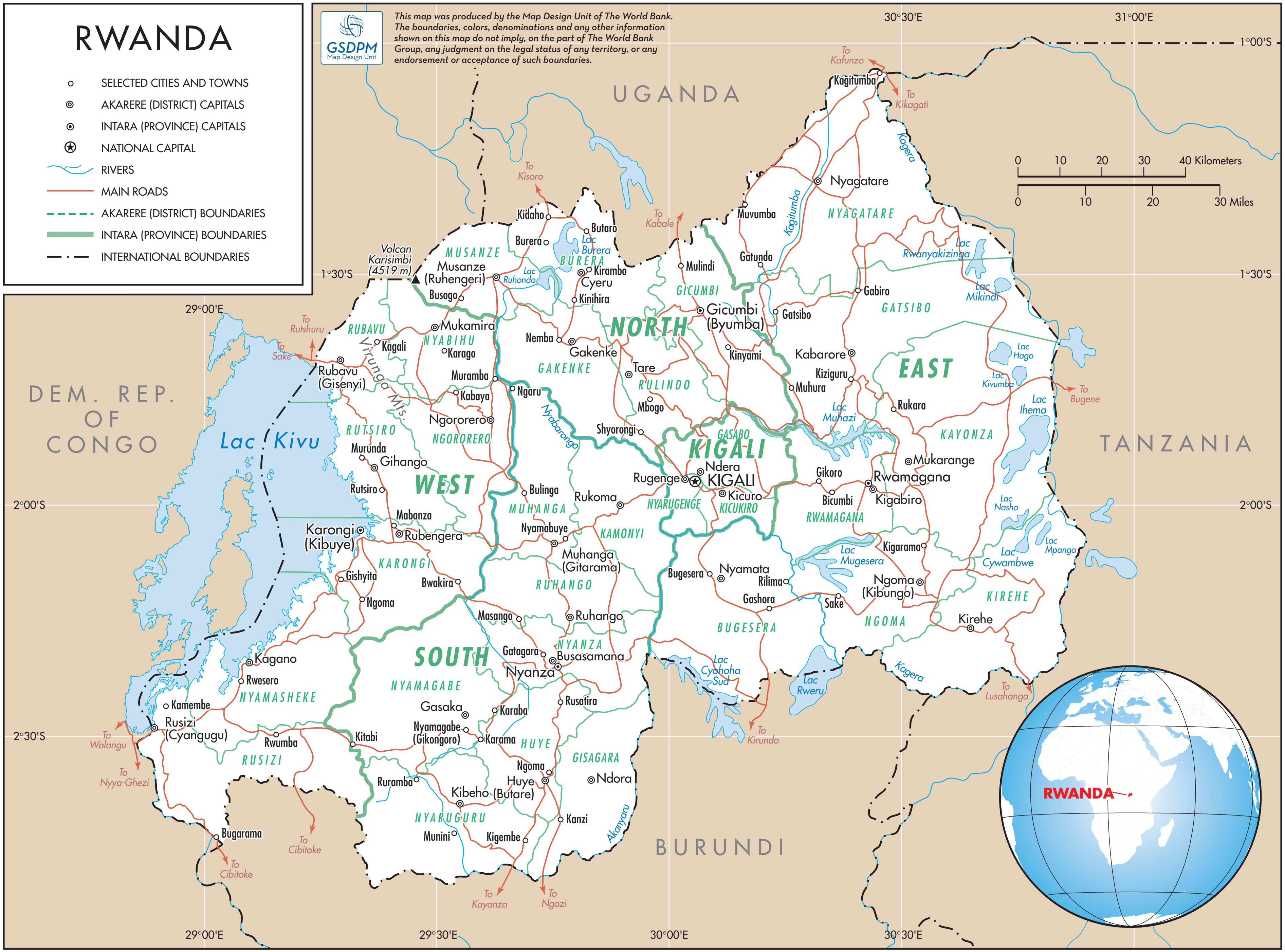
are spending more than US$2.5 per month on lighting expenditure. **This implies that of about 2.5 million households in Rwanda, about 750,000 off-grid households would be able to afford solar lighting products at an installment of around US$2.5 per month.**[80] The market size is likely to further grow with population growth, though by exactly how much depends on where the growth in population takes place—grid or off-grid areas.

Table 11.2. Quantiles of Monthly Households Expenditure on Lighting (US$, 2017 Prices)

Quantiles	Mean	Median	Minimum	Maximum
Q1	0.31	0.27	0.00	0.63
Q2	0.95	0.94	0.63	1.34
Q3	1.89	1.88	1.35	2.56
Q4	3.54	3.45	2.57	5.25
Q5	8.65	7.14	5.29	26.81
Total	**1.28**	**0.75**	**0.00**	**26.81**

Note: The figures are calculated for off grid households and do not include cooking or electricity payments.

[80] Assuming about 25 percent electricity access.


RWANDA
SELECTED CITIES AND TOWNS
AKARERE (DISTRICT) CAPITALS
INTARA (PROVINCE) CAPITALS
NATIONAL CAPITAL
RIVERS
MAIN ROADS
AKARERE (DISTRICT) BOUNDARIES
INTARA (PROVINCE) BOUNDARIES
INTERNATIONAL BOUNDARIES
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0 10 20 30 40 Kilometers
0 10 20 30 Miles
UGANDA
DEM. REP. OF CONGO
TANZANIA
BURUNDI
Lac Kivu
NORTH
EAST
KIGALI
WEST
SOUTH
KIGALI
Musanze (Ruhengeri)
Gicumbi (Byumba)
Rubavu (Gisenyi)
Karongi (Kibuye)
Muhanga (Gitarama)
Nyanza
Huye (Butare)
Nyamagabe (Gikongoro)
Rusizi (Cyangugu)
Nyagatare
Rwamagana
Ngoma (Kibungo)
Kirehe
Nyamata
Volcan Karisimbi (4519 m)
Virunga Mts.
RWANDA
JANUARY 2016
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