

# Enhancing energy access in rural Rwanda

Village Grid Results-based Financing Project  
Closing Report



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# EnDev at a glance

2.6 billion people are without access to modern cooking energy and 759 million people have no access to electricity. This has a dramatic impact on quality of life, environment, health, education and income opportunities. EnDev's involvement focuses on providing access to modern, renewable energy. This is a pivotal factor in strengthening socio-economic development and combatting climate change.

EnDev's drive is to improve the lives of the most vulnerable people, ensuring no one is left behind. Economic opportunities and green jobs are created by building markets for modern, renewable energy. EnDev contributes to reducing greenhouse gas emissions to protect our planet's climate. Its approach is to empower structural, self-sustaining change; kickstarting market and sector development that evolves further without support by EnDev.

EnDev's work is about people. Results are monitored and reported rigorously. EnDev's achievements on helping people, schools, health centres and companies gain access to electricity or improved cooking technologies can be found in this report. This report also presents EnDev's impacts on gender, job creation and reduced carbon emissions.

EnDev is a strategic partnership. Dedicated donors, partners and individuals work together to support social development and economic growth by providing access to modern, renewable energy in more than 20 countries around the globe. The driving force behind EnDev is the partnership of Germany, the Netherlands, Norway, Sweden, and Switzerland; donors who are committed to accelerating energy access and socio-economic development.



## Acronyms and Abbreviations

AC	Alternating Current
BRD	Rwanda's Development Board
CAPEX	Capital Expenditures
CLASP	Collaborative Labelling and Appliance Standard Program
COVID-19	Coronavirus disease 2019
DC	Direct Current
E4I	Energy for Impact
EDCL	Energy Development Corporation Limited
EDPRS	Economic Development and Poverty Reduction Strategy
EIA	Environmental Impact Assessment
EnDev	Energising Development
ESSP	Energy Sector Strategic Plan
EUCL	Energy Utility Corporation Limited
EWASA	Energy, Water and Sanitation Authority
FCDO	UK Foreign, Commonwealth & Development Office
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoR	Government of Rwanda
HIVOS	Humanistisch Instituut voor Ontwikkelingssamenwerking
IVA	Independent Verification Agent
MININFRA	Ministry of Infrastructure
MoU	Memorandum of Understanding
NEP	National Electrification Plan
NST1	National Strategy for Transformation
O&M	Operation & Maintenance
PPP	Public Private Partnerships
RBF	Results-based Financing
RDB	Rwanda Development Board
RECP	Renewable Energy Cooperation Programme
REF	Renewable Energy Fund
REP	Rwanda Energy Policy
RES	Rural Electrification Strategy
RURA	Rwanda Utilities Regulatory Agency
SACCO	Savings and Credit Cooperative
SIDA	Swedish International Development Cooperation Agency
SNV	Netherlands Development Organisation
SREP	Scaling-Up Renewable Energy program
REG	Rwanda Energy Group
TA	Technical Assistance
VG RBF	Village Grid Results-based Financing Programme
WB	World Bank

# 1. Introduction



Between 2013 and 2020, EnDev's Results-Based Financing Facility piloted 17 projects across 14 countries in Africa, Asia and Latin America, covering a wide range of modern energy technologies to enhance energy access markets with funding provided by UK Aid through the Foreign, Commonwealth & Development Office (FCDO)<sup>1</sup>. Implementing agencies included GIZ, CLASP, HIVOS, Practical Action and SNV.





Results-based Financing (RBF) is a modality in which a funder (this can be a donor, an implementing organisation, a national government or other institution) disburses funds to a recipient only once a pre-agreed set of results is achieved. This approach involves three key principles. Firstly, payments are made only after the results are achieved; secondly, the recipient may independently choose how to achieve these results; and lastly, independent verification of results is the trigger for disbursement. The Rwanda Village-Grid Results-based Financing Programme (VG RBF) was one project under the EnDev RBF Facility. It was also one of the first pilot countries to implement the RBF approach in 2013.

## 1.1 Rationale and objective

The objective of the VG RBF was to increase off-grid electricity connections through mini-grids run by private companies in areas where the national utility was not planning to extend the grid in the short- to medium-term. The rationale of this RBF design was to focus on linking financing more directly to outcomes and results as opposed to inputs and processes, while also encouraging private sector ownership of the project. The VG RBF project was introduced at a time when the mini-grid sector in Rwanda was still in its infancy; privately run mini-grids, isolated from the national grid, had never been implemented there, thus constituting a new field for private

sector involvement in off-grid electrification. International companies new to the country were sceptical about the reliability of the regulatory environment, while local companies were altogether new to the mini-grid field. Both types of companies welcomed EnDev's support in advancing their business.

The key objective of the VG RBF was to boost energy access and support private companies — rewarding first movers and pilot projects which would demonstrate both technical and financial viability, but also allowing firms to gain experience and improve their business models along the way. The VG RBF also considered improving energy access for micro- and small-scale businesses as well as social institutions.

Project Results	
Technology	Solar and micro-hydro mini-grids
Project Duration	06/2013 – 09/2020
Implementer	GIZ, Urwego Bank
Results	 More than 10,000 people gaining access through 22 solar DC nano-grids, 2 solar AC mini-grids and 1 hydro mini-grid  More than 350 enterprises gaining access  More than 20 social institutions gaining access  3,113 t of CO <sub>2</sub> e avoided (over lifetime)

<sup>1</sup> To access a portfolio-wide report by EnDev on lessons learnt from 7 years of implementation, click here: [EnDev RBF-Lessons-Learned-Report\\_2021.pdf](#)

Table 1: EnDev VG RBF Project Results

## Rwanda RBF Mini-grids

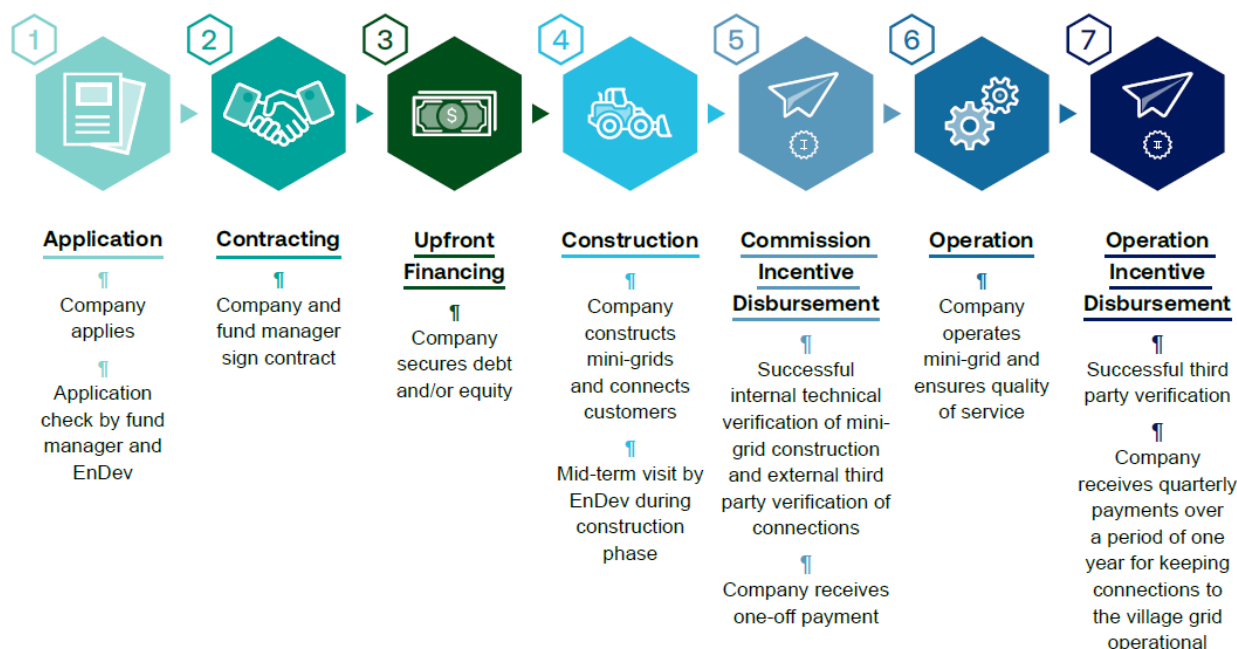


Figure 1: EnDev VG RBF model

### 1.2 RBF Model and Design

The VG RBF offered incentives to mini-grid developers and operators for the supply of electricity to customers that would not be otherwise be connected to the national grid in the short- to medium-term. **The general principle of the RBF scheme was that payments were made against pre-specified results.** Private developers were to take full risk until the delivery of the contracted results, therefore ensuring for greater private sector accountability.

The first stage of the VG RBF project was to provide targeted technical assistance (TA); for example, EnDev — in collaboration with other development partners — assisted the Rwandan government to improve investment conditions for mini-grids. EnDev also supported companies in developing their project proposals, estimating demand and modelling tariff structures. The RBF mechanism’s financial support only came in at the second stage: the first step was to be selected for

support and the second step to successfully commission the mini-grid and connect

customers — i.e. the result — as the basis for incentive payments

The key actors involved in the VG RBF were:

1. **EnDev** as the main project implementer and provider of incentives;
2. **A financial institution with public benefit purpose**, Urwego Bank, as the fund manager supporting the day-to-day management of the RBF mechanism and responsible party for the administration of the incentive disbursement procedures;
3. **Independent verification agents (IVA)**, who verified claimed results by the private sector to trigger disbursements;

**4. Private companies (locally registered)** as the providers of the energy products/services and recipients of the RBF incentives.

EnDev closely cooperated with the Government of Rwanda (GoR) and other development partners, including the Rwandan Ministry of

Infrastructure (MININFRA), the local utility, the Energy Development Corporation Limited (EDCL), and the RURA. Establishing clear institutional procedures for the off-grid and, specifically, the mini-grid sector was crucial for the success of the project.

### **1.3 Country context**

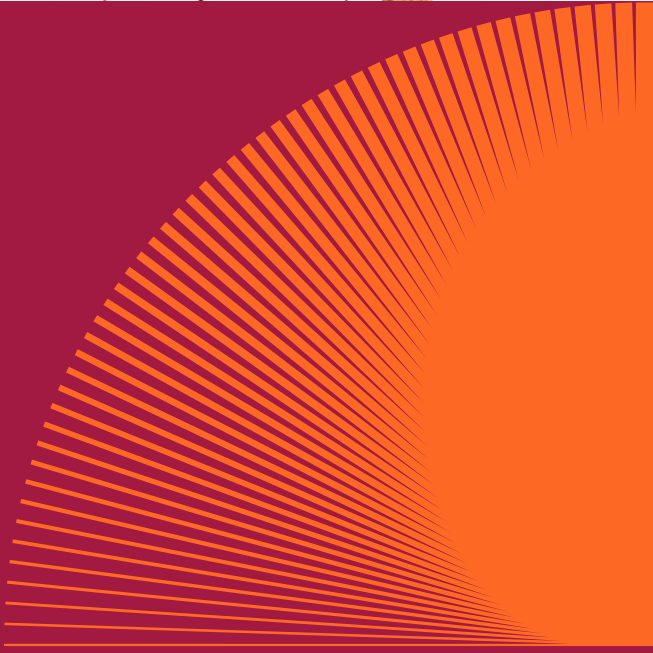
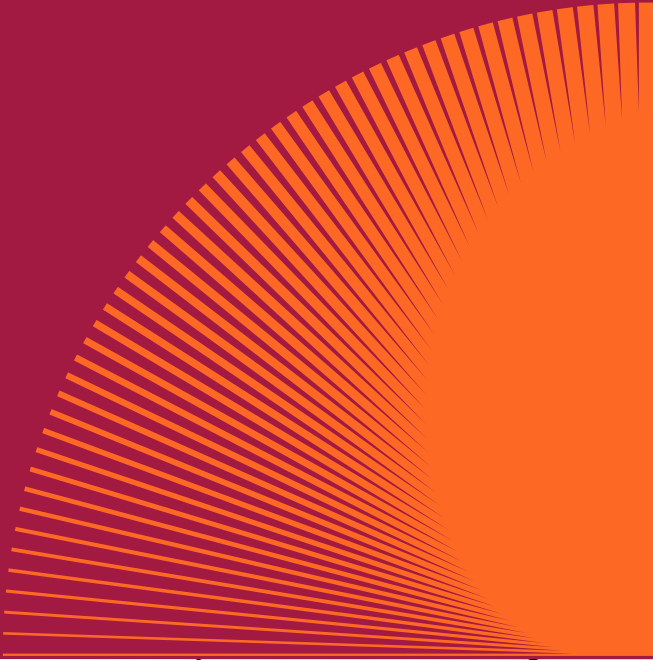
Rwanda's energy landscape witnessed rapid changes over the period 2014-2020. Electricity access increased from 19% in 2014<sup>2</sup> to 59% in December 2020.<sup>3</sup> The GoR has made a number of strategic and policy reforms in the energy sector, including the transformation of the former state-owned utility, EWSA, into a commercially operated state-owned enterprise, Rwanda Energy Group Ltd (REG), in 2014. In June 2016, MININFRA published the Rural Electrification Strategy (RES) and the Rwanda Utilities Regulatory Agency (RURA) issued a simplified licensing regime for off-grid renewables, which provided a supportive framework to mini-grids.

Rwanda's latest seven-year development plan, the National Strategy for Transformation (NST1) for 2017-2024, aims to achieve universal access to electricity by 2024 by providing access to 100% of households, through off-grid and on-grid connections.

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<sup>2</sup> MININFRA, SE4ALL Rwanda Assessment and Gap Analysis, November 2014

<sup>3</sup> <https://www.reg.rw/what-we-do/access/>





## 2. Implementation

### 2.1 Beneficiary criteria, application process and contracting

#### Criteria

The VG RBF specifically targeted private sector beneficiaries: private firms, registered associations and cooperatives were eligible to apply for support. Ultimately, however, only private firms participated. The application criteria for applicants was comprehensive, requiring:

- A technical feasibility study with comprehensive site assessment, demand assessment and clear maintenance plan,
- A financial model demonstrating realistic commercial potential,
- A district letter of approval,
- A letter of support by local representatives of potential customers at cell/village level,
- Proof of company registration with Rwanda Development Board (RDB), including a valid tax and social security clearance certificate and commercial bank account,
- Confirmation that the site is in an off-grid area (previously issued by EDCL, then later through a process outlined in the Ministerial Guidelines for mini-grids),
- An environmental Impact Assessment (EIA) or exemption, and
- A Registration or Simplified Electricity License as governed by RURA.

Companies could chose to build new **hydro-** or **solar-powered** mini-grids up to 100 kW capacity, rehabilitate or extend existing mini-grids, or build a distribution-only mini-grid (i.e. by purchasing energy from an independent power producer or EUCL and act as a Small Power Distributor, in accordance with RURA guidelines). Mini-grids were defined as isolated power stations that connect customers via low voltage distribution networks.

#### Application process

The EnDev Rwanda VG RBF programme, through Urwego Bank, invited applications through six separate calls-for-proposals. Submitted applications were ranked and shortlisted.

#### Contracting

To ensure smooth fund disbursement and management, Urwego Bank was contracted to act as fund manager. In this role, Urwego Bank was responsible for contracting successful applications, disbursement of funds, official communications with companies, and supporting EnDev in implementation of the programme.

The contracts outlined the expected results, with companies only able to claim the incentives upon verification of the results. This was followed by disbursement of the incentive payments.

### 2.2 Incentive structure and calculation

The incentive structure was designed to take into account investment for the design and construction, as well as the operation and maintenance (O&M) of mini-grids considering timelines of 10 and 15 years.

The maximum amount that could be granted to any individual company constructing a solar alternating current (AC) or hydro mini-grid was EUR 250,000. The maximum incentive amount (i.e. for the commissioning and quarterly payments combined) could also not exceed 70% of the capital expenditures (CAPEX) cost.

The RBF incentives were disbursed according to two distinct payment triggers:

- 1) **Commissioning:** A one-off payment was made after construction was completed, all connections were verified, and all technical requirements were satisfied.

- 2) **Operations:** Quarterly payments were made over a period of one year for maintaining active connections and ensuring a high quality of service. This amounted to EUR 15 per connection per quarter.

For solar direct current (DC) nano-grids, the incentive for O&M was set at EUR 20 per connection per quarter, due to the relatively low CAPEX investment required.

It was expected that any additional CAPEX investment required for the project be secured by participating companies in form of equity and/or debt. Any additional grants had to be disclosed so that the total combined grants would not exceed 70% of the total CAPEX cost.

The exact incentive amount was determined through a financial viability analysis — taking into account a number of indicators, including cost-efficiency, number of connections, and economic internal rate of return (EIRR), among others — to ensure the project's long-term viability, with the aim of bringing the EIRR to an acceptable level. Incentive levels were transparently calculated for each individual project, in line with the above-described calculation method.

## 2.3 Pre-commissioning financing

The EnDev VG RBF required that participating companies take full investment risk and pre-finance their projects through equity and/or debt, since the incentive payments are only made after verification of results. While the financial sector in Rwanda is increasingly diversified, banks still primarily finance traditional sectors with short-term financing needs. Financing challenges included:

- Lack of knowledge of the energy access/mini-grid sector by financial

- institutions
- High collateral requirements
- High interest rates
- Focus on financing of traditional sectors with minimal diversification

### EnDev's cooperation with the Renewable Energy Fund (REF)

In June 2017, the GoR and World Bank approved USD 50 million for the Scaling up Renewable Energy Program (SREP), designed to accelerate off-grid electricity access through stand-alone solar systems and renewable energy-based mini-grids. The newly created REF aimed to catalyse private sector investments without distorting local financial markets through the facilitation of local currency capital.

The REF, which is implemented by Rwanda's Development Board (BRD), was officially launched in late 2018. It is structured along four financing windows<sup>4</sup>, with Window 3 supporting the provision of direct financing to mini-grid developers via BRD, applying credit risk appraisal and due diligence. Mini-grids could receive a maximum initial amount of USD 500,000 with a loan tenor of 3-8 years.

Additionally, Sweden signed a loan guarantee agreement with BRD for lending to the renewable energy sector, accepting up to 50% of the risk for male borrowers and 70% for female borrowers.

Against these new developments in the sector, EnDev Rwanda identified potential for cooperation with SREP: funding from the REF would act as a 'bridge loan' and provide the required pre-commissioning financing to developers before funding from the VG RBF programme was disbursed.

To further formalise cooperation between the programmes, EnDev and BRD signed an MoU to streamline cooperation and enhance communication during project reviews. Unfortunately, due to a misalignment of

<sup>4</sup> a) Window 1 - On-lending through SACCOs to households and micro-enterprises: this window will provide a line of credit to BRD for on-lending to eligible SACCOs. SACCOs, in turn, will on-lend the funds to eligible households and micro enterprises in the purchase of off-grid solar systems.  
b) Window 2 - On-lending through banks (commercial and microfinance) to households and small and medium enterprises (SMEs): this window will provide a line of credit to BRD for on-lending to eligible commercial and microfinance banks, which will extend sub-loans to household and SMEs.

c) Window 3 - Direct financing to mini-grid developers: this window will provide direct financing to mini-grid developers to finance up to 70% of construction of renewable-energy based mini-grid systems.  
d) Window 4 - Direct financing of locally registered off-grid solar companies (OSCs) supporting Tier 1 or higher solar systems (this was launched in 2019)

implementation timelines, no mini-grids received REF funding during the VG RBF project. Amid the coronavirus disease (COVID-19) pandemic, developers struggled to secure equity or debt to construct the mini-grids in time to meet the VG RBF project end date. Companies mostly self-financed their mini-grids by tapping into existing capital rather than accessing new financing channels.

## 2.4 Commissioning and verification

Once the construction was complete and the mini-grid was commissioned, the companies could claim their commissioning incentive at Urwego Bank. The commissioning process was undertaken by a commissioning committee composed of Urwego Bank, EnDev and IVAs. EnDev used a commissioning checklist to review the technical installation and the IVAs verified the connections claimed by companies. The IVAs, through field verification, visited each household to verify operating connections. Operational incentives were verified through smaller samples of field and phone verification.

Upon positive verification, Urwego Bank disbursed the commissioning incentives and the following quarterly operation incentives.

## 2.5 Enabling environment during implementation

### Policy, regulatory and planning developments<sup>5</sup>

In 2019, the Rwandan government launched NST1, which lays the foundation for Rwanda achieving upper-middle-income status by 2035 and high-income status by 2050. Through this strategy, the GoR has set an ambitious target of achieving universal access to electricity by 2024, 48% of which is set to be comprised of off-grid solutions and 52% via on-grid solutions. As of December 2020, 59.7% of Rwandan households have access to electricity, of which 43.8% are connected to

the national grid and 15.9% through off-grid systems.<sup>6</sup>

Rwanda went through a number of crucial transformations in the development of the enabling environment for mini-grids since the programme inception:

2013:

The GoR endorsed its 5-year plan, the Second Economic Development and Poverty Reduction Strategy (EDPRS II) for 2013-2018, to achieve the country's long-term development aspirations embodied in the Rwanda Vision 2020. This set the basis for the Rwanda Energy Policy (REP) and the updated Energy Sector Strategic Plan (ESSP), which were adopted in March 2015.

2015:

RURA introduced a simplified licensing regime for off-grid renewables, which provided early support and a legal framework to the mini-grid sector.

2016:

The GoR published the RES, which outlined development plans through four areas of intervention, of which the third provided direct support to the private development of mini-grids: **“Mini-grids will be developed by the private sector with Government playing a key role in identifying sites and establishing a framework through which these can become financially viable investments.”**

2016:

Adoption of the law on Private Public Partnerships (PPP) created uncertainty due to the question as to whether some or all mini-grids need to be procured as a part of the PPP procedures. Following a 6-month consultation process, led by the Africa-EU Renewable Energy Cooperation Programme (RECP) and supported by development partners, the GoR decided that mini-grids with no off-take agreement with REG do not fall under the PPP Law and are instead governed by the simplified licensing regime.

<sup>5</sup> The policy, regulatory and planning environment reflects the situation during programme implementation. In 2021, the GoR revised

electrification targets to 89.9% of villages to be electrified through the grid and the remaining 10.1% to be electrified off-grid.

<sup>6</sup> <https://www.reg.rw/what-we-do/access/>

2019: RURA published the updated Simplified License and Guidelines on Minimum Technical Requirements for Mini-Grids. A separate tariff methodology was drafted in August 2020. Forthcoming regulations will specify options for ownership of mini-grids looking into the medium- to long-term, when the national grid will arrive at the off-grid sites.<sup>7</sup>

In summary, the key policies, tools and regulations guiding the mini-grid sector currently are:

- National Electrification Plan (NEP) (June 2019, REG)
- Regulation governing the Simplified Electricity Licensing Framework for Rural Electrification in Rwanda (June 2019, RURA)
- Draft Tariff Methodology for Isolated Grid in Rwanda (August 2020, RURA)
- Guidelines on minimum technical requirements for mini-grids in Rwanda (2019, RURA)
- Ministerial Guidelines on mini-grid development (June 2019, MININFRA)

## 2.6 COVID-19 Impacts

**The COVID-19 pandemic impacted the Rwandan mini-grid sector and the EnDev VG RBF project.**

A number of projects that were selected and contracted in December 2019 could not be initiated or completed.

Between March 22 and May 4, 2020, Rwanda was in full lockdown. Travel between provinces was banned from April to June 2020, significantly impacting mobility of people and goods. Due to port and movement restrictions internationally and within the country, developers faced challenges and delays in importing equipment and bringing project teams on site. In addition, cost implications materialized by, for example, flying equipment into the country via air freight.

On demand side, COVID-19 restrictions resulted in severe economic impacts, notably reducing income-generating opportunities and therefore the ability to pay for electricity services. In concrete terms, some mini-grid operators were faced with challenges regarding customers unable to pay their bills.

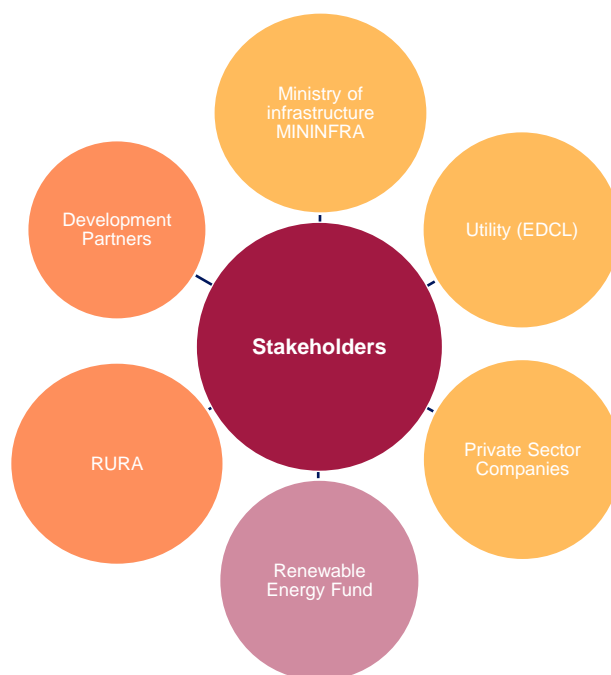


Figure 2: EnDev Rwanda Stakeholders

<sup>7</sup> The sector description in this documents reflects the situation at the end of the project in 2020.

## 3. Results

### 3.1 Connections achieved

The EnDev VG RBF project provided access to electricity to more than 10,000 people. Four companies were supported, resulting in one hydro mini-grid, two solar AC mini-grids and 22 solar DC nano-grids. Through these projects, more than 350 MSMEs and 20 social institutions gained access to electricity, creating over 100 jobs.

companies successfully commissioned projects. One of the reasons being the importance to streamline site selection with the final NEP, which was developed from late 2017 until June 2019. Based on the mapping of proposed projects and planned extension of the national grid, several projects had to withdraw due to imminent grid encroachment.

KPI	Results
No. of persons gaining access	More than 10,000
No. of enterprises gaining access	More than 350
Number of social institutions gaining access	More than 20
Tonnes of CO <sub>2</sub> e avoided (over system lifetime)	3,113
Jobs created	100

### 3.2 Company participation

The EnDev VG RBF raised significant interest from the private sector, with a total of 52 mini-grid applications over 6 calls for proposals from November 2014 to December 2017.

Beneficiaries would vary between local developers and international companies based in Rwanda, with the majority of applicants having limited experience in developing mini-grids. In the later calls, the number of shortlisted applicants increased, highlighting that the quality of proposals improved. Key success factors for this positive development were (1) EnDev's support to proposal development and (2) the increasing private sector interest with more experienced companies entering the market.

The third crucial success factor for mini-grid developers was timing: despite the improvement in quality of applications, only four

Company	ECOS	Meshpower	Absolute Energy	Equatorial Power
Project name	Nyakiramaba mini-grid	Rwanda Solar Village Grids	Rutenderi mini-grid	Gakagati mini-grid
Technology	Hydropower	Solar DC	Solar AC	Solar AC
Location	Southern Province, Muhanga District, Kibangu Sector, Jurwe Cell	Eastern Province, Ngoma District, Bugesera District	Eastern Province, Gatsibo District, Kabarore Sector, Marimba Cell	Eastern Province, Nyagatare District, Rwimiyaga Sector, Cyamunyana Cell
Capacity	11kW	22 x 1kWp nano-grids	50kWp	120kWp (six clusters)
Connections	224 HH* 36 MSMEs** 6 SI***	594 HH 253 MSMEs  Extension: 270 HH 38 MSMEs	504 HH 43 MSMEs 10 SI	755 HH
Commissioning date	December 2016	October 2016 – January 2017, Extension in February 2020	May 2020	August 2020

Table 4: Company summaries

\*HH= households

\*\*MSMEs<sup>§</sup>= micro, small and medium-sized enterprises

\*\*\*SI= social institutions

### 3.3 Project descriptions

#### ECOS

The first mini-grid supported by EnDev Rwanda was a 11kW hydro power plant commissioned in December 2016. The project connected 266 customers. With the Nyakiramba project, ECOS became one of the first private companies in Rwanda to construct and operate a commercial hydro power mini-grid and one of the first with a distribution grid that complies with the Electricity Access Rollout Programme (EARP) Reticulation Guidelines.

EnDev supported the project developer in obtaining financing from a local SME fund, Societe Mutuelle de Garantie et de Financement (SMGF) Limited, by using the RBF contract as one form of guarantee to convince the institution to lend to the developer.

#### MeshPower

EnDev supported the development and extension of 22 solar DC nano-grids connecting over 850 households and 290 small businesses. The easy-to-install systems proved to be an innovative solution to bring electricity to Rwanda's smaller remote villages.

<sup>§</sup> Productive uses of energy (PUE) are those that increase the profitability of MSMEs through increased income (through production at larger scale) or productivity (through lower input costs on fuel / electricity).

Meshpower's solar DC nano-grids are equipped with smart load and metering systems, which allow for web-based management of generation and distribution.

### Absolute Energy

The third company, Absolute Energy, installed a 50 kWp solar hybrid PV-diesel mini-grid in Rutenderi Village, Gatsibo district, commissioned in May 2019 with 557 customer connections. Absolute Energy implemented an innovative business model incorporating rural development approach. The company worked together with partners from the Interuniversity Centre for Sustainable Development – University of Rome “Sapienza”- Italy, AVSI Foundation and Energy 4 Impact to identify, create and stimulate growth of local business. Thereby, the project put a special focus on promotion of productive use of energy ranging from grocery stores (i.e. bakery, popcorn shop), processing of agricultural products (i.e. grain milling) to craft businesses (i.e. welding, carpentry).

### Equatorial Power

Equatorial Power implements a holistic business model at the intersection between renewable energy and access to energy as well as productive use and clean water.

EnDev supported the development of a solar PV AC mini-grid (120kWp), which connected 755 customers. The initial planning foresaw connecting more customers, but just like the other projects, this project also faced challenges due to the implications of the COVID-19 pandemic, as described above. At the heart of this innovative mini-grid is the so-called 'Infinity Grid', developed by Zola Electric<sup>9</sup>. It is a decentralized system consisting of generation hubs which can be scaled up in line with growing electricity demand of the community, making the technology highly modular and scalable. Equatorial Power's objective is to continue

extending the mini-grid until June 2022 to fully develop its potential, even after the phasing-out of the VG RBF.

## 3.4 Impacts on customer level

To assess the impact of the VG RBF programme, EnDev Rwanda used the EnDev Surveys tool – a web-based application to create, manage, process and analyse surveys. IVAs interviewed about 10% of all customers to analyse their socio-economic situation and assess impacts of the mini-grid projects. The key findings include:

### Customer profile

- Household size: average of 4.4 people with 84% of households headed by men and 16% by women
- Income source: About 91% of households state that farming is their primary or secondary activity
- Pro-poor approach: 57% of households classified as Ubudehe<sup>10</sup> 3, followed by 41% in Ubudehe 2 and 3% in Ubudehe 1
- Decrease in energy spending: after gaining access to electricity, the majority of customers reported a drop of energy spending by 63% on average – only a small portion of customers reported the contrary, with energy-related spending slightly increasing
- Living conditions: improved lighting and cooking, reading time for students and phone charging, safety
- Opening hours: business owners report increased average working time per day

<sup>9</sup> <https://zolaelectric.com/>

<sup>10</sup> The Ubudehe system is a socio-economic classification for households used by the government for targeting development efforts. It consists of

four categories, with Ubudehe 1 being the poorest households and 4 the richest households in Rwanda.





## 4. Lessons Learned and Recommendations

### 4.1 Introduction

The VG RBF project was a pioneering approach for mini-grid development in Rwanda, which gathered a lot of lessons-learned regarding the suitability of RBF instruments as a market development approach. The key lessons are summarized here.

### 4.2 Lessons learned from the VG RBF in Rwanda

#### Sector development and coordination

Overall, the VG RBF helped raise the profile of the mini-grid sector, not only through its provision of financing, which enabled some of the first mini-grids in Rwanda to be built, but also through its involvement in the sector as a prominent stakeholder. Donor coordination is taking place on all levels: from high level representatives to technical working groups and strong inter-donor dialogue. The GoR takes the lead in developing policy and sector plans, and development partner and private sector stakeholders. Over the years, EnDev — jointly with other development partners — has contributed to the development of the RES, the regulatory framework for mini-grids, and the NEP, among others.

To share knowledge with a broad group of stakeholders, EnDev published three off-grid sector status reports (2016, 2017, 2018), providing an in-depth analysis of the off-grid (solar home system and mini-grid) market in Rwanda<sup>11</sup>.

#### Flexible approach and complementary TA

The ability of the VG RBF in Rwanda to respond to changing conditions and unanticipated challenges and to participate in the overall evolution of the sector, was critical to ensuring its successful implementation.

While the RBF is a purely financial incentive, the EnDev Rwanda team realized quickly that the project would need to provide a wider package of TA for companies to develop technically and financially viable proposals, support companies in applying for loans and work toward the joint development of the sector with the main actors.

The project also employed a flexible approach to its incentive structure. The maximum subsidy amount per company (EUR 250,000) and maximum subsidy amount per project (70% of CAPEX) were used to ensure that a reasonable number of companies could participate and that each company had enough 'skin in the game' (i.e., 30% equity). As the financial models surrounding mini-grids are not only complex, but based on numerous assumptions, EnDev worked closely with the companies to develop realistic and conservative business models. Incentive levels tended to lean closer to 70% due to the broad range of market barriers including the early stage of market development, lack of proven business models, lack of demand at sites, high operating costs (e.g. transport, taxes) and lack of affordable access to pre-financing for working capital.

#### Capacity building of a local financial institution as fund manager

EnDev Rwanda contracted a local financial institution, Urwego Bank, as its fund manager for the VG RBF project. EnDev, through a dedicated advisor to the bank, trained staff to not only manage the fund effectively and efficiently but also to support the development of financial products for the energy sector at the bank. Urwego Bank has now established itself as a RBF knowledge broker, is well trusted by the private sector and is a dedicated RBF manager.

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<sup>11</sup> <https://www.urwegobank.com/partners/endev/>

### Strong verification system

Monitoring for the VG RBF was rigorous, and could have easily become overwhelming, but the development of clear procedures, processes and training ensured relatively smooth implementation. The verification process for VG RBF required complete datasets to be submitted in specific claim formats. The IVAs counted all customer connections on site during commissioning in order to guarantee 'operating connections', while additional sampling was conducted through subsequent rounds of phone and field verification. The verification required intensive data checking and close communication between both EnDev, the fund manager and the IVA.

While verification was an intensive process, the robust verification procedures outlined in the VG RBF operations manual, rigid training and continuous supervision ensured its relatively smooth implementation and ability for the project to confidently confirm the results.

### Partnership with SREP and wider coordination with the sector

Limited access to finance — especially for pre-commissioning financing — proved to be a critical barrier for mini-grid developers, as many commercial banks were unwilling or hesitant to lend to this non-traditional sector. To address this issue in Rwanda, EnDev joined forces with SREP. The programme's REF was administered by Rwanda's Development Bank and included credit and direct financing for mini-grids. EnDev supported the design of a direct lending window within the fund as a 'bridge loan' to provide pre-commissioning finance to developers before grant funding from the RBF project became available (upon commissioning). This upstream coordination ensured the complementarity of financial instruments, which avoids the risk of funding duplication or overlapping, showcasing future cooperation in market development focused energy access interventions.

EnDev Rwanda also collaborated with other TA partners, including SNV and Energy4Impact (E4I), who provided

considerable support to hydropower applicants in the development of their technical and financial feasibility studies and overarching project proposals.

## 4.3 Recommendations for successful RBF projects

The lessons learned derived from the EnDev VG RBF project reflect the complex processes and structures required to design and implement a RBF project: it requires numerous procedural adjustments, building trust with all stakeholders and working closely with energy stakeholders.

### The RBF 'package': Conducive enabling environment, financing, capacity building

A conducive enabling environment complemented by other market-based instruments, especially since access to pre-financing is key for successful RBF projects. Experience showed that developing private sector mini-grids should be placed within a larger context of policy and regulatory development and TA to project developers as well as with the financial sector.

In 2014, the VG RBF entered a nascent market, with barriers to market development in the enabling environment, inexperienced market actors and financial institutions which were hesitant to provide financing for energy projects. The project design had to take these aspects into account and widen its scope of interventions, including coordination among sector stakeholders, providing TA to companies, advising the government on regulation and policy and working closely with financial institutions.

In a nutshell: RBF projects need to engage with all relevant actors in the market and along value chains: government, private sector, financial institutions, and civil society stakeholders. This builds the basis for effective identification of specific barriers and needs to develop targeted support and ensure cooperation and collaboration.

Cooperation with existing projects that are providing capacity development (e.g. development of feasibility studies), providing complementary financial services (i.e. loans)

or improving the regulatory or policy environment (e.g. technical advisory services to the development of regulations) will bring RBF projects to a successful conclusion, jointly overcoming key barriers to wider market development.

When planning to work with RBF instruments in nascent markets, it is important to assess if this approach really fits the purpose or if applying this mechanism is premature due the early market development stage, including numerous barriers and needs for capacity development.

### **RBF approaches are complex and require a high level of clarity and transparency**

An RBF project is based on a number of processes and requirements which must be complied with in order to receive incentives. These requirements need to be clear and transparently communicated to all parties involved.

It is vital that the fund manager, or whoever is administering the fund, is credible and has received the appropriate training in order to be able to issue contracts and disburse funds.

Companies need to have a firm understanding of the RBF scheme and the conditions to which they are agreeing, Therefore, it is key to keep the RBF design, incentive calculation and verification process as lean as possible and as detailed as necessary.

The higher the RBF focus of a project — and the lower the share of accompanying TA — the more important is a careful selection of companies to ensure they are able to comply with the requirements and raise the necessary pre-financing.

Private sector partnerships can successfully combine the experience and technical know-how of international companies with the ability of local companies to navigate local institutions and markets.

### **Overcoming the barrier pre-financing mechanism**

While the financial sector in Rwanda is increasingly diversified, banks mostly finance traditional sectors with short-term financing

needs. If financial institutions are willing to venture into new sectors — such as mini-grids — requirements and interest rates are likely to be high. With the launch of the REF in 2019, an important step was accomplished to overcome this barrier in Rwanda.

RBF can play a crucial role to enable companies to raise private investment. Projects should be designed taking the current financial landscape and existing financing mechanisms into account. Thereby, the project can assist companies to mobilise private capital, both debt and equity.

### **Ensuring mini-grid economic and financial viability through incentive structure and productive use of energy**

Project viability remained a critical aspect for the private sector in terms of developing bankable, attractive business models, and most projects struggling to attain a positive 10- and 15-year EIRR. It is recommended to consider countermeasures to overcome this barrier (e.g. through higher incentive caps) or other techniques to improve project attractiveness (e.g. bundling of various projects to improve economies of scale). For all projects, deviations between anticipated and actual costs could be observed — in some cases greatly. While on the one hand remaining conservative in its costing model, RBF mini-grid projects should include mechanisms to readjust the RBF design if necessary, in order to reflect actual project costs after implementation and verification (e.g. through the option of top-up budgets bound to fulfilling certain criteria).

Project viability is impacted by yet another aspect: demand. Often mini-grid projects are faced with less-than-anticipated demand or usage by households. To bring electricity consumption up, promotion of productive use of energy is a viable option. Consumption by rural households is typically on the lower end (e.g. in Rwanda, consumption levels of 1-7 kWh/month was observed), therefore the financial viability of mini-grids relies on commercial and productive activities. However, the uptake of productive use upon the completion of a mini-grid has often fallen short of expectations.

Therefore, it is recommended that RBF mini-grid projects are complemented by activities

to promote the productive use of energy and income generating activities. This can be either done by the projects itself or through cooperation with other stakeholders. Either way, the objective should be twofold: (1) to trigger local economic development, income generation and job opportunities and (2) to develop a solvent customer base to ensure electricity consumption and reliable revenue for the operator at sufficient scale to support the investment in the long-term.

**RBF requires adaptability and flexibility**

RBF projects need to be prepared to adapt to unforeseeable changes in the enabling environment and market conditions, which impact private sector capabilities and needs. While RBF projects need to be designed in

detail from the beginning to ensure transparent processes and communication with the companies involved, initially identified opportunities and bottlenecks might — over the course of the project period — be replaced by new or additional constraints. Therefore, it is key to embed in the project implementation plan regular rounds of consultations to re-assess, whether the project design and incentive structure targets the right barriers in the sector and is fit to overcome them. The approach should be flexible enough to be restructured and adjusted over time and should include additional accompanying TA support.

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