



Impact Assessment of Fiscal Incentives on Rwanda Off- Grid Sector

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Abbreviations



Acronym	Definition
ACETAF	Africa Clean Energy Technical Assistance Facility
BRD	Rwanda Development Bank
CAGR	Compound Annual Growth Rate
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
EARP	Electricity Access Rollout Program
EDCL	Energy Development Corporation Limited
EnDev	Energising Development
EPD	Energy Private Developers
EUCL	Energy Utility Corporation Limited
GDP	Gross Domestic Product
GoR	Government of Rwanda
MFI	Microfinance Institution
MININFRA	Ministry of Infrastructure
MoU	Memorandum of Understanding
NEP	National Electrification Plan
OGS	Off-Grid Solar
PAOP	Power Africa Off-Grid Project
PAYG	Pay-as-You-Go
RBF	Results Based Finance
REEP	Regional Energy Efficiency Programme
REF	Renewable Energy Fund
REG	Rwanda Energy Group
RICA	Rwanda Inspectorate Competition and Consumer Protection Authority
RISE	Regulatory Indicators for Sustainable Energy
RRA	Rwanda Revenue Authority
RURA	Rwanda Utilities Regulatory Authority
SACCO	Savings and Credit Cooperative
SAS	Stand-Alone Solar
SE4ALL	Sustainable Energy for All
SEFA	Sustainable Energy Fund for Africa
SHS	Solar Home System
USADF	United States African Development Foundation
VAT	Value Added Tax

Executive Summary



Context and objectives

The purpose of this assessment is to support the implementation of a fiscal incentive framework for Rwanda's off-grid solar (OGS) sector, by providing evidence on the impact of fiscal incentives and how they contribute to Rwanda's achievement of universal access to modern energy by 2024. This assessment reviews value added tax (VAT), import duty policies and other fiscal incentives deployed to support the expansion of stand-alone solar (SAS) technologies, including solar home systems (SHS) and solar lamps, and presents the impact of these incentives on energy access targets. It also considers the lessons learned for the much more nascent mini- and micro-grid sectors in Rwanda.

This report builds on the existing Africa Clean Energy Technical Assistance Facility (ACE TAF) responsible taxation toolkit and extends the quantitative and qualitative analysis to respond to the Government of Rwanda's request to consider not only the appropriate tax policies, but also to situate these within a broader framework of fiscal incentives for the OGS sector. In particular, Rwanda has deployed various results-based finance (RBF) grants to accelerate deployment of SAS technologies and has also implemented minimum quality standards as defined in the 2019 Ministerial Guidelines to ensure Rwandan households access high-quality but affordable, energy access technologies.

The core objective of this report is to provide an evidence base for the fiscal, economic and broader socioeconomic and environmental impacts delivered by the SAS sector. By doing so, it provides supporting analysis of the mutual goals of the government and private sector in achieving universal energy as a public-private partnership. It helps the Government of Rwanda (GoR) understand the trade-off between foregoing

revenue in the short term through tax exemptions and achieving energy access targets and a range of social benefits SAS solutions bring to communities.

Summary of approach

This study builds on the previously developed ACE TAF multi-country responsible taxation tool and extends it to better reflect the context and key policy questions in Rwanda. It extends the analysis to consider the impact of other fiscal incentives such as RBF grants, and minimum quality standards. It also looks in more detail at key issues to reach the remaining unconnected households in Rwanda, with a focus on affordability. In addition to building on the quantitative tool, a further 11 key stakeholders were engaged bilaterally to inform the analysis, and a small survey of over 100 households included to help calibrate modeling assumptions to the reality of current and potential off-grid energy end-users.

Key findings

While the off-grid energy market in Rwanda has expanded rapidly in recent years, the remaining unconnected customers also represent the hardest to reach. The market for SAS solutions to the most commercially viable customers has been saturated, with SAS companies now expanding to riskier customers who are less likely to afford the products. This has led to an increase in the default rate for SAS companies to between 5 per cent and 25 per cent.

Despite the reduction in import duties and VAT, some SAS companies have struggled with delays and uncertainty when importing qualifying solar products. This has improved in recent years, however, SAS companies expressed uncertainty over the implementation of rules by the Rwanda Inspectorate and Competition Authority (RICA).

Design and application of fiscal incentives will play a vital role in delivering on the Rwandan energy access targets. Although companies have been active in the off-grid energy sector for almost a decade, many are still at a relatively early stage of their operations and are not profitable. A favourable fiscal policy environment plays two key roles in supporting the sector to achieve its potential: (i) making products affordable to end-users, and (ii) providing companies with a stable and attractive enabling environment to foster confidence to grow their presence in Rwanda. Indeed, a balanced mix of fiscal incentives will be needed to realise the ambition to achieve access to energy for all Rwandan households by 2024, including 32 per cent of households using SAS products and a further 16 per cent connected to mini-grids. VAT and import duty exemptions are a crucial foundation to creating the right conditions for this to happen, but will need to be supported by targeted RBF programmes to ensure no one is left behind.

Fiscal incentives will make the most direct contribution to making SAS systems affordable for the underserved – predominantly low-income – customer base. While the pay-as-you-go (PAYG) business model helps bring quality solar products within the reach of households, there would still be around 40 per cent of Rwandan households that would not be able to afford a system compliant with the 2019 Ministerial Guidelines in the absence of some form of fiscal incentives. VAT and import exemptions are a key building block in reaching these remaining households, and RBF subsidies of up to USD100 per system should bring SAS products within reach of almost all the population.

Recommendations

1. Maintain VAT and import duty exemptions until the energy access targets have been met. Once the market is well established, has a healthy number of providers achieving positive margins and demonstrated repeat sales to customers, there may be conditions under which tax exemptions could be phased out over a defined period.
2. Continue to use targeted RBF to make sure the poorest and hardest to reach households can afford an entry level SAS product.
3. Closely monitor the impact of the minimum standards set out in the 2019 Ministerial Guidelines and course-correct if needed. This includes making sure fiscal incentives bridge the gap between the ambition to reach Rwandan households with high-quality, high-capacity systems to ensure no one is left behind and unable to afford a system that meets the Ministerial Guidelines.
4. Support capacity development with local banks to bring down the cost of debt, with a view to opening a market for local currency lending. GoR should explore extending financial support and technical assistance to local banks to enable lenders to better manage their internal risk controls while providing usable financial products for OGS.
5. Continue to improve public and private sector dialogue. Key public sector agencies should continue to interface with Energy Private Developers (EPD) and other private sector interest groups to ensure appropriate implementation of incentives. At the same time, the capacity of key public agencies should be maintained and improved to keep pace with the evolving policy and regulatory frameworks. For example, RICA processes for standards and labelling requirements should be streamlined as they can be technically challenging for companies to get used to, which can result in confusion over which standards to apply.

1. Introduction



The primary purpose of this assessment is to support the continued implementation of an effective and coherent fiscal incentive framework for Rwanda's off-grid market. The overarching objective is to support the Government of Rwanda (GoR) to evaluate the impact and effectiveness of fiscal policies to ensure use of public funds delivers value for money and lead to universal access to modern energy by 2024. This assessment will contribute to the updated design of Rwanda's tax policies and incentives framework to lower product costs and increase access to off-grid solar (OGS) energy. It reviews VAT and import duty policies, and other fiscal incentives deployed to support the expansion of stand-alone solar (SAS) technologies, including solar home systems (SHS) and solar lamps, and presents the impact of these incentives on energy access targets. It also considers the lessons learnt for the much more nascent mini- and micro-grid sector in Rwanda.

The key objective of this study is to provide an assessment of various fiscal incentives contributions to supporting the deployment of the SAS industry in Rwanda. As such, this assessment will explore the wider impacts of fiscal incentives including (i) increased national revenue, (ii) increase in foreign investment in the sector, job creation and economic activity generally, and (iii) enabling increased access to end-users and adoption of off-grid solutions due to greater affordability, and

ultimately to support recommendations for future fiscal incentive structures to enable the national policy and strategic goals for the energy sector.

The remainder of this report is structured as follows:

- ☀ Section 2 provides a short context to the Rwanda energy sector, the OGS sub-sector and the national revenue/fiscal situation.
- ☀ Section 3 describes the current incentives in place for SAS products and mini-grids.
- ☀ Section 4 summarises the findings from stakeholder engagement and surveys carried out as part of this assessment.
- ☀ Section 5 provides a brief overview of some international examples of fiscal incentives deployed to support the development of the OGS sector.
- ☀ Section 6 describes the methodology deployed for the quantitative tool developed for this assessment.
- ☀ Section 7 presents the results of the quantitative assessment and the balance of the cost to GoR and its partners against the benefits delivered by accelerated access to quality energy access products.
- ☀ Section 8 sets out key recommendations and next steps arising from this study.

2. Context

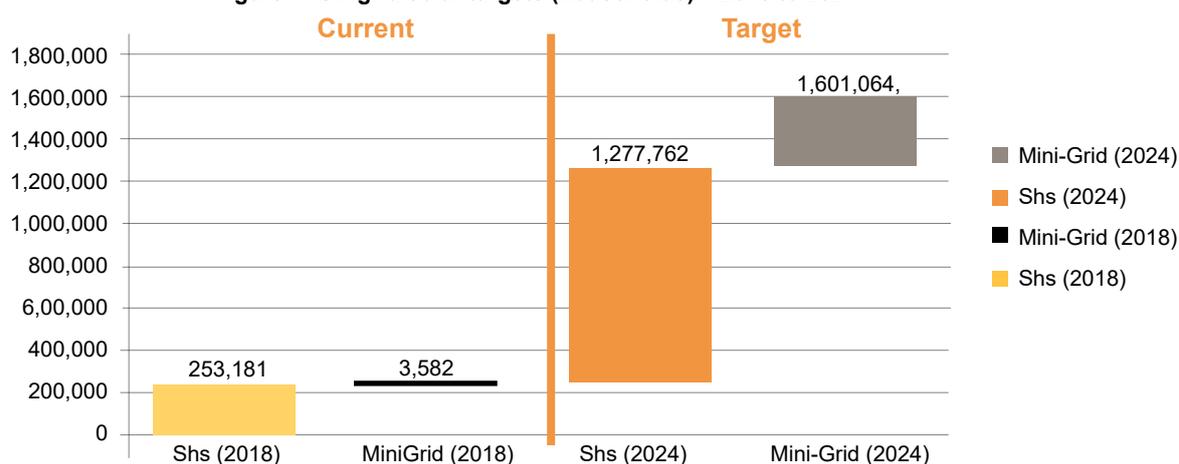


2.1 RWANDA ENERGY SECTOR OVERVIEW

The current electrification rate of Rwanda is 63 per cent, of which 16 per cent is provided through off-grid solutions and 47 per cent through on-grid connections.¹ Nonetheless, in rural areas, where over 70 per cent of the population resides, only 18 per cent of the population has access to electricity.²

GoR has set a target to achieve universal electricity access by 2024, including 48 per cent of households using off-grid solutions. The national grid is expected to reach 52 per cent of households, while the off-grid target is expected to be met through a combination of SAS technologies (32 per cent) and mini-grids (16 per cent).

Figure 1: Off-grid solar targets (households) – 2018 to 2024



Source: ACE TAF analysis of Off-Grid Electricity Access Expansion Programs in Rwanda; Uwera Rutagarama/EDCL; Ghana June 24-28, 2019

Among households not connected to the grid, the vast majority use dry-cell batteries as their main source of lighting. This contrasts with other countries in the region where kerosene lamps and candles are more commonly used. In 2018, 50 per cent of households used batteries as their main source of lighting, around 30 per cent used the grid, over 7 per cent used solar powered devices

and the rest used oil lamps, firewood, or candles.³ Many of the households not currently connected to the grid, or receiving limited service from the grid, represent potential SAS customers. Around 24 per cent of unconnected households would be willing to pay full price upfront for an OGS device that allows them to reach Tier 1 for access to electricity, and this rises to 30 per cent with repayment over a 6

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or 12-month period.⁴ The main uses of these SAS products are phone charging (42 per cent) and powering a radio (20 per cent) and/or television (13 per cent).

To reach the target of 32 per cent of households using a SAS system by 2024 will require significant acceleration in annual sales volumes. Around 250,000 new connections to SAS systems will be required each year, while older systems coming to the end of their useful life will need to be replaced. The annual sales will therefore need to increase from just over 100,000 units per year over the past five years to around 500,000 systems per year

by 2024. In line with this commitment, the Energy Development Corporation Limited (EDCL) signed memoranda of understanding (MoUs) with 21 private companies to increase the supply of SHS – a full list of these companies is provided in Annex 2.

The Rwanda energy sector is presided over by vertically integrated state-owned institutions: the Rwanda Energy Group (REG) and its two subsidiaries, Energy Utility Corporation Limited (EUCL) and EDCL, which are entrusted with energy development and utility service delivery.

2.2 SAS MARKET OVERVIEW

After strong sales in 2016 and 2017, the SAS sub-sector has flattened out in the last few years at around 150,000 units per year. In 2020 the Rwandan OGS market for cash and pay-as-you-go (PAYG) solar products amounted to about USD 20 million in sales. Approximately USD34 million had been invested in the SHS sub-sector as of December 2017, with USD15 million invested in 2017 alone.

An estimated 531,000 people gained access to electricity through SHS in 2018.⁵ This translates to 4.3 per cent of households nationwide gaining access to electricity, while cumulative sales of all SHS now amount to an estimated access rate of 16 per cent of the population, that is, over two million people.⁶

Historically, the total cost of SAS systems available in Rwanda has varied widely from USD58 to over USD1,000, representing significant product diversity. Solar lamps have also been sold at much cheaper prices, from USD5.50 for a simple single lantern, to around USD45 for a small multi-light

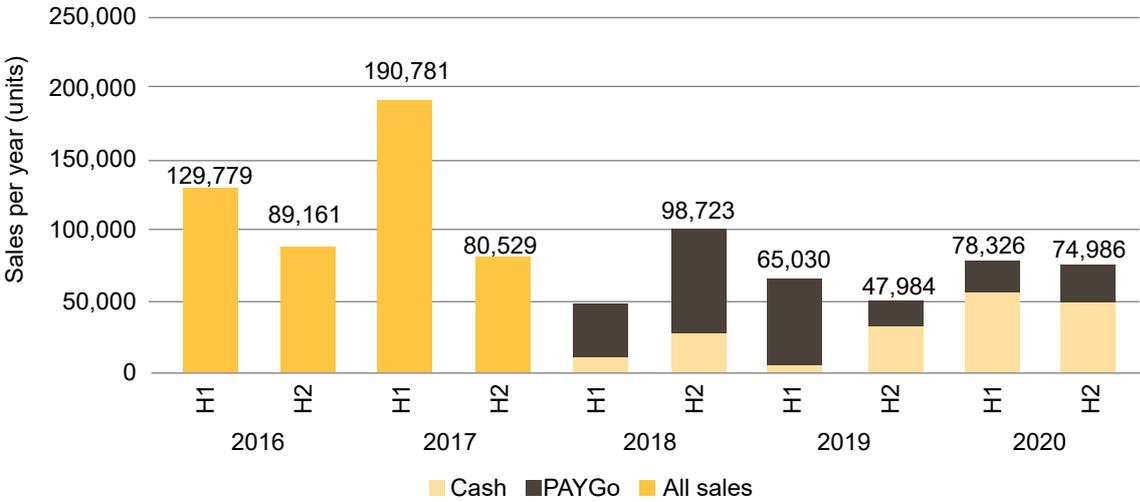
system. Tier 1 SHS made up the majority of SAS products sold in 2018, with the Sun King Home 60 being one of the most popular products with more than 40 per cent market share.⁷ The SAS market is driven by five major companies that have sold more than a quarter million SHS as well as many lanterns.⁸ As shown in Figure 3, most sales have been of entry level SHS and small multi-light systems between 3Wp and 10Wp, and a significant market share of smaller lighting products between 1Wp and 3Wp. Very few medium and larger sized SHS have been sold to date.

PAYG, rent-to-own and fee-for-service are the dominant business models, representing 96 per cent of sales, as opposed to only 4 per cent for direct sales. PAYG technology sales comprised over 80 per cent up to the first half of 2019, although the second half of 2019 and the first half of 2020 appear to have seen an increase in cash sales, with PAYG declining to just 30 per cent of sales. However, these recorded “cash” sales may also be through rent-to-own or fee for service models.

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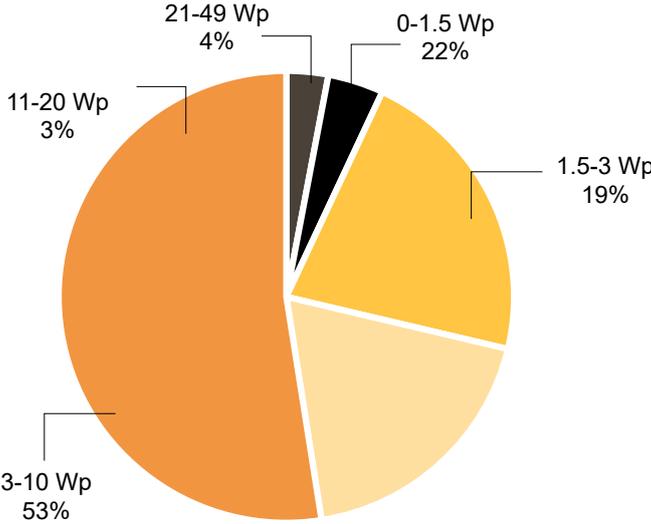
8. *Power Africa stakeholder consultation, March 2021.*

Figure 2: Sales of SAS products recorded by GOGLA since 2016



Source: ACE TAF analysis of GOGLA half-yearly sales reports

Figure 3: Estimate of respective historic sales by system size (up to 2018)



Source: ACE TAF based on data presented in the PAOP (2019) Off-Grid Solar Market Assessment – Rwanda

The major barriers to accelerating deployment of SHS are:

- ⦿ Saturation of the most commercially viable customer market. SAS companies have started to expand to riskier customers (with lower or irregular income), which has led to an increase in their default rate to between 5 per cent and 25 per cent.⁹ This challenge is not unique to Rwanda but has been

experienced by SAS companies across sub-Saharan Africa, with business models not yet fully adapted to servicing lower income households with limited affordability.

- ⦿ Low affordability among unreached potential customers. In 2018 Ubudehe 2 and 3 customers made up approximately 41 per cent and 51 per cent of new solar lighting sales, respectively. The lowest income (Ubudehe

1) households accounted for only 8 per cent of lighting product sales. This presents a dual challenge of both pushing to improve the quality of energy access, while ensuring all households gain access to clean, modern and affordable energy. Most households rely on dry-cell batteries as the primary source of lighting – which is different from many other countries where, for example, kerosene is a major source of lighting. About 40 per cent of SAS sales historically have been relatively small systems, less than 3Wp.

☀️ Customer default rates on consumer-finance business models have increased, with most SAS companies reported default rates ranging from 5 per cent to 25 per cent. Most SAS companies in Rwanda are not yet profitable. A few SAS companies have been able to access local and international debt financing. At the same time, one international SHS company (Solarkiosk) was declared bankrupt in March 2019 while Mobisol was acquired by French company Engie in September 2019.

☀️ Implementation of import duty and VAT at the

border. Despite the reduction of import duties, some SAS companies report delays and a degree of uncertainty around importation of some qualifying solar products and kits – although it is noted that this has improved in recent years with greater clarity and understanding of qualifying SAS products at the border. Some SAS companies also noted that uncertainty over the implementation of rules by the newly instituted Rwanda Inspectorate and Competition Authority (RICA) posed a challenge to their operations.

☀️ Implementation of the off-grid zoning policy as set out in the National Electrification Plan (NEP) may result in low uptake of SAS products. The NEP delineates the regions that are earmarked for mini-grid development and those earmarked for SAS subsidies. Strict enforcement of these boundaries in the NEP may lead to under-electrification. Many Rwandans who live in mini-grid designated areas may be excluded from accessing the SAS subsidies, while mini-grid development and main grid extension may not be achieved in these areas for years.

2.3 MINI-GRID MARKET OVERVIEW

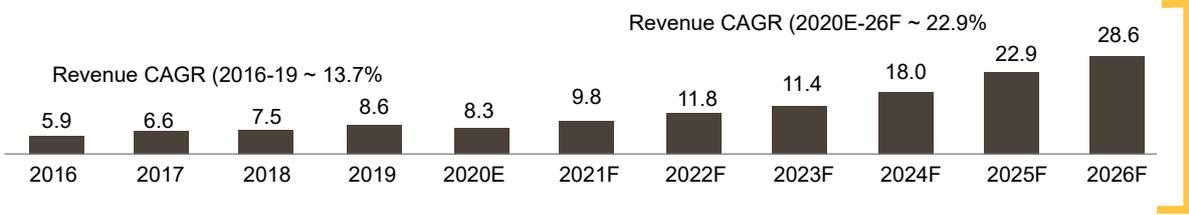
The solar mini-grid subsector is at a very early stage of development. Currently, 84 mini-grids (78 DC and 6 AC) have been installed in Rwanda with a total capacity of around 250kW. These solar and solar hybrid mini-grids may be DC, AC, or a combination thereof. While most mini-grids are AC, rural communities with low power demands may be suited to DC. DC systems, such as those developed and operated by MeshPower, tend to have a lower capex per watt as they require fewer components and do not require expensive inverters. DC mini-grids also have the added benefit of being directly compatible with

DC appliances, which tend to be more energy efficient. This ultimately allows mini-grid operators to set lower tariffs. On the other hand, AC mini-grids are more expensive, while allowing for the use of higher-voltage appliances. They also allow for easier connection to the main grid, if it arrives.

Rwanda mini-grid developers are ready to scale up, but they are limited by access to concessional capital. Even with access to loan guarantees, high interest rates, large upfront capital and collateral requirements remain considerable hurdles for potential developers.¹⁰

10. Power Africa stakeholder consultation, March 2021.

Figure 4: Rwanda solar and solar hybrid mini grid market revenues, 2016-2026 (USD million)



Source: Rwanda Mini-Grid Market Report 2021, 6W Research

The Rwanda mini-grid market revenue is projected to grow at a CAGR of over 20 per cent in the coming six years (2020-2026).¹¹ The market is anticipated to witness a period of slow down on account of the Covid-19-triggered global recession. However, the situation is anticipated to improve post 2020 on account of increasing power demand and ambitious government targets of 100 per cent electrification by 2024. These initiatives are expected to drive the deployment of mini-grids in Rwanda. Additionally,

GoR plans to increase the off-grid connections to 48 per cent under NEP, which is anticipated to give a significant boost to the deployment of mini-grids in the country. Initiatives such as the National Strategy for Transformation and easy financing for mini-grids are also anticipated to aid the growth of the market in coming years. Furthermore, the solar powered mini-grids segment is anticipated to grow significantly due to widespread adoption by public sector authorities.

Table 1: Mini-grids operational in Rwanda

Company	Technology	Location	Size	Households Connected	Grant Support
Neseltec	Solar	Kirehe District	30kW	183	EEP
ECOS	Hydro	Muhanga District	11kW	303	EnDev
RENERG	Solar	Nyamasheke District	30kW	121	USADF
MeshPower	Solar	Multiple in Bugesera and Ngoma districts	1kW each, 57 sites	2,046	EEP & EnDev
MeshPower	Solar	Bugesera District	4kW AC/DC	78	None
Absolute Energy	Solar	Gatsibo District	50kW	505	EnDev

Source: Energising Development (EnDev), 2019

The major barriers identified for scaling up the deployment of mini-grids are:

- ☀ Lack of sufficient subsidies. Compared to national utilities operating the main grid, mini-grid developers are under-subsidised. A

2016 World Bank study found that only two sub-Saharan African countries had financially viable electricity sectors at the time – Uganda and Seychelles.¹² Only 18 countries were able to recover operating costs when

11. Rwanda Mini-Grid Market Report 2021, 6W Research.

12. World Bank Group (2016).

accounting for transmission and distribution losses, though not capital costs. The World Bank study also found that the financial deficit, or hidden subsidy, of the electricity sector is approximately equal to 1.5 per cent of each country's Gross Domestic Product (GDP) on average. Mini-grids are therefore under-subsidised despite often serving as a lower cost solution because they cannot rely on scale and access, higher paying off-takers and other forms of government to provide their services.

- Commitment to off-grid regions identified in the NEP. There are purported instances where mini-grid developers submitted plans to the EDCL and then REG extended the grid to those locations. This lack of certainty for investors and project developers threatens the development of the mini-grid private sector as it exposes investors to a risk of revenue collapse that they are not able to manage.

This perceived risk is all the more important in the context of plans to rapidly expand the main grid, which may result in some competition with the development of mini-grids that rely on committed revenue streams over the course of a decade or more. There may need to be compensatory rules to provide revenue certainty when the grid does arrive, e.g. sale of the mini-grid to the national utility at price that includes return on investment.

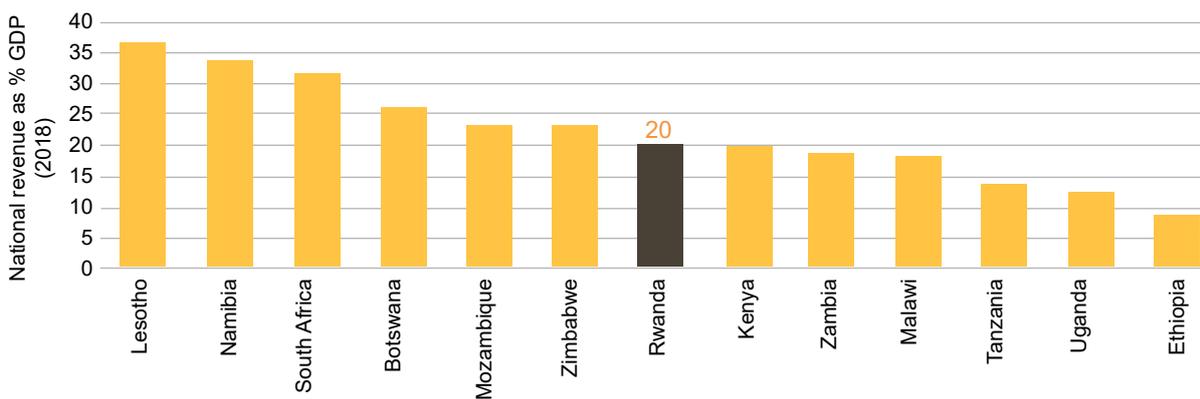
- High installation and maintenance cost. The initial cost of investment in mini-grids remains relatively high. The cost of materials and components required for installing mini-grids and limited access to financing act as a hurdle for the growth of the Rwandan mini-grid market. Additionally, mini-grid maintenance costs in Rwanda are also quite high due to the paucity of technical expertise in remote areas where mini-grids would be deployed.

2.4 GOVERNMENT TAX AND IMPORT DUTY REVENUE

Rwanda's GDP is RWF9,105 billion (2019, approx. USD10.1 billion), while its national revenue to GDP ratio is around 20 per cent.¹³ As shown in Figure 5, this is broadly in line with national revenue

collection rates in East and Southern Africa, although it is well below the rates seen in much of Europe where national revenue often reaches between 30 per cent to 40 per cent of GDP.

Figure 5: Government of Rwanda national revenue as a share of GDP



Source: ACE TAF analysis of World Bank, World Development Indicators

National revenue in 2018 amounted to RWF2,052 billion, of which most was generated from GoR tax and non-tax revenue streams. The total tax-

based revenue was RWF1,401 billion and non-tax revenue is RWF651 billion. Taxes from income, profits and capital gains amounted to RWF556

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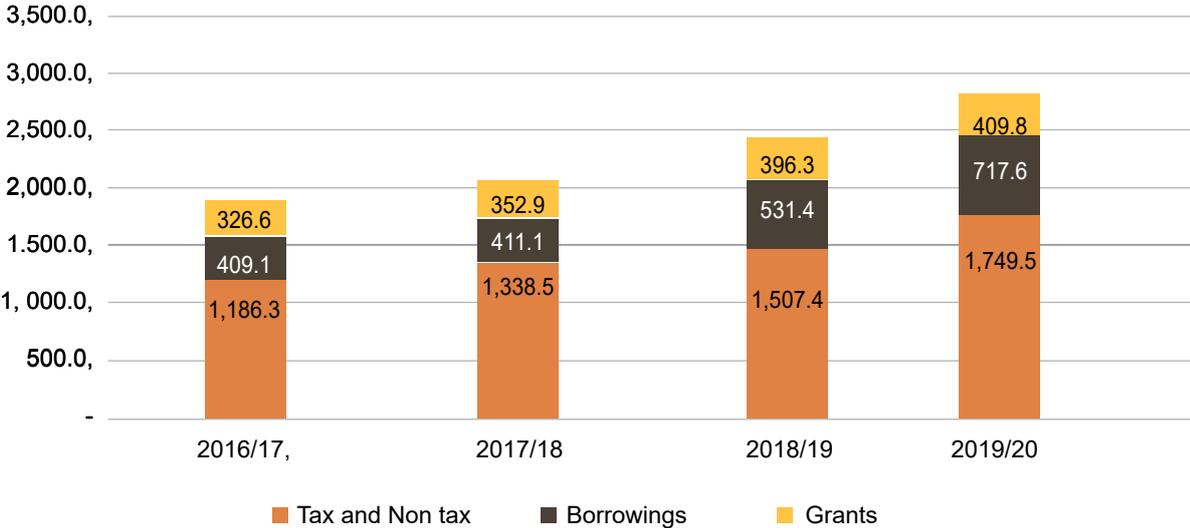
billion. Taxes in the form of social security contributions amounted to RWF83 billion. Taxes revenue from property is around RWF1.3 billion, taxes on goods and services are RWF752 billion, VAT amounts to RWF445 billion and import duties RWF152 billion.

For the 2019/20 fiscal year, the total revenue collection (both tax and non-tax, excluding local government collections) amounted to RWF1,516.3 billion, against a target of RWF1,589 billion, which is an achievement of 95.4 per cent, and RWF72.8 billion below target. Tax revenue collection for the 2019/20 fiscal year was RWF1,494.8 billion while the target was RWF1,569.0 billion, an achievement

of 95.3 per cent. Despite Covid-19, the overall import tax in 2019/20 was RWF149.6 billion, with solar components (appliances and equipment that are not on the exemption list) contributing RWF93.95 million, which is equivalent to 0.07 per cent of all imports.

Rwanda’s raising of revenue for its national coffers through taxation must be balanced against the effects of taxation on its industrialisation and further expansion of its tax base. As such, this comparative examination of Rwanda’s national revenue streams offers insights into how tax policy may be adapted to support the development of the rural electrification sector.

Figure 6: Government of Rwanda national revenue (RWF billion)

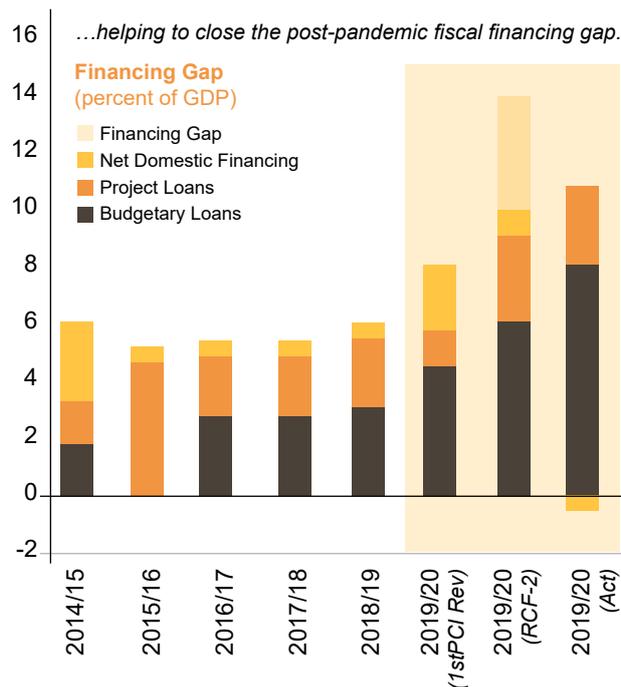
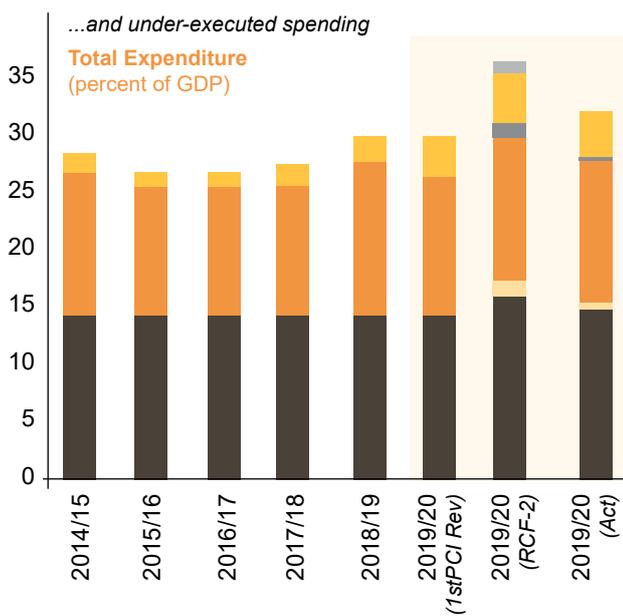
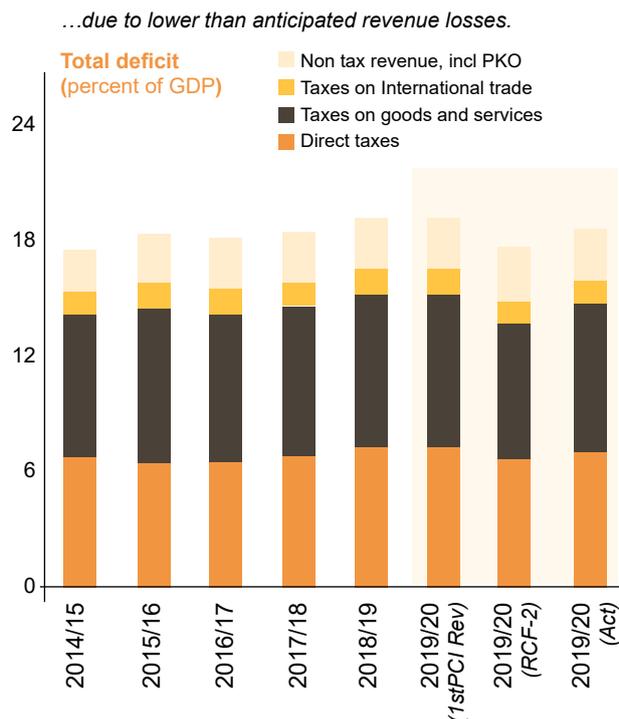
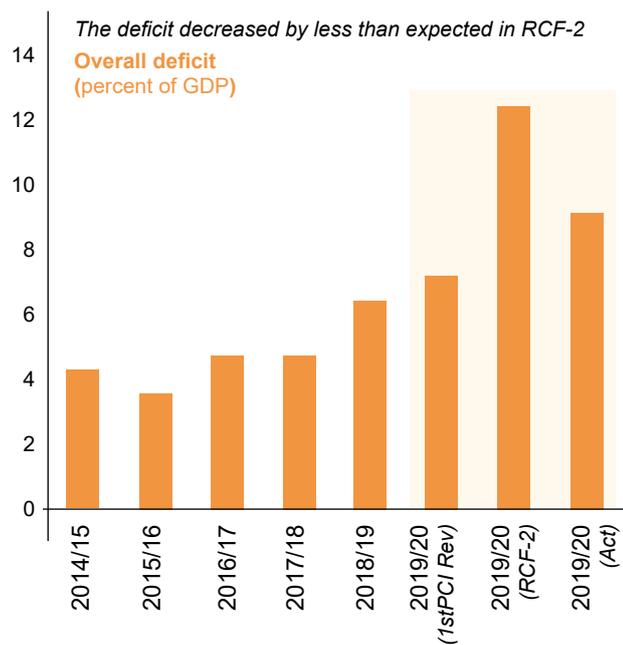


Source:

11. Rwanda Mini-Grid Market Report 2021, 6W Research.

12. World Bank Group (2016).

Figure 7 - Rwanda fiscal indicators



- Net lending (o/w Covid-19 spending)
- Capital expenditure (o/w covid-19 spending)
- Current expenditure(o/w Covid spending)
- Net lending
- Capital expenditure
- Current expenditure.

Source: IMF, Third Review Under Policy Coordination Instrument, Rwanda Country Report No. 21/1, January 2021.

3. Existing Policy and Fiscal Incentives to Support SAS and Mini-Grid Sub-Sector Development



There are a range of incentives planned or already in place to support achievement of GoR's ambitious energy access targets. These are briefly described here.

3.1 SAS INCENTIVES

Eligible SAS products benefit from both VAT and import duty exemptions. The Ministry of Finance and Economic Planning added solar components and related accessories to the List of energy supply equipment exempted from VAT. To qualify for the exemptions, the products must meet VeraSol quality standards and be in line with the minimum standards defined in the 2019 Ministerial Guidelines. Spare parts and accessories, however, including appliances, are not exempt from import duty. Clean

energy projects importers must also cope with considerable insurance fees and freight charges in addition to the usual corporate and investment tax considerations.

VAT and import duties context

Rwanda Revenue Authority (RRA) has implemented a wide range of reforms, and has introduced new tax types to bring Rwandan tax policy and administration in line with 21st century best practices.

Figure 8: Overview of tax types in Rwanda¹⁴

Domestic Taxes	Local Government Taxes and Fees	Customs Duties
Income tax, including: <ul style="list-style-type: none"> ❖ Personal Income Tax (PIT) ❖ Corporate Income Tax (CIT) <ul style="list-style-type: none"> • Pay as You Earn (PAYE) • Value Added Tax (VAT) • Excise Duty - Withholding Taxes (WHT 15% and WHT 3%) • Gaming Tax • Capital Gains Tax • Tax on Minerals 	<ul style="list-style-type: none"> • Property Tax • Trading License Tax • Rental Income Tax • Local Government Fees 	<p>Taxes paid on imports that are also paid on domestic goods</p> <ul style="list-style-type: none"> • VAT 0.2% • Excise Duty <p>Taxes that are specifically paid on imports</p> <ul style="list-style-type: none"> • Import Duty • Withholding Tax of 5% • Infrastructure Development Levy (IDL) at 1.5% • Strategic Reserves Levy (SRL) • African Union Levy (AUL) at 0.2% <p>Taxes that are specifically paid on exports</p> <ul style="list-style-type: none"> • Export Duty on raw hides and skins <p>Small fees on imports and exports</p> <ul style="list-style-type: none"> • Computer processing fee • Quality Inspection Fee (QIF) at 0.2%

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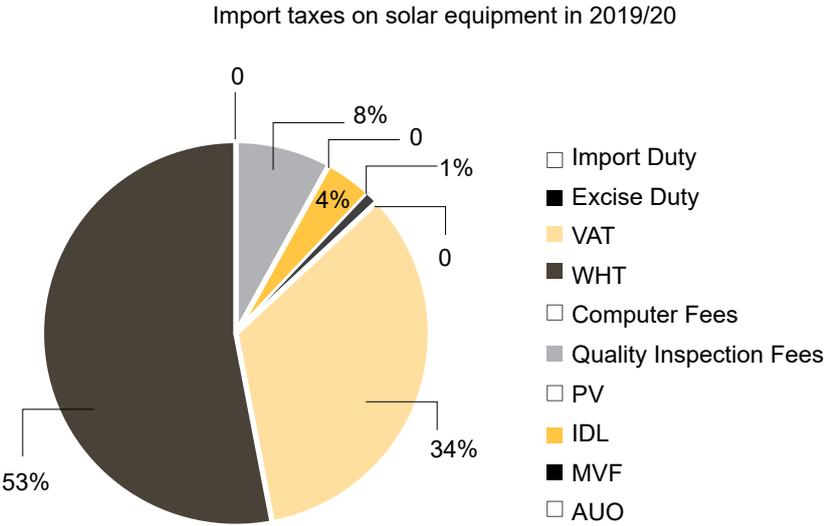
As a member of the East African Community (EAC), Rwanda applies the Common External Tariff, a four-level duty structure for imports from outside of the community: 0 per cent for capital goods and raw materials, 10 per cent for intermediately processed goods, 25 per cent for finished goods, and various other levels of taxation for goods that are deemed “sensitive”.

There are two exceptions to the common external tariff: (i) the Duty Remission Scheme, an exemption from import duty available to taxpayers who are importing goods to be used as inputs in the production of goods for export or in the production of particular goods for home consumption, and (ii) a stay of application, a different rate of import

duty from the common external tariff available for specific products, these are negotiated on a country-by-country basis, but once agreed are available for all importing taxpayers.

Other taxes and levies for Rwandan imports include: excise duty that varies depending on the product and is applied to the cost, insurance and freight value (CIF) and import duty plus handling fees; VAT, which is at 18 per cent and is applied on CIF and import duty and excise duty plus handling fees; withholding tax, which varies and is applied to CIF value; an infrastructure development levy of 1.5 per cent applied to CIF value; a strategic reserves levy and an African Union Levy of 0.2 per cent applied to CIF value.

Figure 9: Rwanda revenue by source



Source: Rwanda Revenue Authority (RRA)

Companies have had issues claiming these exemptions, but as clearing agents are becoming more familiar with the sector, the issue has improved. However, it is recommended that companies hire skilled clearing agents to facilitate the process.

The other major incentive in place is Results-Based Financing (RBF) grant awards. The RBF programme provides a targeted incentive to reach lower income households (Ubudehe 1, 2 and 3) in off-grid areas mapped by NEP. Each household is

eligible for one subsidised off-grid system and the subsidy varies according to household categories. The EnDev Pro-Poor programme connected 23,000 households between November 2019 and February 2021 in five southern districts, with a maximum incentive of up to USD100 per system.

Building on similar design principles to the initial RBF pilot, a similar RBF programme is now being scaled up as part of the Renewable Energy Fund (REF) supported by the World Bank. It intends to reach 360,000 households by the end of 2026

through various funding facilities. In October 2020, the Development Bank of Rwanda (BRD) launched a series of new facilities aimed at connecting 360,000 rural households with solar energy. One consists of a subsidy of USD15 million through domestic solar companies while the other is a USD20 million guarantee framework covering lending institutions.¹⁵ Eligibility for this grant and lending support will be based on the qualifications of the solar products and services. The products supported are multi-light SAS products that

comply with the minimum standards set out in the 2019 Ministerial Guidelines and meeting Verasol quality verification standards.¹⁶ Households can choose any system, with a maximum subsidy level as set out in Table 2. Participating companies and products must fit eligibility criteria and abide by data collection and reporting procedures for the Off-Grid Monitoring Information System (OMIS), which is used to check customer eligibility and serves as a data repository for registered sales.

Table 2: RBF subsidy level by Ubudehe

Category	Absolute cap	Relative cap
Ubudehe 1	USD108	90%
Ubudehe 2	USD84	70%
Ubudehe 3	USD54	45%

Source: EnDev 2019

The Rwanda Energy Fund, established in 2017, has operated through five windows:

- ☀ Window 1 – Sales of SHS through SACCOs (wholesale lending)
- ☀ Window 2 – BRD provided on-lending capital (wholesale lending)
- ☀ Window 3 – Lending for mini-grid developers directly (direct lending)
- ☀ Window 4 – Lending for direct lending for SHS (direct lending)
- ☀ Window 5 – RBF subsidy window, initially USD15 million, follow on to Pro-Poor.

The Ministry of Infrastructure (MININFRA) Ministerial Guidelines, approved in 2019, define minimum service-level and performance

requirements for SAS products.¹⁷ The motivation for these requirements is to protect customers by mandating that all imported SAS power systems meet minimum standards requirements to ensure quality and reliable service. Systems must be capable of supplying enough electricity to power at least the following:

- ☀ Three lamps of at least 120 lumens each, operating at least four hours per day.
- ☀ Mobile phone charge supply for at least two hours per day.
- ☀ Radio charge supply for at least five hours per night.
- ☀ Supply for the above loads for least one day without input from the solar module/when there is no sunshine.

3.2 SAS MARKET OVERVIEW

EnDev Village Grid RBF Rwanda

This programme is implemented in partnership with MININFRA, EDCL, Energy 4 Impact (E4I) and

Rwanda Utilities Regulatory Authority (RURA).

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Eligible projects

The projects that are eligible include: mini-grids powered by renewable energy technologies (hydro, solar and solar-diesel) with installed capacity of 5-50kW with at least 40 customers or an installed capacity of 51-100 kW; and distribution only mini-grids that purchase power from an existing isolated power plant that is covered by license exemption for generation installation of under 50kW. To be eligible for this programme, the project must also meet technical and safety service quality including: (i) reliable power supply within the mini-grid distribution network, (ii) load control and power quality to protect electrical appliances, (iii) customer and staff safety of the installation through implementation of proper earthing, design, system sizing and installation standards, and (iv) implementing Electricity Access Rollout Program (EARP) grid standard construction guidelines for the distribution network.

EnDev Rwanda also provides detailed technology specific guidelines (solar, hydro and distribution) for the planning, design and commissioning of solar and hydro mini-grid installations and distribution networks.

Subsidy financing

Eligible projects with a costing up to EUR1.07 million, and any single eligible company, can only receive a maximum of EUR250,000 (about 25 per cent of total project budget) and up to 70 per cent of capex. The subsidy disbursements are on a results-based basis whereby the subsidy is paid out upon the successful commissioning of the project, and through quarterly instalments over the first year of operation.

Rwanda mini-grid guidelines¹⁸

In Rwanda, mini-grid developers can apply for licenses to develop mini-grids with a capacity of up to 1MW and small power generation projects of up to 5MW. A mini-grid license provides exclusive rights to distribute and sell energy on a retail basis for five to 25 years within a determined

geographical area. The retail tariff may be set by the developer at a level allowing cost recovery and a reasonable rate of return, and the tariff may be reviewed at any time by RURA.

Mini-grids of less than 50kW are exempt from the licensing procedure but must notify authorities of their operations. In the case of the main grid arriving within connecting distance of a mini-grid, the license holder must choose one of three options: (i) switch the license to that of a small power distribution and generation licenses, which would be valid for the remainder of the original license period (thereby splitting its business into a generator that sells to the grid that can qualify for feed-in tariffs and an electricity retailer that buys from it; (ii) enter into negotiations with the national utility for acquisition of the project; and (iii) relocate the assets, and where possible, and in exchange for a relocation fee, operate for the remainder of the license period. In exceptional case where connecting to the main grid would not benefit the local population, the regulator may decide to withhold the license conversion.

SEFA grant for green mini-grid studies (Dec 2015)

In December 2015, the African Development Bank-hosted SEFA awarded GoR a USD840,000 grant to promote green mini-grids and further private investments in the mini-grid sector. The project supported GoR rural electrification efforts to provide connections to at least 145,000 rural households and improve off-grid access rate from 5 per cent to 22 per cent by 2018. REG, the project implementer, has identified over 200 villages as potentially feasible sites for mini-grids and will eventually provide advanced feasibility studies for at least to 20 sites.

Import duty and taxes

The issue of import duties and VAT on solar mini-grids was not a significant one for the developers interviewed. For although mini-grid development is similar to SAS distribution as it is a capex heavy

18. Regulation No. 01/R/EL-EWS/RURA/2015 Governing the Simplified Licensing Framework for Rural Electrification in Rwanda.

enterprise, the financing of mini-grids is amortised over a number of years, therefore taxes and duties have a comparatively smaller impact on end-user pricing. Nonetheless, hydro mini-grid developers are not exempt from import duties and VAT, and there have been reports of importation cost challenges for OGS component importers.

Global LEAP Awards

The awards provide RBF for high-quality and efficient SAS appliances and are funded by UKAID, Power Africa, EnDev and Acumen Fund.¹⁹ The award aim to catalyse the uptake of high-quality

super-efficient appliances as well as lower the cost to procure large volumes of best-in-class off-grid appliances for early mover OGS companies and facilitate new business partnerships for appliance suppliers that have invested in the production of high-quality off-grid appliances. The pilot round launched in Bangladesh in 2016 and expanded to East Africa in its second round in late 2017. To date, the Global LEAP RBF has catalysed the procurement of over 230,000 best-in-class solar TVs, fans and refrigerators across Kenya, Uganda, Tanzania, Rwanda and Bangladesh.

19. Efficiency for Access (2021). Global LEAP Awards; Global LEAP Awards (2020). Results-based-financing.

4. Overview of Stakeholder Interviews



4.1 OVERVIEW OF CONSULTATION PROCESS

Eleven stakeholder interviews were conducted to collect data and qualitative information on the impacts of various fiscal incentives over the last five years. The research for this assessment followed a semi-structured

interview approach for each stakeholder engagement to ensure comprehensive information is collected, while remaining flexible to reflect each stakeholder's experience.

Table 3: Stakeholder backgrounds

Public stakeholders	Private stakeholders	Other institutional partners
1. REG/EDCL	1. EPD	1. GIZ (EnDev)
2. RRA	2. Ignite	2. Power Africa
3. End-users	3. One Acre Fund	
	4. BBOXX	
	5. Mobisol	
	6. Serve and Smile	

4.2 KEY MESSAGES FROM STAKEHOLDER CONSULTATIONS

Fiscal incentives

The SAS companies are aware of the VAT exemptions, no import duties and the Pro-Poor programme and they have all applied for the Window 5 grant programme. They have found that the subsidies and incentives support affordability, which is closely associated with sales volumes. This widespread participation in the subsidy programme suggests that the subsidies are very impactful. SAS companies interviewed found the fact that access to Window 5 is conditional upon proving a loan application in windows 1, 2 or 4 to be a barrier since it is inelegant to take out an additional loan for the same business activity.

Standards

The 2019 Ministerial Guidelines established standards among other aspects. The most established SAS companies found them to be

advantageous since this limits their competition to sellers of high-quality products. Nonetheless, SAS companies generally felt that RICA has added another layer of quality verification that has led to frustration due to confusion over which standards to apply and coordination with customs officials. It was also reported that the Ministerial Guidelines may need updating owing to the rapid pace of technological innovation. This will help ensure clarity with RICA to avoid potential confusion and it will help harmonisation with IEC standards. Generally, interviewees agreed that there should be more coordination and harmonisation of processes regarding access to exemptions and customs issues.

SAS sector and employment

The number of total employees per company, including part time employees and agents, varied

greatly among companies, ranging from 300 to 10,000. The number of full-time employees per company was comparable across companies (100 to 300), for whom withholding tax and RSSB contributions payments are made. The percentage of female employees varied across the interviewees, ranging from 17 per cent of total staff to 80 per cent of call centre staff for one interviewee. To ensure gender inclusivity, one interviewee mentioned working with Women in Rwandan Energy to access additional female interns.

Competition with mini-grids

Generally, across the SAS companies interviewed, there was no direct competition between SAS and mini-grids due to the comparatively much greater expense of installing and operating mini-grids. On the other hand, it was reported that some interviewees had experienced competition with the national grid, which caused customers to return the SAS systems.

The effect of increased affordability

Across all interviewed SAS companies, there was agreement that fiscal incentives supported increased affordability and in turn made a substantial impact on sales. There is significant price sensitivity in the Rwandan market. Nonetheless, responses from interviewees varied regarding whether they had reached cash flow break even and how quickly it had occurred for them. This suggests a range of costing and capital structures among SAS companies, the result of which would directly or indirectly affect product affordability. Another potential influence on affordability would be the regional trade and the customs duties, however, it seemed that most of

the SAS companies were not aware of the trade benefits under the Common Market for Eastern and Southern Africa (COMESA) and EAC regional agreements.

SAS sector challenges

- ☀ Tax exemption on some imported parts of solar systems, which are currently taxed.
- ☀ Influencing the new NEP that is being revised to consider flexibility in off-grid systems zoning in favour of developers.
- ☀ Subsidies could be increased, especially compared to the subsidy that the government is providing for grid connection.
- ☀ Some companies struggle to convince financiers to support them even with RBF support. Also, to access local loans from commercial banks, one interviewed SAS company revealed it was asked to provide surety over its fixed assets and found that available interest rates were too high.

Suggested improvements to incentives

The SAS company interviewees also provided some insightful critiques of the existing incentive scheme. Some companies reported that they could have done better if the Pro-Poor programme did not limit the number of connections since some companies may have more financial capacity to implement more connections. Similarly, the REF Window 5 applications are limited to RWF1 billion, which can be extended to companies three times. The companies wished to have the entire amount in one go for the funds to make a significant investment impact. The segmented support wastes a lot of time as the process of application takes too long.

4.3 END-USERS

End-users consultation covered both existing and potential end-users of SHS. According to NEP, some areas were marked as SHS zone as indicated on Figure 10. Accordingly, the survey was conducted in 23 districts from the total of

30 districts in the country. The sampling covered 72 households for existing end-users and 40 households for potential end-users.

The survey intended to collect general information on the socioeconomic situation of SHS users and

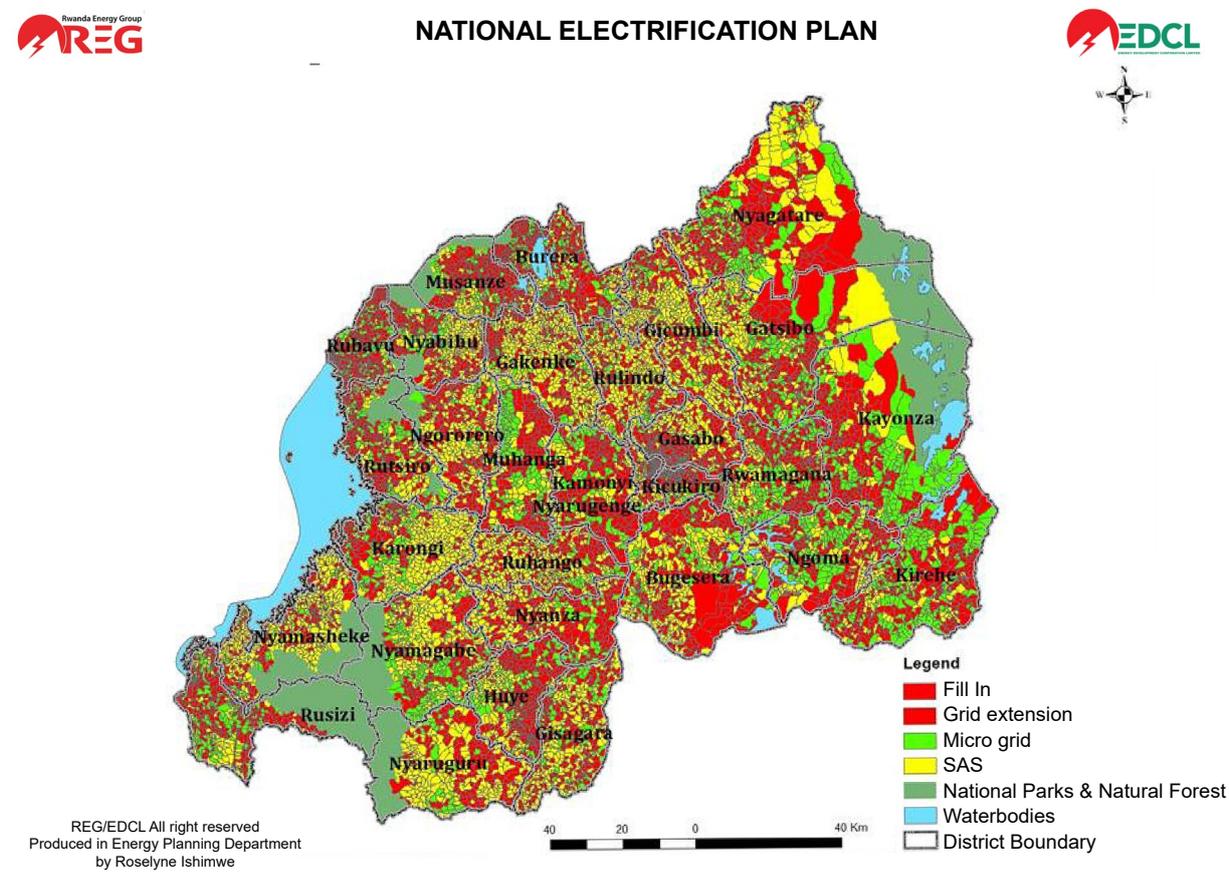
the assessment of impacts SHS use in education, job creation, income taxes, business standards and their monthly kerosene use on potential users' side.

The study showed that SHS are used for lighting, telephone charging as well as income generating activities. Though the majority of SHS users are not using SHS for income generating activities, as 78 per cent of existing users interviewed never started businesses, instead they use energy for lighting homes, phone charging and powering televisions. This improved their standard of living.

However, 22 per cent of respondents who were existing users were able to start businesses. Some of the businesses started included phone charging, cinemas and sports viewing.

SHS had also a significant impact on students – studying hours of students from families possessing SHS have increased from 0 to 2 hours, positively impacting education outcomes. The study found out that 96 per cent of existing end-users recommend SHS to new users, implying that they are happy with the SHS purchases.

Figure 10: System map for the Rwandan National Electrification Plan



Source: TASK 2 Report. Design of the National Electrification Plan in Rwanda

SHS/SAS financial affordability of end-users

Affordability was assessed by consulting both existing and potential end-users. Among key parameters that were assessed included earnings, monthly payment instalments, current spending

on alternative forms of energy and how much they are willing to pay for SHS.

SHS monthly payments

Over half (56 per cent) of SHS users interviewed have kept up with their PAYG payments. Nonetheless, 44 per cent of respondents

reported that at some point, their SHS had been deactivated due to delayed payments, which may indicate that a significant share of SHS users still face affordability challenges after purchasing their systems.

Income earning of existing end-users

The maximum average annual salary for management jobs is RWF6 million (USD6,000) whereas minimum earning was 0 RWF. Income generating activities differ from place to place and are greatly affected by economic activities of the area, since people mostly rely on agricultural activities leading to seasonal and unpredictable income.

Potential end-users affordability

According to data collected from potential end-users of SHS, the current average amount spent on energy sources like candles and charging of

phones is around RWF3,188 per month, with the maximum being about RWF10,000 per month and the minimum as low as RWF0 per month for those who are still using firewood for lighting. The majority are willing to increase what they spend per month to shift to SHS. Their willingness to pay on monthly instalment basis was reported as an average of RWF9,519 per month, with a maximum of RWF25,000 per month and minimum of RWF500 per month.

Technical challenges and recommendations

Most of SHS batteries have minimal days of autonomy i.e. no sun days. Also, maintenance of SHS poses a challenge. Companies distributing SHS sometimes take a long time to send a technician to provide repairs. Some SHS users requested SHS with multiple plugs instead of one plug so that they can operate more appliances.

5. Overview of Fiscal Incentives for SAS products and Mini-grids Internationally and in the Region



In reviewing international policies, regulations, mandates and incentives relating to the OGS markets, East Africa, generally, is a leader in supporting the sector. In fact, according to the

World Bank Regulatory Indicators for Sustainable Energy (RISE) rating system, Rwanda scores 73/100 for its energy access policies.²⁰

5.1 INTERNATIONAL POLICIES AND INCENTIVES FOR CLEAN ENERGY SECTOR DEVELOPMENT

Feed-in tariffs

A feed-in tariff and a feed-in premium is a policy tool designed to promote investment in renewable energy sources. This usually means promising small-scale producers of the energy – such as solar or wind energy – an above-market price for what they deliver to the grid.

Feed-in tariffs have proven to be very effective in stimulating rapid and large-scale development of renewable energy technologies in countries such as Tanzania, Uganda, Kenya and Egypt, and especially Germany, Denmark and Spain. Feed-in tariffs (FIT) and feed-in premiums (FIP) remain the most widely adopted renewable power generation policies employed at the national and state/provincial levels.²¹ As of early 2014, 73 countries and 28 states/provinces had adopted some form of FIT/FIP policy.²² This has been mainly attributed to the high investment security that long-term guaranteed FIT are providing.

Investment tax credit

The Investment Tax Credit (ITC) reduces United

States federal income taxes for qualified tax-paying owners based on capital investment in renewable energy projects (measured in dollars). The ITC is earned when the equipment is placed into service. As long as one owns a renewable energy system, one is eligible for the solar investment tax credit. Even if one does not have enough tax liability to claim the entire credit in one year, one can roll over the remaining credits into future years for as long as the tax credit is in effect. However, if one signs a lease or power purchasing agreement with a solar installer, they are not the owner of the system and thus they cannot receive the tax credit.

Advanced energy manufacturing tax credits

The Advanced Energy Manufacturing Tax Credit (MTC) awards tax credits to new, expanded or re-equipped domestic manufacturing facilities that support clean energy development. The MTC was enacted on February 17, 2009 as part of the American Recovery and Reinvestment Act of 2009, which authorises Treasury to award up to USD2.3 billion in tax credits that will allow eligible taxpayers

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22. REN 21 Renewables 2014 Global Status Report.

to claim a 30 per cent general business investment tax credit in exchange for a qualified investment made during the taxable year and that is part of a qualifying advanced energy project. A qualified investment generally means tangible personal property subject to depreciation and that is part of a qualifying advanced energy project. Property that is part of the building or its structural components is specifically excluded from eligibility. Generally,

a qualifying advanced energy project is a project that enables a manufacturing facility to produce at least one of the following: property designed to generate energy from renewable sources such as wind, solar and geothermal deposits; fuel cells, microturbines or energy storage systems needed to power electric and/or hybrid-electric motor vehicles; electric grids that support transmitting and/or storing renewable energy.

6. Methodology for Analysis of Fiscal Incentives



6.1 SUMMARY OF MODELLING APPROACH

This assessment builds on a previous ACE TAF study that piloted an assessment tool of the impact of VAT and import duty on the SAS sector, including in Rwanda. This initial tool was developed to provide a flexible resource that could be deployed quickly in different country contexts to evaluate the impact of introducing national VAT and national or regional import duties on SAS products, kits and components.²³

This deeper assessment of fiscal incentives and SAS sub-sector development builds on the previous assessment in two key ways:

- First, it builds in a more nuanced assessment of context-specific factors in Rwanda. In this assessment, we only consider eligible products that would meet the relatively recent 2019 Ministerial Guidelines as contributing to the achievement of the national energy access targets. In practical terms, this means that smaller systems (less than 10Wp), which have comprised the bulk of sales historically, are not included.
- Second, it builds in functionality to combine other fiscal incentives – the RBF grant subsidies. The tool has been augmented with

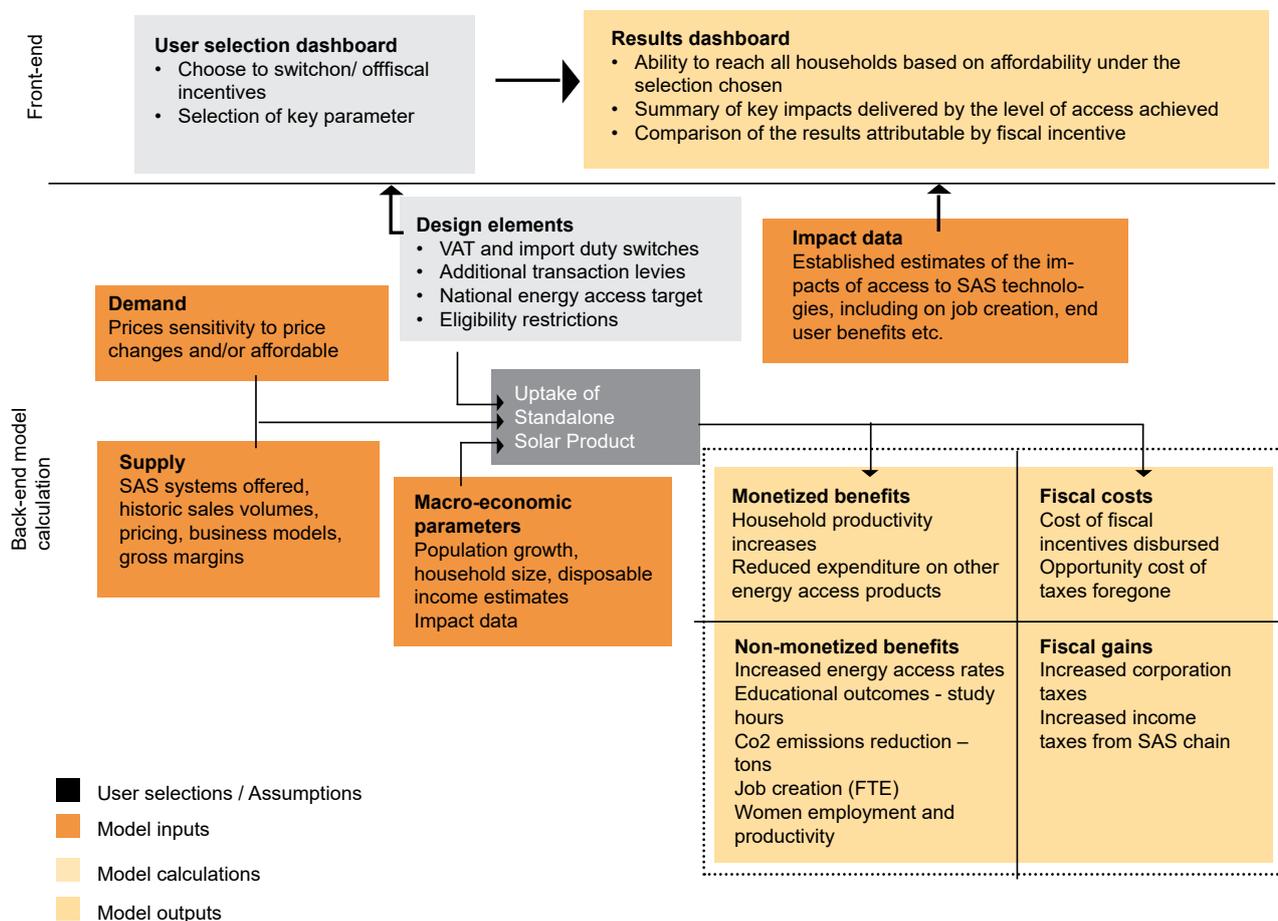
an upfront dashboard, and a more nuanced assessment of affordability for Rwandan households, to examine the impact of the respective fiscal incentives on reaching national energy access targets. This includes a more detailed analysis of the share of Rwandan households that would be able to afford SAS products of different sizes under both cash (over the counter) and PAYG business models.

The tool developed for this assignment is structured as shown in Figure 11. This modelling tool is also provided as an Excel document (Annex 3).²⁴ The main model mechanics estimate the direct impact on demand of a change in prices, if VAT and/or import duty policies were to be changed. This model is then augmented with a more detailed affordability assessment for systems of different sizes, which can be easily adjusted by the user. This is built into a single control sheet that defines the types and levels of fiscal incentives operational in the model, and summarises the resulting contribution to accelerating access to SAS technologies, and the impact to government's net fiscal revenue, job creation in the SAS value chain, and households accessing SAS products, etc.

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Figure 11: Overview schematic of fiscal incentives tool



6.2 KEY INPUTS AND ASSUMPTIONS

Key economic and demographic indicators in Rwanda – Population growth rates, GDP per capita, consumption and expenditure levels

We use the following data and assumptions on key macroeconomic parameters:

🌀 **Population size and potential demand (households).** Starting from a population estimate of 12,626,950 in 2019, we project

this forward using the UN population growth forecast of 2.36 per cent each year. We assume household size stays constant at 4.3 people per household, so by 2024 there will be 3.3 million households nationwide, of which over one million (32 per cent) would need to be reached with SAS solutions to meet the energy access targets, and a further 500,000 (16 per cent) by mini-grids.

🌀 **Ability to pay.** We estimate affordability across the population based on the shape of a “proxy” demand curve, which is based

on the PovcalNet database (latest available 2017). As PovcalNet represents consumption expenditure from a fitted household consumption bundle – not disposable income – the shape of this demand curve is then fitted using the latest available GNI per capita data, which is USD820. This proxy demand curve is broadly consistent with triangulation to other assessments of ability to pay, based on similar underlying data, such as the finding that 75 per cent off-grid households spend less than USD1.67 per month on lighting and telephone charging.²⁵

- 🔦 **SAS sales trajectory.** The model takes as its baseline the potential to reach the energy access target of over one million households by 2024. This would require a phased acceleration of the annual sales of SAS systems from around 150,000 per year in 2020 to over 350,000 by 2024.
- 🔦 **Change in uptake of SAS solutions.** The main model result presents the resulting change in sales volumes from a simple price elasticity of demand (PED) approach based on estimates from previous studies.²⁶ The model uses a single elasticity of -0.9, which means that for a 10 per cent increase in price, sales would be expected to fall by 9 per cent. Alongside this simple price response function, the model also has a module to calculate demand response based on affordability across the income distribution, which could also be customised to specific regional settings.

Assumption and sources for impact estimates

We use the following data and assumptions to estimate the impact of accelerated reach of SAS products:

- 🔦 **Corporation tax:** It is assumed that average SAS companies makes a fairly modest pre-tax gross margin of 16 per cent.²⁷ Note that this is an assumption and is intended to represent where the sector could get to in the next five years under the right enabling conditions. Most companies are still on the path to profitability and are yet to achieve positive margins.

Low margins mean that any cost increases as a result of taxes levied would likely be fully passed on to end-users – the supply curve has very limited ability to absorb these costs, with products typically provided close to an at-cost basis. To estimate potential corporation tax contributions, we assume a tax rate of 30 per cent.

- 🔦 **Employment in the SAS value chain.** The tool estimates the number of jobs created in the SAS value chain to deliver the annual sales in each tax scenario. This is (intentionally) not a reflection of specific employment levels and is based primarily on the GOGLA Growth Engine for Jobs study, which itself is based on a comprehensive review of the literature on job creation associated with SAS technologies worldwide.²⁸ This approach produces results in line with recent estimates of employment in the sector. For example, EnDev's 2019 report estimated around 3,106 full-time and 2,866 part-time jobs in the sector in 2018.

To estimate income tax contributions from workers in the SAS value chain, it is assumed that the average managerial position earns around USD15,000 annual income and faces an average tax rate of 20 per cent. Other workers in the SAS value chain are assumed to earn USD5,000 in taxable earnings, with an average tax rate on these earnings of 10 per cent to reflect the much lower share of earnings that will fall within income tax bands.

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 **Benefits to users of SAS products.** Users of SAS products are expected to both take up new jobs and start new businesses, and become more productive and spend longer in their current jobs. The share of SAS users that use their systems to generate additional income is based on the GOGLA Powering Opportunity EastAfrica report, which estimates that 28 per cent of SHS users generate an average additional income of USD46 per month.²⁹ As we expect that much of this extra income will be generated from low-wage jobs, often in the informal sector, we do not include any increase in tax revenues associated with this increase in economic activity. However, this is a conservative assumption as some of these micro-business activities may begin to generate formal, tax-paying jobs, and the additional income earned may also be spent in the marketplace on goods that attract VAT.

We also estimate the reduction in expenditure, based on a 70 per cent reduction in spending on other energy access technologies such as battery powered torches, candles and kerosene.

 **Educational outcomes.** The model assumes that the average end-user of SAS products household has two children of school age and gains an extra two hours of light put to education each evening.

 **Climate mitigation benefits.** We estimate the reduction in CO2 equivalent emissions from a reduction in kerosene use only.

Based on an average monthly usage of two litres of kerosene per household, and 2.5 kilogrammes of CO2 emissions per litre of kerosene consumed, these emissions are valued at a global social cost of carbon of USD50 per tonne.

Fiscal incentives and pricing assumptions

In line with the 2019 Ministerial Guidelines, the tool does not include single lantern and small lighting systems. It assumes a minimum size, quality-verified, SHS comprising at least three 120 lumens lights, phone charging and radio. The default minimum price product to achieve this level of access is USD150 (although this is part of the user-input dashboard so it can be modified).

To estimate the benefits of VAT and import duty exemptions, we consider an alternative scenario where standard VAT and import duties would be applied. This would consist of a 15 per cent rate of VAT and an additional 15 per cent import duty. VAT and import duties (both when on and when exempt) are applied to all eligible systems.

To account for the impact of the forthcoming RBF, we assume all funds are disbursed up to a maximum subsidy of USD100 per system, for up to 340,000 systems. The tool shows the impact of layering both tax exemptions and the RBF in terms of affordability for end-users, and the limitations in terms of reach from the cap on the RBF subsidy and how this may affect the ability to reach the poorest and hardest to reach households.

7. Results from Quantitative Analysis



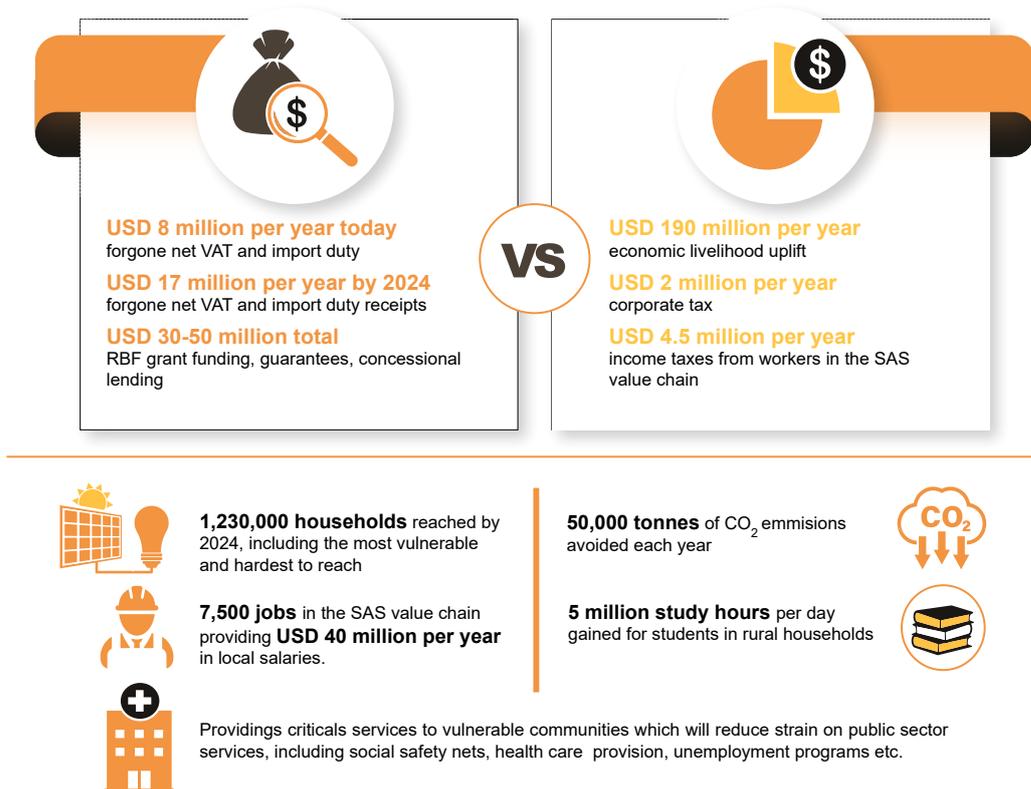
7.1 IMPACT OF FISCAL INCENTIVES ON SAS IN THE NEXT FIVE YEARS

Overview of impacts

In 2020, SAS had reached 500,000 households and is anticipated to reach 1,230,000 by 2024. This increased access to SAS technologies will drive

significant outcomes for the Rwandan economy, communities and households, as set out in Figure 12. However, it will also require continued support from GoR and a coherent set of enabling policies, including fiscal incentives, to unlock this potential.

Figure 12: Overall impacts of fiscal policy and tax exemptions delivered by the SAS sector by 2024



To realise these benefits would need, at least, the continued VAT and import duty exemptions and targeted finance to reach the poorest and most remote communities i.e. Ubudehe 1, 2 and 3. These tax exemptions represent an annual opportunity cost rising to USD17 million dollars per

year by 2024. The additional fiscal incentive in the form of RBF grants and guarantees is anticipated to come to a total budget of around USD30 million to USD50 million, including previous RBF programmes to date.

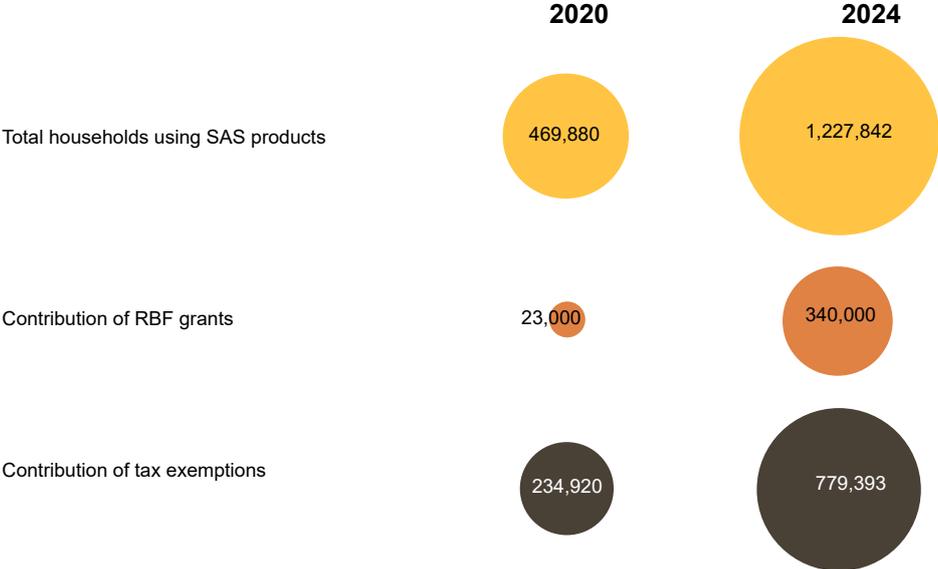
These fiscal incentives will drive growth of the SAS sub-sector, the benefits of which greatly outweigh the fiscal costs. Indeed, while growth of the SAS will represent a net “cost” in the short-term – including foregone tax revenues – a significant portion of this may be offset by increased fiscal space in future. As SAS reaches full maturity, it is expected to contribute around USD6.5 million each year in corporation tax and income taxes. And as the sub-sector grows, its potential to contribute to VAT and import duties also rises, so there is good reason to support growth of the sector through incentives today to maximise fiscal potential in the future.

The major benefits accrue to Rwandan households and communities. As households access SAS technologies, some will put those technologies to income-generating activities, including through improved access to modern communication and technology. This could be worth around USD190 million each year by 2024, although there is significant uncertainty around this central estimate.

Achieving the energy access targets

Reaching the ambitious energy access targets by 2024 will require a rapid increase in annual customers connected to SAS solutions. As noted in Section 2, this comes at a time when companies are also reaching saturation point for the commercially viable customer base, having so far connected those customers best able to afford SAS technologies. While the growth of the PAYG business model undoubtedly helps address the affordability challenge by spreading the cost of payments over time, it is not a panacea for low-income and harder-to-reach households. Indeed, the longer the PAYG payments are spread, the higher the overall cost of accessing technologies will be, and some companies are seeing rising default rates as they expand their networks to serve lower income households.

Figure 13: Achievement of energy access targets by 2024



Source: ACE TAF

Fiscal incentives will therefore play a vital role in delivering on these energy access targets. As shown in Figure 13, to date the main incentive has been tax exemptions, which have been a mainstay in market building. All companies interviewed for this assessment noted the importance of both exemptions and a clear and straightforward

importation process to underpin the success of their business models. Although the sector now has almost a decade’s experience behind it, many companies are still at a relatively early stage of operations and still on the path to profitability. These exemptions remain an important factor in both making products affordable to end-users and

providing companies with an enabling environment that gives confidence to enter and grow in the Rwandan marketplace.

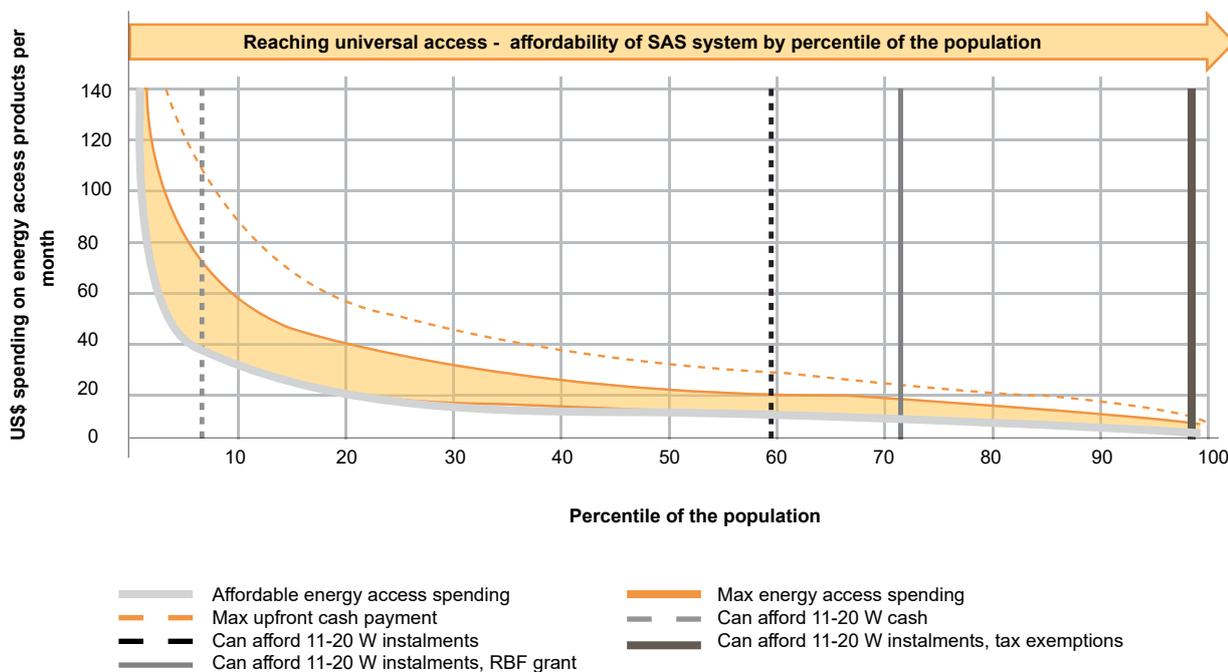
The RBF programmes have had a limited impact so far, but are now well established and will be a major driving force for SAS connections in the next five years or so. The Pro-Poor RBF pilot has demonstrated proof of concept and reached over 20,000 households. The REF will need to meet its ambitious objective of reaching over 300,000 more households with RBF grants to realise the energy access targets. The RBF subsidy alone will not accelerate sales of SAS systems sufficiently above the current 150,000 products sold each year, so it needs to be maintained as an additional incentive layered on top of the historic VAT and import duty exemptions.

Affordability, accessibility and uptake of SAS technologies

The most direct contribution of fiscal incentives is in making SAS systems affordable for the currently underserved (predominantly low-income)

customer base. As shown in Figure 14, looking across the full population of Rwanda, very few households would be able to afford the over-the-counter cost of a quality-verified, entry-level 11-20Wp system that complies with the Ministerial Guidelines. This upfront cost challenge is mitigated by the PAYG business model, which brings these products within the reach of about 60 per cent of households. However, it is worth noting that many of these relatively higher-income households are likely to be served by the main grid – so while they may also be able to afford a SAS connection as a back-up power system, this is unlikely to make a significant dent on the energy access target. Maintaining the tax exemptions would bring an entry level system within the reach of a further 12 per cent of the population – and crucially makes continuing to expand business models to reach some of the remaining unconnected population viable. Finally, the RBF subsidies of up to USD100 per system should bring SAS products within the reach of almost the entire population – as indicated by the darker brown line to the far right of Figure 14.

Figure 14: Mapping to affordability under different scenarios



Source: ACE TAF

Fiscal impacts

At current sales volumes of around 150,000 SAS products a year, VAT and import duties could be worth up to USD8 million per year. Foregoing these revenues represents a strong indication of GoR's commitment to meeting the energy access targets, and to fostering the development of clean, modern, and sustainable energy. As sales volumes rise, this foregone tax revenue could rise to as much as USD17 million per year by the end of 2024, although it would then stabilise and eventually decrease as annual sales volumes decrease.

Continuing to foster a vibrant SAS industry would contribute other forms of taxes to offset these foregone import duty and VAT revenues – offsetting up to USD6 million per year by 2024. As companies mature – as appears to be the case for some companies in Rwanda – and achieve stable financial viability, including positive margins, they would also make increasing contributions to corporation tax. Furthermore, as a relatively labour-intensive supply chain, the SAS sub-sector creates much-needed jobs, including in rural areas, as part of a nationwide distribution network. These jobs are in growth sectors of the future, contributing to green growth and green job creation nationwide (discussed further below). Corporation taxes could reach up to USD1.7 million per year by 2024, while income taxes from workers in the SAS value chain could reach USD4.3 million per year.

Foreign and local investment impact

☀️ In 2018, USD11.58 million was invested in the solar off-grid sector. International credit was a key source of financing for large, multinational companies, with over USD11 million raised to meet working capital and investment needs. Smaller and local companies continue to rely primarily on grants and equity funding to meet their financial needs.

☀️ Only two companies have accessed local

loans so far. They however have high interest rates of between 15 per cent and 18 per cent, and high collateral/guarantee requirements.

☀️ Risk of repaying USD loans when revenues are in RWF.

Jobs of the future in the SAS value chain

The SAS value chain is relatively labour intensive and creates important jobs in the clean energy sector. Employment in Rwanda has already reached over 3,000 full-time employees and could reach 7,500 in the coming few years. These jobs would come in a range of both high- and low-skilled positions, from technicians to install and maintain systems, to customer sales networks and after-sales services. The majority of SAS industry employment is in the formal sector, supporting the transition to a professionalised labour force. Of the upstream jobs created, 27 per cent of the positions are filled by women, which would translate to over 2,000 upstream jobs for women where VAT and duty are exempted for SAS products.³⁰

Household income generation and potential energy savings

The use of SHS has already spurred a range of new employment opportunities, as the sector matures, the potential productivity gains for end-users will continue to evolve. Between 20 per cent and 40 per cent of SAS end-users put their system to income-generating activities, such as establishing micro-enterprises like hair salons, electricity charging services for the community, pay-per-view television and cinema, etc. SAS systems can also support local enterprises like small shops and village markets to operate during the evening.

The estimated economic benefit of these livelihood impacts could reach almost USD200 million per year. This is to some extent an “upper bound” of the possible impact, in that it assumes a possible income uplift of USD46 per month for

30.

those households that use their SAS technology to support income generating activities. This would be a very significant contribution to rural incomes if it was achieved at scale, but may be muted as some of the services described above may decrease in value as all households gain energy access. For example, selling phone charging services to neighbours would be redundant if all households have access to their own SAS product. On the other hand, the “network effect” and contribution of access to clean energy community wide is not included in this estimate – it is also possible that the economic effect of all households having access to energy and the package of services that comes with it (in particular information and communication technologies) could be much higher as part of a contribution to the broader economic infrastructure of the country.

Women are often the main beneficiaries of improved household energy access, no longer dependent solely on sunlight to complete their household chores. Lighting also benefited other household activities, such as sewing by women, social gatherings after dark and so on.

In general, SAS can offer an economically attractive form of energy access, although in Rwanda, where household spending on energy access alternatives is relatively low, this benefit is more muted. Once SAS products are installed, the operating and maintenance costs are relatively limited, providing energy access that is near-free at the point of consumption. However, the upfront costs are high, or may be spread using the PAYG business model over up to 24 months in general. For products meeting the Ministerial Guidelines, this would imply monthly PAYG payments of between USD6 and USD10 per month. For many rural households, this is considerably more than current spending on lighting and mobile phone charging, which for many households is less than

one dollar per month as they rely on freely collected firewood for basic energy access services. Nonetheless, compared to alternatives that could provide a similar level of service for households, SAS solutions represent the most cost-effective solution for many rural Rwandan households.

Light hours for study

Access to lighting remains one of the driving benefits of access to SAS products, albeit one that is not immediately monetisable. Solar lighting allows rural families to extend their workday into the evening hours and extends availability of light for learners of all ages. For the vast majority (78 per cent) of respondents to our household survey, lighting was the main reason why they installed SHS. Assuming lighting delivers an additional two hours of study hours per student, by 2024, some four million study hours each day will be gained through access to SAS, helping create a skilled workforce of the future to take advantage of job opportunities and help drive Rwanda’s ambition to reach upper-middle income status by 2035, and high-income status by 2050.

Reduced carbon emissions and improved local environments

Use of SAS products rather than conventional household energy fuels could both reduce CO2 emissions, and improve local environments. In many countries, a significant benefit of increasing access to SAS technologies is to reduce the burning of fuel in kerosene lamps, or in small petrol/diesel generators. However, in Rwanda, very few households use kerosene or generators, with most reliant on wood fuels for cooking and basic lighting. Nonetheless, up to 50,000 tonnes of CO2 emissions could be mitigated each year as access to SAS expands. More importantly, reducing the use of wood fuels could help preserve local environments and reduce deforestation.

7.2 APPORTIONING IMPACTS BY FISCAL INCENTIVE

VAT and import duty exemptions

The most important incentive consistently highlighted by SAS providers is the availability and consistent implementation of VAT and import duty exemptions. These exemptions have historically contributed to providing attractive conditions for companies to enter the market and scale up their business models. They provide a clear signal of the importance the government places on achieving its energy access targets and the important role of SAS technologies.

While the impact of VAT and import duty exemptions through a price response is relatively well established, the exemptions contribute far more than this “direct” price effect. Various studies have investigated the price sensitivity of households to changes in the price of energy access products, such as those that would result from the imposition of VAT and/or import duties. This effect can be estimated, and indeed forms the underlying basis for the results estimated in the ACE TAF responsible taxation tool.³¹ However, in markets that have not yet reached saturation, that is, they have not achieved the volume of products needed to achieve universal access, tax exemptions also make an indirect contribution to sector development, one that is more important where the market is young and still maturing. This indirect effect is through a contribution to a broader, stable and attractive enabling environment that attracts new entrants and provides the conditions for companies to scale up their activities. This indirect effect is not well studied in the literature – and is much harder to quantify in the absence of structured statistical data. However, the evidence from the last decade of international growth in SAS solutions suggests that this effect is very significant, with almost all countries with well-developed SAS sectors having implemented tax exemptions as part of a policy and regulatory environment conducive to development of the

SAS sub-sector.

Tax exemptions may also help level the playing field compared to other energy access products and represent a limited incentive compatible with sustainable market development. The exemptions help bring SAS products within the financial reach of households, which are more cost-effective for many households than grid connections that also benefit from subsidised connection costs in rural locations. Importantly, the tax exemptions do not represent a long-term crutch for businesses, but enable them to achieve a critical mass of sales volumes and become commercially sustainable. On the same basis, it is possible that once the energy access targets are well on course to being met, tax exemptions could be revisited and reviewed through some form of regulatory impact assessment, but this should only be the case once the market has demonstrated it is well on course to realising its potential.

The 2019 Ministerial Guidelines

The guidelines represent both an opportunity and a challenge to sector growth. As described in Section 2, around 40 per cent of SAS sales prior to 2018 were of systems smaller than 3Wp, while 50 per cent of sales were in the 3–10Wp range, most of which would not meet the minimum standards in the guidelines. On the other hand, if households can effectively leapfrog basic energy access products and access multi-light, radio and other appliances as their first product, this would increase the potential for productivity gains and a virtuous circle of boosting rural livelihoods that in turn would boost affordability and market sustainability.

RBF grants

The previous windows of the REF have had relatively limited immediate impact on the SAS industry.³²

31. See Annex 3.

32.

- ☀ Window 1 – Saving and credit cooperatives (SACCO) lending to households and microenterprises. While four SAS providers and 47 SACCOs qualified to participate, successful lending has been relatively limited with only a few hundred systems sold. Some of the barriers include limited ability of SACCO members to make monthly repayments, high collateral requirements, limited willingness to take up solar products and limited awareness of required maintenance. There was also an increase in transaction costs by adding another layer in the value chain, with SAS providers and SACCOs also now having to establish contracts.
 - ☀ Window 2 – Commercial bank loans to SAS providers. Two banks registered through the BRD vetting process, but no funds had yet been disbursed to those banks. Many SAS operators have ongoing loans at low(er) interest rates from international credit lines, so availability of local currency loans may not represent an immediately more attractive option.
 - ☀ Window 3 – Direct lending to mini-grid developers. This window provides direct financing to eligible mini-grid developers to finance up to 70 per cent of construction of renewable-energy based mini-grid systems. The REF may provide bridge loan financing until grant funding from existing RBF programmes becomes available, as well as long-term financing beyond commissioning. REF loans are used to bring a mini-grid project to commissioning when RBF becomes available from other donor-funded programmes. 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 Scaling up Renewable Energy Programme (SREP).³³
 - ☀ Window 4 – Direct lending to locally registered SAS providers. This window provides direct financing to qualifying locally registered OSCs supporting Tier 1 or higher solar systems or locally registered OSCs serving poor households under the government’s programmes.
 - ☀ Window 5 – Results-based financing facility (RBF facility) to OSCs. This window will provide results-based partial grants (RBF grants) to eligible OSCs to facilitate the sale of Tier 1 and above SHS and the provision of after-sale services to qualifying households. The partial grant will be provided to OSCs to lower the cost of the system for end-users.
- RBF grants represent the most direct way to address the affordability challenge in rural areas. Since they only apply to households meeting strict eligibility criteria (i.e. based on Ubudehe category and potentially on region), if these criteria can be well enforced there will be no “leakage” of the incentive towards products that more affluent households may have been able to afford in the absence of the grant. RBF grants can therefore represent a far more cost-effective way of reaching the poorest and most remote households, on a per-connection basis.
- However, the RBF grants need to be recalibrated over time as they do not contribute as easily to sustainable commercial operations. In general, the RBF grants seek to roll out access to poorer households and harder to reach regions. They should not form the backbone of sales for operators, given the less commercial nature of these markets. In this way, they should only be contributing to additional sales by addressing the “direct” price sensitivity challenge. They are not as appropriate a measure as tax exemptions in supporting development of sustainable commercial operations nationwide, which should also encourage companies to identify and serve the higher-income customer segments that can support achievement of scale and profitability.

33. *Mini-grid operations manual (Window 3).*

8. Recommendations and Next Steps



8.1 RECOMMENDATIONS

1. Maintain VAT and import duty exemptions until the energy access targets have been met. Once the market is well established, has a healthy number of providers achieving positive margins and demonstrated repeat sales to customers, there may be conditions under which tax exemptions could be phased out over a defined period.
2. Continue to use targeted RBF to make sure the poorest and hardest to reach households can afford an entry level SAS product.
3. Closely monitor the impact of the minimum standards set out in the 2019 Ministerial Guidelines and course-correct if need be. This includes making sure fiscal incentives bridge the gap between the ambition to reach Rwandan households with high-quality, high-capacity systems to make sure no one is left behind and unable to afford a system that meets the guidelines.
4. Support capacity development with local banks to bring down the cost of debt, with a view to opening a market for local currency lending. GoR should explore extending financial support and technical assistance to local banks to enable lenders to better manage their internal risk controls while providing usable financial products for OGS.
5. Continue to improve public and private sector dialogue. Key public sector agencies should continue to interface with EPD and other private sector interest groups to ensure appropriate implementation of incentives. At the same time, capacity of key public agencies should be maintained and improved to keep pace with the evolving policy and regulatory frameworks. For example, RICA processes for standards and labelling requirements should be streamlined as they can be technically challenging until companies get used to working with them, which can result in confusion over which standards to apply.

8.2 PRIORITY NEXT STEPS IN IMPLEMENTING RECOMMENDATIONS

1. Coordinate with Treasury regarding tax recommendations and fiscal planning to continue VAT and import exemptions.
2. Develop roadmap for RICA coordination and implementation of import policies.
3. Carry out scheduled reviews of current RBF REF funding windows.
4. Work with donors to support technical assistance programmes for local lending to OGS sector.

Annex 1: Stakeholder Engagement



Organisation	Dates	Discussion topics
EPD	March 5, 2021	<p>A registered professional association in Rwanda grouping private companies operating in the energy sector. It also plays a key role in advocating for energy developers, including those in the off-grid space (both SAS and mini-grids).</p> <p>The study was introduced to the Director of Operations, Mr Robert Mugabe.</p> <p>EPD gave an overview of several consultations with government departments, including the MININFRA and RRA, discussing challenges the developers were facing.</p>
REG/EDCL	April 2, 2021	<p>The objective of EDCL is to increase investment in development of new energy generation projects in a timely and cost-effective manner to expand supply and achieve national targets. EDCL is also playing a crucial role in supporting the off-grid sub-sector through engagement of private sector, especially in the SHS space targeting to attain 48% of the energy mix through the use of off-grid solutions.</p>
RRA	April 15, 2021	<p>A government revenue collection agency in charge of enforcing, assessing, collecting and accounting for the various taxes imposed in Rwanda.</p> <p>The discussion topics were:</p> <ul style="list-style-type: none"> • Actual situation on taxes in terms of revenue • Types of taxes • Exemption policy on solar equipment
GIZ (EnDev)	March 23, 2021	<p>Provides technical assistance for the improvement of regulatory and policy structures for off-grid sector such as revising mini-grid regulation plan.</p>
Private developers <ul style="list-style-type: none"> • Mobisol • BBOXX • Ignite power Ltd • Loyal Trust • Zola 	<ul style="list-style-type: none"> March 31, 2021 March 31, 2021 April 1, 2021 April 8, 2021 April 14, 2021 	<p>The main topics were:</p> <ul style="list-style-type: none"> • The awareness and engagements in existing fiscal incentives • Challenges they are facing • Recommendations

Annex 2: List of SAS Companies with MoU signed with EDLC



• BBOXX
• DASSY ENTERPRISES
• Elerai Global Services Ltd
• Energy Resources Power Ltd
• ERF
• GEKO Ltd
• GLAS Ltd
• Global Evolution Energy
• Great Lakes Energy Ltd
• Ignite power Ltd
• Innotech Consulting Ltd
• Intertech Ltd
• Mobisol Rwanda Ltd
• Munyax ECO
• NESELTEC
• NOTS SOLAR LAMP Ltd & Barefoot
• Power (Rwanda) Ltd
• Nuru East Africa Ltd
• O1 grid Electric
• Serve and Smile Ltd
• Solarkiosk
• Loyal Trust Company Ltd

Annex 3: Rwanda Development Partners in the SAS Sector



Development partner: Programme	Type of assistance	Comments
African Development Bank: Scaling Up Electricity Access Program Phase II (SEAP II)	Loan	2018/19–2020/21 targeting 124,800 off-grid connections.
European Union	Technical assistance	Capacity building support for MININFRA. Feasibility study for the upgrade of the Bugesera e-waste plant.
Foreign, Commonwealth and Development Office: Africa Clean Energy Technical Assistance Facility	Technical assistance	Catalysing SAS markets with support to build the enabling environment. It will also provide support in further clarifying the tax regime for the off-grid sector, including SAS.
Swedish International Development Cooperation Agency	Loan guarantee	USD20 million guarantee available to all REF financial intermediaries.
United States Agency for International Development/Power Africa, implemented by Women in Rwandan Energy: East Africa Energy Program	Technical assistance Grant	Promoting women's and girls' participation and social inclusion across the energy sector in Rwanda.
United States Agency for International Development/Power Africa: Power Africa Off-grid Program	Grant Loan guarantee	<ul style="list-style-type: none"> • SHS RBF subsidy (Pro Poor RBF). • OMIS and Eligibility Tool software for REF Window 5. • Support to private sector, PUE and electricity access for refugees. • Supporting implementation of off-grid policy, programmes and regulations. • Development Credit Authority (DCA) partial loan portfolio guarantee for risk mitigation and to catalyse up to USD5 million in loans by Banque Populaire du Rwanda to the off-grid sector.
United States Agency for International Development/Power Africa via US African Development Foundation	Grant	Has funded five off-grid energy projects in Rwanda through the Off-Grid Energy Challenge Initiative, three of which are ongoing.
World Bank: Renewable Energy Fund and Energy Access and Quality Improvement Project	Loan Grant	USD48.94 million REF managed by BRD (June 2017–September 2023). EAQUIP USD15 million for REF Window 5 (September 2020–December 2026).

Africa Clean Energy Technical Assistance Facility (ACE TAF)

Tetra Tech International Development leads the implementation of the Africa Clean Energy Technical Assistance Facility together with several key partners. Tetra Tech International Development is responsible for the programme set-up, leadership and overall management taking an inclusive and collaborative approach ensuring that we engage partners throughout the implementation of the programme.

Impact Assessment of Fiscal Incentives on Rwanda Off- Grid Sector

June 2021



Africa Clean Energy



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