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# Off-Grid Energy Access (OGEA)

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A Learning Guide from the USAID Southern Africa Energy Program

May 2022

# Off-Grid Energy Access

A Learning Guide from the Southern Africa Energy Program

## Disclaimer

This report is made possible by the support of the American People through the United States Agency for International Development (USAID). The contents of this report are the sole responsibility of Deloitte Consulting LLP and do not necessarily reflect the views of USAID or the United States Government. This report was prepared under Contract Number AID-674-C-17-00002.

# About the Program



## What is Power Africa?

Power Africa is a U.S. Government-led partnership that harnesses the collective resources of over 170 public and private sector partners to double access to electricity in sub-Saharan Africa.

Power Africa's goal is to add at least 30,000 megawatts (MW) of new electricity generation capacity and 60 million connections by 2030.

## What is the USAID Southern Africa Energy Program?

The USAID Southern Africa Energy Program (SAEP) is a technical support and capacity building program designed to meet Power Africa goals in the southern Africa region. SAEP leverages its resources to unlock private investment in the energy sector, helping countries to achieve their energy-related development goals.

## What is a Learning Guide?

A learning guide is one of many types of knowledge products SAEP produces. It is a comprehensive document that synthesizes SAEP's project experiences with other global examples and leading practices. Guides share practical insights, case studies, and topic-specific supporting documents/templates in an easy-to-digest format for energy stakeholders across the region and beyond.

## What other knowledge products are available?

In addition to learning guides, SAEP and other USAID and Power Africa programs develop various knowledge products, including manuals, toolkits, white papers, and handbooks. A full list of publicly available products is available at [www.dec.usaid.gov](http://www.dec.usaid.gov).

**More Learning Guides:** Search for Southern Africa Energy Program on [www.dec.usaid.gov](http://www.dec.usaid.gov)

**Contact:** Liz Pfeiffer, SAEP Chief of Party at [lpfeiffer@southernafricaenergy.org](mailto:lpfeiffer@southernafricaenergy.org) or [contact@southernafricaenergy.org](mailto:contact@southernafricaenergy.org)

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### **Did You Know?**

Two out of three people in Sub-Saharan Africa lack access to electricity

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Photo credit: ANKA Madagascar

## OGEA Learning Guide Objectives:

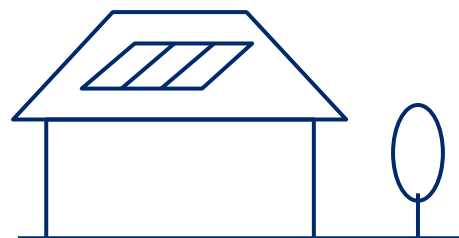
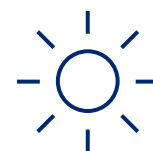
1. Convey lessons learned for the Southern African Development Community (SADC) and future implementers in alternate markets
2. Provide implementers of future off-grid programming with useful resources and case studies

### Audience:

Readers devoted to **off-grid energy work** both in and out of USAID.

**Internal audiences** include but are not limited to the Western Africa Energy Program, Nigeria Power Sector Program, and Power Africa Off-Grid Project.

This guide will also benefit **external audiences** versed in off-grid work seeking to learn from SAEP's experience, build on efforts, or replicate in alternate markets. This includes but is not limited to SADC.



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## Acronyms

Acronym	Definition
DFI	Development Finance Institutions
OGEA	Off-Grid Energy Access
OGTF	Off-Grid Task Force
PV	Photovoltaic
RTM	Route-to-Market
SADC	Southern African Development Community
SAEP	Southern Africa Energy Program
SHS	Solar Home System
SIAZ	Solar Industry Association of Zambia
USAID	United States Agency for International Development

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## **Section 1**

### **OGEA Sub-Saharan Africa Context**

Overview

Definitions (Solar Lanterns, SHS, Mini-Grids)

Choosing Solution(s)

Choosing Target Region(s)

Key Stakeholders

Four Overarching Challenges

## **Section 2**

### **Targeted Interventions to Address Overarching Challenges**

Challenge 1: Minimal access to info and data

Challenge 2: Undeveloped enabling environment

Challenge 3: Inadequate local managerial expertise

Challenge 4: Limited access to financing

## **Section 3**

### **SAEP Resources**

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## Section I.

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# OGEA Sub-Saharan Africa Context



Photo credit: USAID SAEP

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## OGEA Overview

### What is Off-Grid Energy Access?

More than 1.2 billion people in the world, largely in developing Asia and sub-Saharan Africa, do not have access to electricity. The majority of this population lives in rural areas, out of reach of central electricity grids.

### Why is OGEA important to sub-Saharan Africa?

Renewable energy-based off-grid and mini-grid solutions offer a significant opportunity to increase access to reliable electricity services. Two out of three people in sub-Saharan Africa live without access to electricity.



# 27

Off-Grid Companies supported by SAEP

See Section 3 [page 18](#) for full list

## What is Power Africa's OGEA initiative, "[Beyond The Grid](#)"?

**GOAL: 25-30 million** off-grid connections by 2030

- **Launched:** June 2014 at U.S.-Africa Energy Ministerial in Ethiopia
- **Partners:** Over 60 investors and practitioners committed to invest over \$1 billion
- **Focus:** To unlock investment and growth for off-grid energy solutions in sub-Saharan Africa



Photo credit: USAID SAEP



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## Solar Lanterns



**Solar Lantern Definition** - A portable lamp or light powered through a photovoltaic (PV) panel – sometimes called ‘pico-PV’.

**More Info** - *According to 60 Decibels, solar lanterns currently provide the most impact in terms of bang-for-your-buck. Somewhat surprisingly, the impact of smaller off-grid electrification technology is often greater than that of higher-capacity systems (like solar panels or mini-grids). This is not because the quantity or quality of light they provide is better – indeed it is typically more basic – but that these small but mighty products are the first step up the modern energy staircase. When customers take this first-step it results in the greatest marginal impact and improvement of quality of life. However, there are significant limitations on how solar lanterns can be used and what economic activity it can generate.*

**Source:** [60 Decibels Impact Performance Report on Energy](#) Image: [SunnyMoney](#)

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## Solar Home Systems



Photo credit: USAID SAEP

**Solar Home System (SHS) Definition** - A stand-alone system typically with multiple lights and capacity for additional services, consisting of larger panels than solar lanterns.

**More Info** - SHS range from small Tier 1 products (10 W systems) that only power lights and a phone charger to Tier 4 and 5 products (1-2 kW systems) that power many lights, TVs, and large appliances. SHS are flexible, modular, and fully decentralized (typically used per household, vs. a community-based mini-grid).

**Source:** [60 Decibels Impact Performance Report on Energy](#)

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## Mini-Grids



**Mini-Grid Definition** – A mini-grid, micro-grid, or isolated grid is a set of electricity generators and sometimes energy storage systems interconnected to a distribution network that supplies electricity to an independent, localized group of customers.

**More Info** – *Mini-grids are small-scale electricity grid that range from 10 kW to 10 MW to serve a limited number of consumers via a distribution grid that can operate in isolation from national electricity transmission networks. Mini-grids serve the highest proportion of low-income families compared to other off-grid technology. The mini-grid business model requires a high density of connections to cover the fixed costs of setting up a localized grid. Because of this, we think mini-grids will need to play an important role in the off-grid energy sector if we are to succeed in achieving Sustainable Development Goal 7: clean, safe, and affordable energy access for all.*

**Source:** [Energypedia.info](https://energypedia.info), EU Energy Initiative mini-grid [policy toolkit](#)

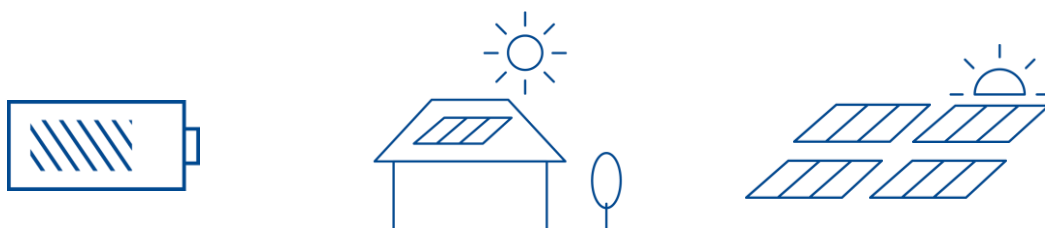
## Choosing Off-Grid Electrification Solution(s)

SAEP structured its support based on an **initial strategic assessment and refinements from a geospatial Route-to-Market (RTM) tool** (see [page 17](#)) to understand existing regulations, enabling environments, population distributions, and other factors for each region.

This assessment primarily shed light on:

1. the **most effective electrification solutions** to illuminate the most underserved customers (i.e., solar lanterns/home systems, mini/micro-grids, and grid expansion) and
2. the **interest and presence of private sector companies** operating in/expanding into the regional market, capable of scaling

SAEP understands various electrification solutions require local support to scale those solutions to additional underserved communities. For example, in Mozambique, the regulatory/enabling environment for mini-grids did not exist at implementation time, so our support was redirected to on-grid solutions that could better be achieved by local companies (e.g., grid expansion through Mozambique utility, EDM, and support to SHS distributors).



**This is a constantly changing environment as market and solution capabilities evolve.**

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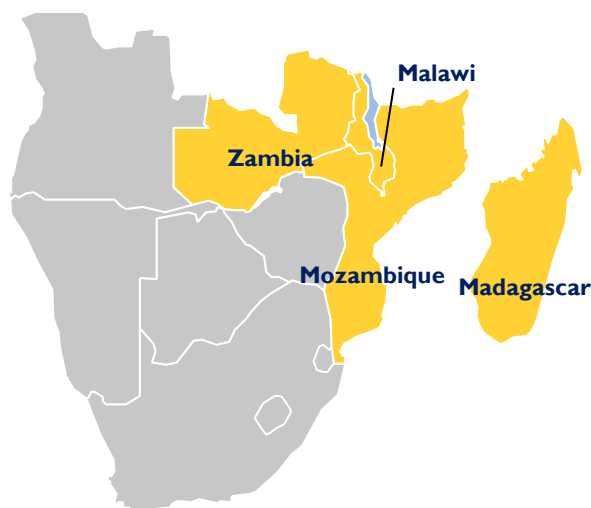
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## Choosing Off-Grid Target Region(s)

### Selection process

SAEP targeted Madagascar, Malawi, Mozambique, and Zambia for off-grid sector support based on a 2019 market assessment, analyzing market characteristics and regulatory landscape (i.e., low energy access rates, high populations, and nascent positive regulation).

Markets in these four countries were most likely to benefit from technical assistance for accelerating off-grid solution deployment.



### Selecting SHS for these regions

Low barriers to market entry, low affordability levels in communities, and light government regulation made SHS the most attractive solution for SAEP's technical assistance.

### Narrowing to sub-regions

SAEP conducted additional studies with their geospatial RTM tools to narrow down which sub-regions would yield the highest electrification rates.

### In general...



**Main grid connections** are least-cost when settlements are close to the grid or have high population density



**SHS** are least-cost for settlements with low demand (<10 kW) or in sparsely populated areas



**Mini-grids** are optimal in settlements further from the grid with denser populations

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## OGEA Key Stakeholders

### Private Sector

*Includes companies that develop and deploy energy access solutions and associations that promote interests of private companies*

- Mini-grid developers
- SHS companies
- Industry associations

### Public Sector

*Includes policy makers, regulators, and other enabling government institutions*

- Policy makers
- Regulators

### Cooperating Partners

*Includes multilateral development banks, bilateral donors, and development finance institutions (DFIs)*

- Multi-lateral development banks
- Bilateral donor organizations
- Development finance institutions
- Non-governmental organizations

### Mini/Micro-Grid Developers

Role: Work with communities in peri-urban and rural areas to develop/deploy decentralized energy infrastructure

Regional examples: Standard Microgrid, ENGIE Power Corner

### SHS Companies

Role: Manufacture, import, distribute, and/or finance standalone solar systems, typically on pay-as-you-go (PAYGO) basis for 18–36 months

Regional examples: SolarWorks!, VITALITE, Yellow, Zuwa Energy

### Industry Associations

Role: Promote interests of private companies and enable industry coordination

Regional examples: Solar Industry Association of Zambia (SIAZ), Renewable Energy Industry Association of Malawi, Africa Mini-Grid Developers Association

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- Non-governmental organizations

### Policy Makers

Role: Develop policies and regulations that are used in the development of energy infrastructure

Regional examples: Ministries of Energy e.g., Mozambique Ministry of Mineral Resources and Energy

### Regulators

Role: Implement and monitor regulations/policies developed by the policy maker; responsible for industry oversight

Regional examples: Autoridade Reguladora de Energia (Mozambique), Energy Regulatory Board (Zambia), Malawi Energy Regulatory Authority (Malawi), Botswana Energy Regulatory Authority (Botswana)

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#### Multilateral Development Banks

Role: Develop, finance, and implement programs that support development; typically financed through concessionary loans to sovereign nations

Regional examples: World Bank, African Development Bank

#### Bilateral Donors

Role: Develop, finance, and implement programs that support development; typically financed through country grants and focused on provision of technical assistance

Regional examples: USAID (US), German Development Corporation GIZ (Germany), United States African Development Foundation, Department for International Development (UK), Swedish International Development Agency (Sweden), Rockefeller Foundation

#### Development Finance Institutions (DFIs)

Role: Provide financing for development programs/projects, typically private sponsors

Regional examples: U.S. Development Finance Corporation

#### Non-Government Organizations

Role: Provide technical assistance to private sector companies to scale their businesses and serve more customers in need

Regional examples: Energy4Impact, Practical Action



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## Section 2.

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# Targeted Interventions to Address Overarching Challenges



Photo credit: USAID SAEP

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4

## Four Overarching OGEA Challenges

	Description of Challenges	SAEP's Targeted Interventions
<b>1</b> <b>Minimal access to info and data</b>	Governments lack geospatial tools for off-grid access planning	<ul style="list-style-type: none"><li>• Development of free geospatial modeling tools (e.g. RTM tool)</li><li>• Least-cost electrification toolkit in Zambia</li></ul>
<b>2</b> <b>Undeveloped enabling environment</b>	Lack of incentives, restrictions on investors and capital controls, and policy restrictions	<ul style="list-style-type: none"><li>• Programmatic support for standing up renewable energy associations and government task forces</li><li>• Operationalization of SIAZ off-grid support in Zambia</li><li>• Support for fiscal exemptions tax relief for import products</li><li>• Training for Zambian tax revenue officials</li></ul>
<b>3</b> <b>Inadequate local managerial expertise</b>	Small SHS companies often face operational and capacity barriers in fully managing and scaling an effective sales force	Private sector support including: <ul style="list-style-type: none"><li>• Sales force effectiveness training</li><li>• Agent recruitment and retention strategy</li><li>• Project management training</li></ul>
<b>4</b> <b>Limited access to financing</b>	Difficulty raising adequate financing to scale operations	Grant funding programs, specifically: <ul style="list-style-type: none"><li>• \$2M SHS Kick-Starter Program for Malawi, partnership between USAID and the Government of Malawi</li><li>• \$1.5M mini-grid grant funding in Madagascar</li></ul>



## Targeted Interventions for CI: Minimal Access to Information and Data

Countries often lack the necessary geospatial data and key potential consumer information to enable effective energy access planning

### Common Interventions/Support Measures:

The most common intervention is to provide governments with the tools to assess the least-cost electrification solutions. Sample interventions include:

- Use of geospatial data to develop electrification planning mechanisms – e.g., least cost electrification tools
- Assessment of ability and willingness to pay (affordability) of communities targeted by energy access providers and utilities



### SAEP Solutions:

**Least-Cost Electrification Tool:** SAEP worked with the Government of Zambia to develop an analysis of the least-cost electrification method for currently unelectrified communities in Zambia using geospatial analysis and techniques that enabled better data-driven electrification planning

**Consumer Affordability Surveys:** SAEP developed tools to provide SHS companies and other sector stakeholders (e.g., donors planning subsidy programs) with detailed information on the ability and willingness of unelectrified communities to pay for basic electrification (segmented by geographic area); surveys also assessed familiarity with and perceptions of small-scale solar products and access to a mobile phone and mobile money network to facilitate PAYGO models

**RTM Tool:** SAEP developed a publicly available RTM tool that uses geospatial data and techniques to map data such as population, electrification, telecoms, roads and infrastructure to provide SHS companies with the ability to prioritize geographic markets with the highest potential for expansion or deeper market penetration

**Econometric Study:** SAEP produced an econometric study to quantify the impact of fiscal incentives on electricity access, government revenues, and end-consumer benefits in Mozambique



## Targeted Interventions for C2. Undeveloped Enabling Environment

Countries typically lack a combination of necessary incentives to encourage private sector investment, including foreign direct investment (e.g., restrictions on investors/capital controls, policy limitations)

### Common Interventions/Support Measures:

The most common intervention is to provide governments with leading examples of enabling environment reforms that have been successfully implemented in other countries. Sample interventions include:

- Guidelines on the establishment of an industry association that can represent the collective voice of private companies
- Guidelines on the establishment of intra-governmental working groups (also called ‘task forces’)
- Guidelines on development of policies that promote effective deployment of off-grid solutions

2

### SAEP Solutions:

**Establishment of the Solar Industry Association of Zambia (SIAZ):** SAEP supported the standing up of SIAZ in 2018 as a convening platform for private sector solar companies and continues to provide governance and monitoring support to the organization; SIAZ has been instrumental in effectively lobbying for essential policy reform

**Establishment of Off-Grid Task Force (OGTF):** SAEP also supported the development of the OGTF in Zambia to enable coordination and oversight of various market initiatives through a joint forum with government, cooperating partners, and private sector companies; OGTF has been a key forum through which key policy reforms have been identified and implemented for the off-grid sector



## Targeted Interventions for **C3. Inadequate Local Managerial Expertise**

New and less-knowledgeable energy access companies often face significant operational and capacity challenges in scaling their business models and effectively building out their sales force networks. Governments also have limited capacity to effectively monitor, oversee, and enable private sector players to increase energy access.

### Common Interventions/Support Measures:

Every country faces different constraints, but most can benefit from one or more of the following interventions, either for private sector, or for Government:

- Workshops and/or training programs on project and program management
- Tailored strategies for enhancing staff recruitment and retention
- Tailored private sector trainings on best practices for sales managers and agents



### SAEP Solutions:

**Sales Force Effectiveness Training:** SAEP facilitated virtual and local-led trainings in geospatial analytics, client needs identification, sales execution, results tracking, location prioritization, gender mainstreaming, weekly schedules, and huddle boards

**Project Management Training:** Developed and distributed work planning framework/techniques, time management, stakeholder management, work planning, and prioritization tips

**Gender Mainstreaming Workshops:** SAEP highlighted cultural and business benefits of gender equality and social inclusion at SHS companies in Malawi and Zambia

**Development of Agent Recruitment and Retention Strategies:** SAEP collaborated with private sector companies to enhance ability to target, recruit and then retain high quality sales teams

## Targeted Interventions for C4. Limited Access to Financing

Energy access companies face difficulties obtaining adequate financing, which impacts their ability to efficiently scale their businesses

### Common Interventions/Support Measures:

Most smaller energy access companies face significant barriers to obtaining financing, in particular local currency financing, due to lack of an adequate credit record, weaker balance sheets, and high local currency interest rates. Additionally, an underdeveloped payments landscape, and currency mismatch (i.e. revenues in local currency, balance sheet funding in hard currency) –leads to high collateral requirements and high costs for financing. Typical interventions include:

- Grant funding support to reduce risk profile and enable companies to raise additional private sector capital
- Introductions to potential capital providers and support through the capital raise process

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### SAEP Solutions:

**SHS Kick-Starter Program for Malawi:** SAEP committed approx. \$2.0M to support the scaling up of four Malawi SHS companies through a results-based financing grant program that awards companies milestone payments on the basis of new system sales (Watch this [video](#) to learn more)

**Working capital loans:** Through the SHS Kick-Starter Program, SAEP helps grantees and other companies access local currency working capital loans from commercial banks

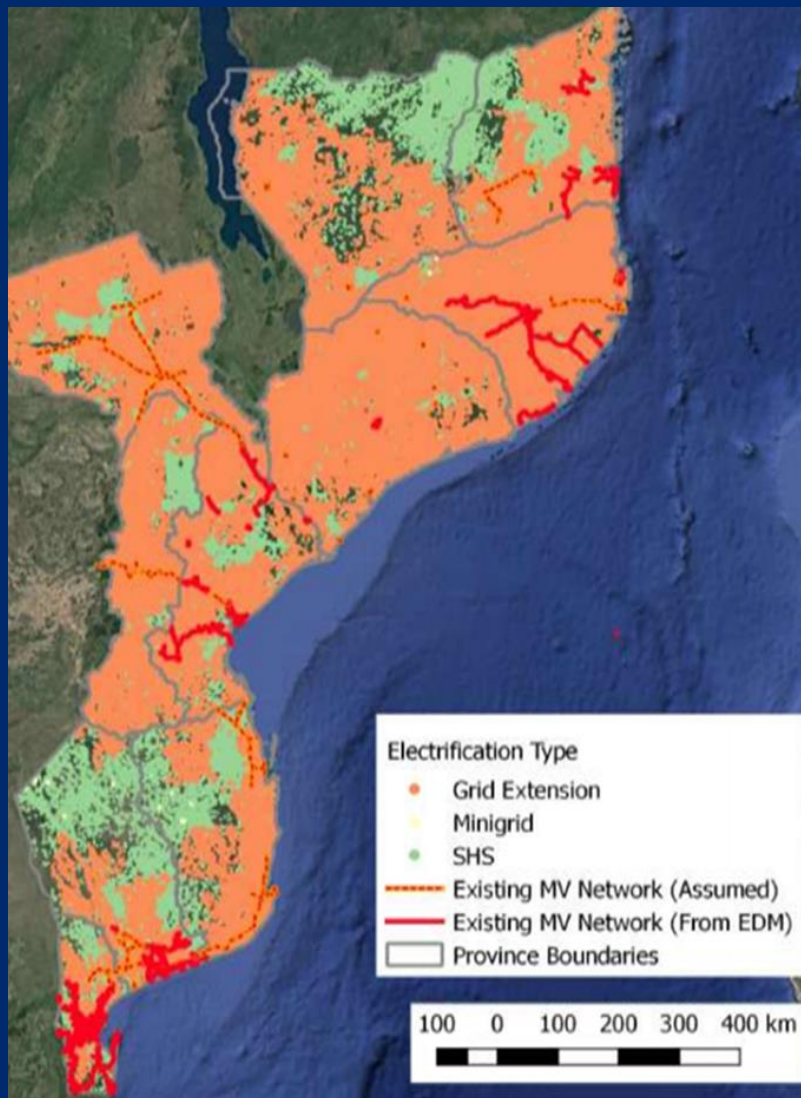
**Madagascar Mini-Grid Development Grant:** SAEP has committed \$1.5M to fund mini-grid developers who have obtained concessions to build or expand mini-grids in Madagascar (Watch this [video](#) to learn more)

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## Section 3.

# SAEP Resources



SAEP's RTM tool

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## SAEP Resources

The following resources are available for future reference:

Resource Name	Links	Purpose/Audience:
RTM tools (general access by country)	<a href="#">Zambia Tool</a> (April 2018) <a href="#">Malawi Tool</a> (June 2020) <a href="#">Mozambique Tool</a> (June 2021)	A tool for energy access companies seeking to expand into new regions and markets – used to facilitate business decision making related to scale-up
SAEP Off-Grid Company Training Package	<a href="#">Off-Grid Company Training Package</a> (November 2021)	A package of training documents and editable templates for training SHS company agents and sales managers
Can Mozambican Households Afford SHS? Insights from a Local Survey	<a href="#">Mozambique Consumer Affordability Survey</a> (April 2020)	Results from a SHS affordability-and-willingness-to-pay survey to inform the plans and strategies of the Government Mozambique, SHS companies, and cooperating partners
Path to Impact in Mozambique	<a href="#">Driving Impact through Connections</a> (August 2019)	An analysis of the most promising opportunities for SAEP to support improved access, in line with our targets, based on the local business environment, reg/policy landscape, and focus of other donor programs
Malawi Market Entry Information Packet	<a href="#">Malawi Market Entry Info Pack</a> (October 2018)	Provides information on entry expansion in the SHS market in Malawi
SAEP Annual Reports	<a href="#">Year 1</a> (October 2018) <a href="#">Year 2</a> (October 2019) <a href="#">Year 3</a> (October 2020) <a href="#">Year 4</a> (October 2021)	An overview of success stories by country, including support to the off-grid sector



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## Off-Grid Companies Supported by SAEP

The following 24 companies were supported in various capacities. For more information, see SAEP's Annual Reports under Resources on [page 17](#).

Name of Company	SHS/Mini-Grid	Country
Autarsys Madagascar SARL	Hybrid (mini-grids)	Madagascar
Baobab+	SHS	Madagascar
ENGIE Energy Access	SHS	Zambia/Mozambique
ENGIE Power Corner	Mini-grids	Zambia
Green Impact Technologies	SHS	Malawi
Greenlight Planet	SHS	Malawi/Zambia
Henri Fraise Fils & Cie	Mini-grids	Madagascar
Hydro Ingénierie Etudes Et Réalisations	Mini-grids	Madagascar
Kazang Solar (Azuri Technologies)	SHS	Zambia
RDG Collective	SHS	Zambia
Renew'N'Able Malawi	SHS	Malawi
SolarAid (SunnyMoney)	SHS	Zambia
SolarWorks!	SHS	Malawi/Mozambique
Standard Microgrid	Mini-grids	Zambia
SunnyMoney	SHS	Malawi
SupaMoto Energy (Emerging Cooking Solutions)	SHS	Zambia
Team Planet	SHS	Malawi
Thunderbolt (Radian)	SHS	Zambia
Total Land Care Enterprises	SHS	Malawi
VITALITE	SHS	Malawi/Zambia
WidEnergy	SHS	Zambia
Yellow Solar	SHS	Malawi
Zuwa Energy	SHS	Malawi

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**Thank you from SAEP!**

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