

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHTS

ENABLING TECHNOLOGIES CALL
OCTOBER 2020
EFFICIENCY FOR ACCESS COALITION



RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

ADILI SOLAR HUBS

SOLAR POWERED ICE FLAKE MACHINE

This project will develop an integrated system comprising a solar-powered ice machine with a water purification unit.

In fishing communities across Kenya, men are mainly responsible for fishing, whereas women typically undertake post-harvest processing of the fish. This involves drying, smoking or deep-frying the fish. In doing so, the market value of fish decreases and this renders the fish unexportable to overseas markets. Furthermore, large industries based in urban centres manage the cold chain away from the fishing communities.

By producing ice with clean water at the shore, Adili Solar Hubs aims to bring cold chain management services to local areas, so that those fishing can do so for an extended time. This will keep the harvested fish fresh for longer, increasing the economic value of the fish.

The project will achieve this by developing an integrated system. This will include a water purification unit, an ice flake machine, an off-grid PV system and a smart controller. The smart controller will enable the machine to be mostly powered by direct solar energy, thereby reducing the need for large energy storage. The excess solar energy will power the purification process of the remaining water in the tank. An online remote monitoring feature will also alert the user and identify any issues.

The project will benefit fishing communities in Kenya by reducing post-harvest fish loss. It will also help to grow the fish market and give women and youth involved in the fish trade around Lake Turkana employment opportunities. A further benefit is that it will help increase food security.



AT A GLANCE

R&D Awardee
Adili Solar Hubs

**Efficiency for Access
Funding**
£53,323

**R&D Funding Unlocked
from Adili Solar Hubs
Limited**
£44,628

Project Location
Kenya

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

ANGAZA

AN OPEN-SOURCE SOFTWARE TO ALLOW COMMUNICATION BETWEEN OFF-GRID APPLIANCES

This project will develop software that will allow off-grid appliances to communicate with power generation systems and cloud services securely. Angaza will release this as an open-source product, will be available for new off-grid appliances in development.

Given the increasing diversity of off-grid software and hardware in the off-grid industry, it is challenging to ensure that products and services are compatible. Angaza aims to address this problem by developing secure, inter-device communication software to function in an off-grid setting. This has the potential to transform the industry by providing a common 'language' for off-grid products and services to communicate with. The software will enable consumers to connect off-grid appliances made by different manufacturers and access cloud services of their choice.

Pay-As-You-Go (PAYGo) financing is a crucial tool in enhancing energy access in off-grid areas. As consumers use more appliances, however, it will be challenging for them to manage the energy requirements and running cost of each product. Angaza will address this by introducing software that will help manage multiple devices. The software will collect performance data to detect and troubleshoot device problems remotely. It will be compatible with smartphones, which will reduce costs further for consumers. By implementing this software, appliances will last longer and be cheaper to run. This will mean that consumers can access more appliances.

Last-mile distributors will be able to detect problems and troubleshoot devices remotely by collecting performance data from the consumer's appliance. This will result in more efficient and cost-effective management of multiple PAYGo appliances for customers. The open nature of the protocol will encourage device manufacturers to build innovative functionality into their products in a standards-compliant way. This will benefit the entire industry.



AT A GLANCE

R&D Awardee
Angaza

**Efficiency for Access
Funding**
£237,613

**R&D Funding Unlocked
from Angaza**
£237,613

Project Locations
USA, Africa

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

GREEN EMPOWERMENT

AN OPEN-SOURCE SOLUTION FOR SMARTER LOAD MANAGEMENT

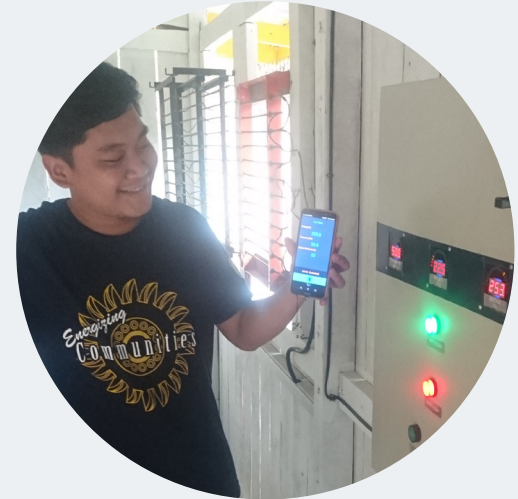
This project will develop an open-source, mini-grid management and optimisation tool. It will be released to a network of developers working to benefit marginalised, indigenous communities.

Off-grid environments present many challenges to electricity providers. These include ensuring that power systems are affordable for consumers and meet their energy demands. Many systems have a power deficit during peak consumer hours and a large power excess during off-peak hours.

Green Empowerment and regional partners in Southeast Asia are developing a reliable communication link between the point of power generation and consumer appliances. Local practitioners can manufacture and install the low-cost, open-source device. It will promote more efficient management of appliance power consumption, which can help ensure reliable power generation.

By developing this technology, Green Empowerment aims to:

- Reduce power outages in peak hours and increase use of available power in off-peak hours through smarter management of productive appliances for household or small-scale industrial use
- Provide more up-to-date system monitoring technology to improve preventative maintenance, fault diagnosis and optimise future projects
- Evaluate financial strategy based on developed technology costs such as PAYGo systems
- Introduce integrating sensors, which will help track environmental factors that influence mini-grid efficiency, such as stream flow rates



AT A GLANCE

R&D Awardee
Green Empowerment

**Efficiency for Access
Funding**
£55,000

**R&D Funding Unlocked
from Green
Empowerment**
£23,478

Project Location
USA

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

JIROGASY

JIRODESK V2 - SOLAR POWERED COMPUTERS TO ENABLE DIGITALISATION IN THE OFF-GRID MARKET

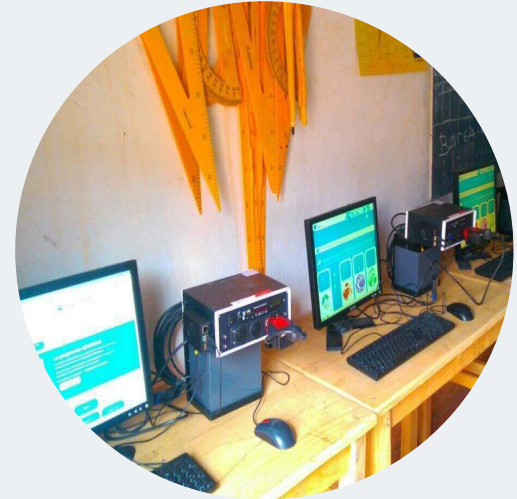
Jirogasy's project focuses on inclusivity with the goal of digitising all schools in off-grid areas across Madagascar and Africa.

Computers currently available on the market are not energy efficient and cannot be powered by solar home systems due to their high energy consumption. While digital appliances such as radios, televisions and fans are increasingly affordable and available on the off-grid market, computers are falling behind.

Jirogasy is passionate about enhancing access to computers and digital literacy, which will help improve educational equity across Africa. In an increasingly globalised world, computers help people stay connected, acquire knowledge, and enhance their employability. As a result, it is important to help children use computers in schools across Africa.

By developing solar-powered computers, Jirogasy aims to reduce inequalities between off-grid areas and the rest of the world. These computers will help people in off-grid areas access widely available digital information.

Having already built a first version of their computer, Jirogasy aims to develop an all-in-one PC. It will combine a solar home system, a motherboard integrated behind a Touchscreen, and a Pay-As-You-Go module. A prototype will be deployed in schools for a pilot project. Once the pilot is complete, Jirogasy aims to provide computer access to over 10,000 students in Madagascar per year.



AT A GLANCE

R&D Awardee
Jirogasy

**Efficiency for Access
Funding**
£110,898

**R&D Funding Unlocked
from Jirogasy**
£12,322

Project Location
Madagascar

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

NADJI.BI SÉNÉGAL

CONNECTED COMMUNITY SOLAR PLATFORM FOR MILLET TRANSFORMATION

A connected solar platform with software to ensure a sustainable business model for millet flour production.

After the production of millet, the flour production process goes through two stages, dehulling and grinding, which are labour-intensive for women and girls in rural areas.

The process involves removing the outer shells of the grains and then grinding them with large mortars and pestles to produce flour. This manual work is painful, time-consuming and can trigger muscular, skin and respiratory diseases. Other methods of flour production for off-grid areas involve diesel-powered machinery, which has negative environmental and health impacts. Diesel-powered machinery can also taint the flour.

Nadji.Bi Sénégal aims to develop a solar solution for millet flour production, which will be connected and managed by a smart software applications platform. This will enable a pain and pollution-free flour processing solution, which can improve quality of life for women and girls. It will also help farmers earn more income, as the solution will help them to increase the value of their millet flour due to the improved production process.

The platform will enable the digital management of customer flow and payment, as well as the production and collection of technical data to monitor the performance of the milling. Nadji.Bi Sénégal will develop the platform with groups of rural women to ensure the service is affordable and addresses their needs. The platform will be offered as an investment to communities of women through microfinance institutions and rural banks, which can help scale up the solution.



Photo Credit: Agsol

AT A GLANCE

R&D Awardee
Nadji.Bi Sénégal

**Efficiency for Access
Funding**
£152,299

**R&D Funding Unlocked
from Nadji.Bi Sénégal**
£74,842

Project Location
Senegal

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

NEOPENDA

A WIRELESS VITAL SIGNS MONITOR FOR NEWBORN BABIES

This project aims to pilot an affordable and wireless vital signs technology in low-resource health facilities in East Africa. The technology will continuously monitor the temperature, pulse rate, oxygen saturation and respiration rate of critically ill newborns.

Vital signs monitoring has the potential to improve newborn health outcomes by providing health staff with early warning scores of a patient's declining status. This can help trigger more timely and effective interventions. In low-resource settings, however, the equipment required to monitor vital signs in critically ill newborns is too expensive and difficult to maintain.

Neopenda's neoGuard technology provides an affordable and sustainable patient monitoring solution allowing clinical staff to monitor up to 20 patients at a time from a central monitoring application hosted on a tablet. They are also able to receive real-time visual and audio alerts if any of the vital signs fall out of the acceptable range.

Incorporating feedback from over 400 health workers, Neopenda's technology has been designed to operate efficiently in dynamic clinical settings. This includes potential space constraints, weak or interrupted power supply and other infrastructure challenges.

The neoGuard technology has been in development since 2017 and undergone two small-scale pilot studies to test for safety and accuracy. Neopenda's project aims to assess neoGuard's feasibility in the real world and evaluate its preliminary efficacy on 600 newborns. The system will be introduced in six to eight health facilities in Kenya, Tanzania and Uganda.



AT A GLANCE

R&D Awardee
Neopenda

**Efficiency for Access
Funding**
£75,000

**R&D Funding Unlocked
from Neopenda**
£49,784

Project Locations
Kenya, Tanzania, Uganda,
USA

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

OMNIVOLTAIC

DEVICE DATA DISCOVERY AS A SERVICE

The project will develop easily discoverable hardware-to-cloud link, enabling remote data collection and sharing for any device in the off-grid sector.

There is a high demand for data in the off-grid sector. Moreover, there is also a need to standardise technology components for them to be compatible with various cloud services that obtain data. This data will help appliance distributors and power operators in addressing analytical or operational requirements.

Omnivoltaic's project will deliver a piece of hardware that will be suitable for mini-grids, off-grid appliances, and PAYGo systems. Omnivoltaic will develop its own apps that will use cloud data and help developers to find innovative ways to enhance user experience. For example, geo-tracking can prompt e-mobility users to seek the nearest location where they can charge their batteries. Climatic data can also be integrated with irrigation pumping devices.

This project aims to create a more general framework that links off-grid technologies in rural areas to cloud storage. The framework will allow its users to access data easily. Omnivoltaic's project will be both scalable and cost-effective, promoting interoperability in the off-grid sector. This will help to advance the market and establish standardisation to enable easy access to data.



AT A GLANCE

R&D Awardee
Omnivoltaic

**Efficiency for Access
Funding**
£70,000

**R&D Funding Unlocked
from Omnivoltaic**
£78,954

Project Location
Hong Kong

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

OVO SOLAR

MODULAR SOLAR POWERED EGG INCUBATOR FOR SMALLHOLDER FARMERS

This project will develop a modular, Pay-As-You-Go enabled solar-powered egg incubator. This will allow farmers to scale their hatchery production as they grow their poultry businesses.

Climate change is making it harder for farmers to rely solely on seasonal crop harvests, as crops are often affected by extreme weather patterns. Enhancing livestock production could significantly improve farmers' resilience by diversifying their income.

OVO egg incubators can help address the global food security challenge faced by smallholder farmers. The company will adapt their current base egg incubator unit and develop egg tray modules, which can be stacked on top of the base unit. Farmers will be able to install each egg-tray-module incrementally, increasing the total unit capacity as each module is added.

The incubator will automatically regulate temperature, humidity and air exchange and integrate Internet of Things (IoT) hardware. This IoT integration will record unit performance data including temperature, humidity, CO₂ levels and the condition of the battery and panel. The data collected will help to optimise performance and return of investment for the end-user. The IoT hardware will integrate with Pay-As-You-Go GSM hardware and software.

The egg incubator will be sold with PAYGo financing, meaning farmers can initially make a small down payment and then make monthly payments until their incubator is paid in full. This will enable farmers to use their incubator appliance to generate further income and re-invest their profit by purchasing additional egg tray modules.

This project will include manufacturing 10 trial units for poultry farmers in Kenya. Its objective is to gain insight into the unit's performance in-field and collect end-user feedback, which will inform future product development.



AT A GLANCE

R&D Awardee
OVO Solar

**Efficiency for Access
Funding**
£92,417

**R&D Funding Unlocked
from OVO Solar**
£11,052

Project Locations
Canada, China, Kenya

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

PEG AFRICA

INNOVATIVE SOLAR-REFRIGERATION SOLUTIONS FOR WEST AFRICA

This project will develop affordable solar refrigeration solutions for women working in commercial settings, which will help them earn income. This includes fisherwomen and traders who sell perishable goods without access to affordable and reliable refrigeration.

PEG Africa decided to pursue this project following surveys in 2019 that revealed refrigeration solutions were one of the top four appliances that customers wanted. Follow-up surveys and visits indicated that there is demand for both fridges and freezers. However, there is a limited understanding of business models, supply chains, economies of scale in manufacturing and demonstrating a strong value proposition to small businesses.

To address this, PEG Africa will pilot refrigeration solutions that address market demand and enable a stronger understanding of the rural refrigeration value chain needed to operate at scale.

PEG Africa foresees that the project will predominantly benefit small female-led businesses. The project aims to combine refrigeration solutions with an affordable financing plan. This will allow female entrepreneurs to access high-quality refrigeration products and services easily. This will help small businesses in Ivory Coast and Senegal to earn more money.



AT A GLANCE

R&D Awardee
PEG Africa

**Efficiency for Access
Funding**
£152,182

**R&D Funding Unlocked
from PEG Africa**
£107,596

Project Locations
Ivory Coast, Senegal

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

POWERGEN RENEWABLE ENERGY

EMPOWERING WOMEN THROUGH MINI-GRIDS
AND ULTRA-EFFICIENT CHICKEN AND EGG
INCUBATION

This project will develop and deploy ultra-efficient egg incubators for productive use, targeting mini-grid users who are primarily women in Tanzania.

In Tanzania, raising poultry is culturally associated with women. It also helps give women more income control and a stronger voice in household decision making.

PowerGen Renewable Energy is working to pilot an ultra-efficient egg incubator with existing mini-grid customers. The project will target female poultry farmers and measure the social and economic impacts of egg incubators as mini-grid compatible productive use appliances.

A pilot of 70 incubators will be produced and deployed. The majority of customers will be women, who will be selected through phone surveys and focus groups. A mobile education service will be set up for customers to receive support and information on how to use the incubator. The success of the project will be assessed through ongoing monitoring and evaluation. A socio-economic impact analysis will allow PowerGen to assess the impacts of the project and its effects on women's livelihoods.

The project aims to prove that egg incubators can help improve the livelihoods of women living in rural areas. It also aims to support the mini-grid business model by increasing the income of and energy demands of mini-grid customers.



AT A GLANCE

R&D Awardee

PowerGen Renewable Energy

Efficiency for Access Funding

£129,866

R&D Funding Unlocked from PowerGen Renewable Energy

£ 88,775

Project Locations

Kenya, Tanzania

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

POWERHIVE INC UK

THE JERR-E-CAN: THE ENERGY STORAGE SOLUTION TO MAKE MICRO-GRIDS ECONOMICALLY VIABLE

The project will create an hourly rental service to make electric vehicles more viable with mini-grids, with a focus on women as the beneficiaries. Each electric vehicle will be powered by a “Jerr-e-can”, a swappable, energy efficient battery. An app will also be developed to help those living in rural areas access cheap and clean energy.

This project will offer an hourly rental service for electric ‘boda bodas’ and three-wheelers vehicles. The vehicles will be powered by a Jerr-e-can, a 72V, energy efficient battery that can be charged by mini-grids or solar home systems. Jerr-e-cans are also swappable. By using Jerr-e-cans, this project helps make electric vehicles cleaner and more economically viable. The project aims to make 20% of customers female drivers. These vehicles will help women transport water over long distances, which is a time-consuming, daily task.

Powerhive will also develop an app for the rural marketplace, which will enable rural communities to purchase excess electricity when prices are low. Ultimately, using the battery and app will encourage the use of more efficient mini-grids, which will benefit all stakeholders. It will also help to make appliances more accessible to off-grid communities. For example, the app will help rural farmers purchase cheaper electricity to power solar water pumps.

Since COVID-19, Powerhive has seen an increase in demand for vital services such as cooking, electricity and mobility. As a result, Powerhive has decided to expand the scope of the marketplace app in this project to include other appliances such as cookstoves.



AT A GLANCE

R&D Awardee

Powerhive Inc UK

Efficiency for Access Funding

£175,176

R&D Funding Unlocked from Powerhive Inc UK

£98,875

Project Locations

Kenya, United Kingdom

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

SIMUSOLAR

WIDENING COVERAGE: DEVELOPING AN INCLUSIVE, GENDER-CUSTOMISED MODEL FOR PRODUCTIVE USES OF ENERGY

This project will expand Simusolar's IoT (Internet of Things) platform by allowing women farmers working off-grid and off-network to benefit from solar-irrigation systems and financing. It will aim to expand this approach to other productive use technologies.

Smallholder farmers, especially women, often face challenges accessing improved agricultural techniques, inputs, affordable technologies, finance, and markets. This is especially true of farmers in off-network areas. Climate change impacts, including unpredictable rain patterns, negatively affect smallholder farmers' income, as it becomes more challenging to maintain their crops.

Simusolar will test an innovative syncing method, named 'PAYGo Bridge', which will use smartphones integrated with Simusolar irrigation systems. It will act as a communication bridge between off-network farms and on-network villages where farmers travel to buy and sell products. Using this proven technology, Simusolar will be able to obtain information on pump use and provide appropriate, value-add services back to farmers, regardless of where they operate. This platform will address affordability, access to information and climate resilience for predominantly female smallholder farmers. The project will be delivered in off-grid and off-network areas.

A combination of hardware, software, and a gender-customised business model will help Simusolar's successful PAYGo Platform to become more accessible. This will enable further productive uses of energy, particularly solar water pumps.



AT A GLANCE

R&D Awardee
Simusolar

**Efficiency for Access
Funding**
£270,000

**R&D Funding Unlocked
from Simusolar**
£230,031

Project Locations
Tanzania, United Kingdom

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

VILLAGE INFRASTRUCTURE ANGELS

SOLAR WASHING MACHINE AND DRYING SYSTEM

The project will develop energy efficient washing machine and dryer centres. The dryers will be multi-purpose, with the ability to dry crops, clothes, and dehydrate food for long-term storage. This will be done by incorporating improved cookstove and DC electric fan technology.

Existing solar home systems are limited in their ability to deliver power to appliances with high-energy requirements over long time periods. As a result, productive use of appliances cannot be used at a high capacity, which means that tasks must be completed manually. This includes washing clothes. As a result, one billion women across the globe spend 100 billion hours laundering by hand.

Village Infrastructure Angels are working to adapt a washing machine and dryer to become energy efficient. The company's research showed that spinning clothes is one of the most power-intensive tasks for a washing machine. This project aims to develop a cost-effective and efficient spinning process for off-grid washing machines and dryers. Village Infrastructure Angels will further develop its prototypes into pre-commercial products in a trial of four washing and drying centres established in Cambodia, Indonesia and Kenya.



AT A GLANCE

R&D Awardee

Village Infrastructure Angels

Efficiency for Access Funding

£245,000

R&D Funding Unlocked from Village Infrastructure Angels

£35,000

Project Locations

Cambodia, Indonesia and
Kenya

RESEARCH AND DEVELOPMENT FUND PROJECT SPOTLIGHT

WALA HARNESSING THE SUN FOR AGRICULTURE

This project will pilot a holistic support solution that will distribute high-quality solar irrigation equipment to smallholder farmers in Malawi.

In Malawi, land is often the only resource of economic value that rural households have own. Over 80% of the population lives in rural areas and depend on subsistence agriculture for their livelihoods. However, agriculture is a highly water-intensive practice. There are also water rights in Malawi, which restrict farmers' access to the water they need. This affects the livelihoods of Malawian women who make up 50% of the country's agricultural workforce.

Irrigation can compensate for agricultural water deficits, but it requires a regular energy source. Only 10.8% of Malawi's population is connected to the grid and only 1% of people in rural areas has access to energy.

Wala works with farmers and focuses on productive use solar technologies for agriculture. The company's pilot project in Malawi will provide farmers with holistic support solutions including:

- Pay-As-You-Grow financing connections to financing partners to help save and access soft loans for technology and farm inputs
- Contract farming which will ensure secure and consistent revenue (This will also enable the farmers to pay for Wala Ltd equipment)
- Training on how to use and maintain solar technologies, good agriculture practices and business skills related to farming

Wala will use its efficient and affordable irrigation technology, expertise, and guidance on agri-business to help support smallholder female farmers.



AT A GLANCE

R&D Awardee
Wala

**Efficiency for Access
Funding**
£100,000

**R&D Funding Unlocked
from Wala Ltd**
£184,179


Project Location
Malawi



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