

# ENERGY ACCESS FROM THE BOTTOM UP: START-UP AND SME SHOWCASE 2018



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Alliance for  
Rural  
Electrification  
*Shining a Light for Progress*

## Imprint

ENERGY ACCESS  
FROM THE BOTTOM UP:  
START-UP AND SME  
SHOWCASE  
2018



### Energy Access from the Bottom Up: Start-up and SME showcase 2018

Compiled and presented on the occasion of the Business Forum “Decentralised Energy in Developing Countries”, a side event implemented by the Alliance for Rural Electrification (ARE), with the support of the Africa-EU Energy Partnership (AEEP) and the UNIDO.

The Business Forum took place a day before as a preparatory meeting for the High-Level Conference on Sustainable Energy and Development: “Regional Cooperation to Accelerate Sustainable Energy Innovation and Entrepreneurship in Developing Countries” in Vienna (Austria) on 3<sup>rd</sup> of October 2018.

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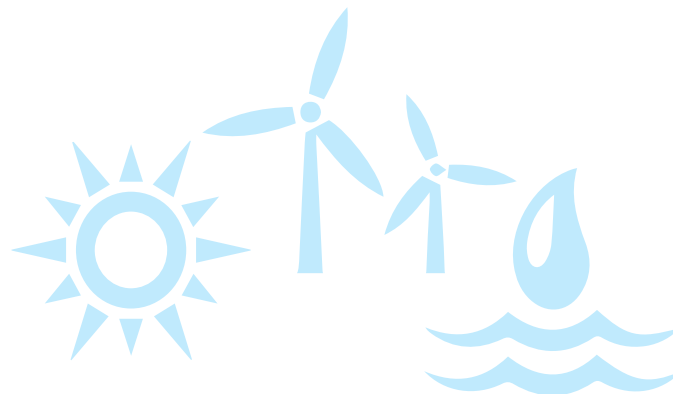
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## INTRODUCTION

### Introduction by the Board of Directors of the Alliance for Rural Electrification

The Board of the Alliance for Rural Electrification (ARE) welcomes that during its EU Presidency, Austria is putting a special focus on examining how development cooperation can be improved, and its effectiveness and collaboration with the private sector scaled up. We would like to thank the Austrian Government for its longstanding and ongoing efforts to support cross-border and regional collaboration on renewable energy for development. Furthermore, we would also like to thank Germany for its work to systematically support the growth of sustainable energy for development through its collaboration with countries and businesses in Africa, and notably with the current development of the “Green People’s Energy for Africa Initiative”, part of its broader “Marshall Plan with Africa”.

With this publication, the ARE Board provides a consolidated analysis of the state of the decentralised renewable energy sector – and a view on what is needed from the perspective of our 150 market-leading Members. The key challenges facing our sector, combined with the central role decentralised energy for development is being called on to play in achieving 12 key SDGs, mean we need to see a substantial shift in the type and quantity of development cooperation aimed at supporting this sector if we are to successfully deliver on our shared global development objectives. We see this shift is starting to take hold for instance in European development cooperation, including in the EU’s External Investment Plan.

#### The Challenge

In the African context, costs per connection for mini-grids have dropped by 20% over the past two years, and on average are now well below what nearly all Sub-Saharan African utilities charge. Mini-grids furthermore provide vastly superior quality and quantity of energy to rural communities than national utilities do in most of these countries. For these reasons and many others, mini-grid firms have the potential to drive transformational economic growth for the hundreds of millions for whom mini-grids have repeatedly been shown to be the least costly option by key international institutions.<sup>1</sup>

Despite this incredible potential, most private sector mini-grid developers in Africa are facing near-term existential threats due to a lack of affordable long-term capital. The same is the case for new players in the household solar market. While all the companies showcased in this publication have the potential to impact millions of lives, firms in this sector face two categories of risks that make financing their work a challenge:

- **Where they are doing business** - countries with either unstable or inadequate political and regulatory environments that make capital either extremely expensive or unavailable; and
- **Who their customers are** - poor people whose ability and willingness to pay makes revenue either unpredictable, or predictable but too low to be economically attractive.

Despite these perceived risks, experience has demonstrated that customers’ ability and willingness to pay is high - provided services are reliable and predictable. Indeed, investment in decentralised renewable energy is a more reliable investment than national grid networks in areas where they cannot provide good service. Yet early stage firms – even if they have the potential to be genuinely catalytic and game-changing for local and national economies – find it very difficult to raise financing to move beyond grant or private equity-backed pilot stages.

Taken together, this means the finance needed to achieve the dozen SDGs reliant on energy simply

<sup>1</sup> Most recently in: IEA (2017). [Energy Access Outlook 2017: From Poverty to Prosperity](#)

is not available, and accordingly the businesses designed to deliver on the global community's sustainable development objectives never get the opportunity to do so.

## The Solution

Billions of euros are given to insolvent and bankrupt utilities every year (only three Sub-Saharan African utilities are currently solvent), but less than one billion euros of donor funds in total has been disbursed in the off-grid sector to date.

To overcome the two overarching challenges noted above, we first need to re-balance this inequality. Development agencies are uniquely positioned to do this – and we strongly encourage them to do so. Rebalancing energy support to better reflect 21<sup>st</sup> century technologies and approaches will ensure a better value for taxpayer money given that mini-grid and off-grid energy companies working on rural electrification address multiple economic, environmental and social development objectives through their excellent customer service, productive economic development support, consumer credit history creation, and in-community presence. This is in contrast to national utilities who generally have poor customer service, no demand stimulation (i.e. economic growth) efforts, offer no credit history development, or other local engagement.

Stepping up or meaningfully redirecting public investment to off-grid renewables, we would see radical further cost reductions per connection and per kilowatt over a short period. This is due to the fact that the mini-grid sector, in particular, would finally be able to reach the economies of scale needed for any sector to reduce costs, as well as enable research and experimentation to further innovate and improve on today's offerings. Concretely, to support the success of the decentralised energy sector today and to boost the creation of new local companies and jobs, we urgently need donor efforts and investment to flow into two broad categories matching the two problems noted above:

- **Hearts and minds:** Today it is unfortunately a reality that utilities, ministries, multilateral development banks (MDBs), and indeed many bilateral donor offices at the national level do not adequately understand the decentralised energy space and how far it has evolved in recent years. Members of ARE – despite being told by the global community that they are urgently needed – receive cold receptions by many key players at the national level, hence many policies and regulations (where they exist) are not developed with the true interests of the sector in mind. We urgently need the EU to support an evolution in this thinking. As all bilateral cooperation partners and MDBs work alongside national government priorities and plans – we need your support in building up local support for decentralised renewables.
- **Good development is good for business:** serving the world's poor as customers without exploiting them means support is needed to lower prices to an affordable level, and/or to raise incomes to a point where poor people can afford life-changing energy services. In other words, market building, not only business-building support is key. Hence there is an urgent need for financial support in two important categories in addition to tools currently available:
- **Large investments of long-term, low interest capital on the business side** – as noted at the start – these companies (mini-grids in particular) are providing better services than utilities, which receive long-term, low interest infrastructure finance. Mini-grids are indeed infrastructure and should be financed as such. Hence, we urgently need large pots of patient debt and equity capital to allow such business to grow and deliver results.<sup>2</sup>

We also need de-risking tools such as off-taker risk guarantees, and political and forex risk mitigation tools to help bring in semi-commercial and commercial lenders. This is the only way we will see companies with successful track records who are not too big for seed funding but too small to access investment capital, really have a chance at delivering on their – and our – goals for rural electrification. We cannot have yet another year of leading companies struggling to finance only five or six new sites when we need each one to be building out at least 50 or 60 per year to accomplish the global SEforALL goals.

<sup>2</sup> See [Acumen \(2018\). Accelerating Energy Access: The Role of Patient Capital.](#)

Business training and asset finance on the community / local entrepreneur side – households using energy only for lighting will never repay a mini-grid. If this is all a household can afford, however, or is the only energy technology they have easy access to, we will not see the change needed to achieve the SDGs. We must focus on building demand for energy by either raising local incomes through productive use training and micro-finance, or by finding ways to cross-subsidise energy costs not only within national utilities as it is done today – but across energy service providers as well. This is the only way we will be able to make energy affordable to the poorest.

It is with these challenges and solutions in mind that the Alliance for Rural Electrification presents this showcase of SMEs and start-ups delivering clean energy access from the bottom up. It is presented as a contribution to the on-going changes and efforts being made by numerous actors to address these shared challenges, for which we offer our thankful collaboration and support. We truly believe that together we can change the world, and we very much look forward to collaborating with you moving forward to make this dream a reality.

Kind regards,

**Aaron Leopold**

ARE Vice President  
CEO, Africa Minigrid Developers Association

**Rebecca Symington**

ARE Board Member  
Executive Director, Mlinda Foundation



## EDITORIAL



## Editorial – by the Africa-EU Energy Partnership (AEEP)

The Africa-EU Energy Partnership (AEEP) was established in 2007 as one of the partnerships under the Joint Africa-EU Strategy (JAES) at the AU-EU Summit in Lisbon in 2007. Since then, energy has remained one of the JAES priorities aiming at connecting the two continents in one mission: to secure access to modern, reliable, affordable and sustainable energy in Africa.

Building on a decade of successful cooperation, the AEEP's work is ever evolving to reflect the changing energy landscape in Africa and Europe. Since 2018 it has been mandated to address new African-EU priorities and, as such, it contributes to setting political priorities, it supports joint EU-African initiatives, and it facilitates knowledge exchange on key issues such as job creation, gender and digitalisation.

The Partnership places great emphasis on working with a broad range of stakeholders, be they from the private sector, academia - or the next generation of decision makers and actors. The AEEP recognises that neither the public nor the private sector have the resources to carry out the energy transformation without cooperating; hence, it has oriented its role to becoming a platform to promote public-private partnerships, new and innovative financing mechanisms and programmes, and linking important and emerging sectors.

With this in mind, the Africa-EU Energy Partnership has brought together start-ups and SMEs, and policy makers from Africa and Europe, for the Business Forum on Decentralised Energy in Developing Countries (Vienna, 2<sup>nd</sup> of October 2018). The AEEP is keen to support the work of energy start-ups on both continents. Learning from their experiences, the AEEP can help enrich the interaction between policy and practice. The work of the AEEP's Steering Group members to facilitate the roll-out of new initiatives, such as the European Commission's External Investment Plan or the ElectriFI, AREI or Germany's Green People's Energy for Africa, helps strengthen the work of partner stakeholders in order to replicate and scale-up solutions. Exploring the implications for the energy sector of important new issues - be it gender, job creation or digitalisation - enables the AEEP to quickly take up important opportunities and feed these into decision and policy-making process.

The Africa-EU Energy Partnership would like to thank the partners who have helped prepare this publication and implement the Forum, and the participants for the insights and expertise they have shared at the event.

### Crispen Zana

Interim Head of Secretariat, Africa-EU Energy Partnership



## EDITORIAL



## Editorial – by UNIDO

The energy sector is undergoing rapid and fundamental transition. Some of the forces behind this transition include the need to decarbonise existing energy systems, opportunities created by digitalisation, and the fact that renewable energy powered mini-grids can now supply better quality electricity to rural communities cheaper than what utilities charge. In this clean energy transition, SMEs and start-ups can be catalysts of new technological and business model innovations that will enable the supply of quality energy services at increasingly competitive prices in cities, industries and rural areas. This is particularly true in developing countries, where the lack of access to modern energy services is a major challenge to social and economic development.

As the United Nations agency mandated to promote inclusive and sustainable industrial development, UNIDO identifies the ongoing energy transition as an opportunity for industrial transformation by supporting the creation of businesses and industries along the clean energy value chain. In particular, UNIDO is committed to identifying early stage SMEs and start-ups with technological and business model innovations and to enhance their market-readiness for transformational impact.

One flagship programme of UNIDO that embodies this unique approach is the Global Cleantech Innovation Programme, GCIP. In the last four years, GCIP has accelerated over 860 climate and clean energy technology innovations from SMEs and start-ups across eight countries, transforming them into fast-growing and investible businesses. By supporting climate and clean energy innovations in developing countries, GCIP facilitates the emergence of endogenous, home-grown technology innovations that accelerate access to modern energy services.

A major barrier to private sector investment in energy and climate projects and businesses in Africa is the lack of investment-grade pipeline. Strengthening the development of investment-ready proposals would unlock financing for these sectors. The Private Financing Advisory Network (PFAN), hosted by UNIDO, has an established track record in identifying and nurturing projects in low carbon, climate resilient development, to subsequently introduce them to prospective investors. PFAN has supported over 100 projects to reach financial close, thereby leveraging in excess of USD 1.3 billion in investment.

UNIDO's integrated approach in supporting the identification and development of climate and clean energy technology SMEs and start-ups through the GCIP, and nurturing the enterprises to unlock financing through PFAN is premised on the recognition of the role of the private sector in accelerating the energy transition. In fact, the energy transition creates opportunities for industrial transformation to create green jobs, protect the environment, create shared prosperity, build national capacities and promote gender equality.

UNIDO is committed to working with our partners to accelerate the clean energy transition by leveraging our leadership role in clean technology innovation and business model development. We will continue to promote and strengthen the capacities of start-ups and SMEs of developing and emerging economies to fully participate and benefit from the opportunities embedded in the energy transition and in industrial transformation.

### Alois Mhlanga

Chief, Climate Technology and Innovation Division  
Department of Energy





## EXECUTIVE SUMMARY



## Executive Summary

The publication “Energy Access from the Bottom Up: Start-up and SME Showcase 2018” shines a spotlight on 15 innovative African and European start-ups and small- to medium-sized enterprises in the energy access space, mostly active in Africa.

It is prepared as background information to the context of the Business Forum “Decentralized Energy in Developing Countries”, held in Vienna on the 2<sup>nd</sup> of October 2018. The Business Forum is a side event of the High-Level Conference on “Regional Cooperation to Accelerate Sustainable Energy Innovation and Entrepreneurship in Developing Countries”, taking place on the 3<sup>rd</sup> of October 2018 in Vienna, Austria, as part of the Austrian Presidency of the Council for the European Union, and as part of European efforts more broadly to support sustainable energy in Africa. It also marks a follow-up in the discussions initiated and implemented by the German Federal Ministry for Economic Cooperation and Development around their initiative Green People’s Energy for Africa as part of the Zambia Off-Grid Investors Forum, held in Lusaka, Zambia, in June 2018.

The aim of the Business Forum, and of this publication, is to contribute to the global efforts to scale up private sector and innovation capacities in Africa to make SDG-7 - and particularly universal access to energy services - a reality by 2030. In particular, the event and publication will provide:

- first-hand insights into operations on the ground;
- key ideas and recommendations for the public sector;
- promote the uptake of renewable energy business opportunities, and
- inform about new technology solutions in fields like digitalisation and fintech<sup>3</sup>, which are elementary parts to be considered for increasing sub-regional cooperation and implementing fit-for-use policies and standards.

As a global but locally acting business and know-how exchange hub, ARE with its 150 committed and passionate companies as well as with its partners plays a key role in rolling out new market developments and business technology trends worldwide, as we help to create win-win solutions via the ARE Off-grid Matchmaking Platform<sup>4</sup>.



<sup>3</sup> Fintech stands for financial technology, generally meaning new technology aiming to compete with traditional financial methods in the delivery of financial services.

<sup>4</sup> See <https://ruralelec.org/matchmaking-platform>

For this publication with its focus on marketable products and services, each company was asked to present itself, focusing on its value proposition to both customers and investors. Each outlines its business model and impact, as well as its constraints and, importantly, recommendations. In addition, the companies each put forward a flagship project that they recently completed or aspire to implement shortly.

The result is a publication full of bright ideas and ambitious projects, demonstrating that access to clean power and broader sustainable development is not only realistic, but is already being delivered today. Hence, the question becomes how to scale up all these blossoming initiatives? What is holding them back?

Firstly, ARE Members and the contributors to this publication consistently identify access to finance as the main barrier limiting their upscaling and rapid clean rural electrification. In particular, project developers struggle to access working and medium to long-term capital, whether through debt or equity.

Also, ticket sizes and transaction costs are too high for accommodating many rural electrification projects, procedures are inflexible and slow, and the real and perceived risks of such projects pushes up the cost of capital and renders especially private investors scarce, particularly in the case of mini-grids.

In our view, the key to unlock the required capital mainly lies with public sector investors, whether donors, development finance institutions, governments in energy-poor countries and, to a lesser degree, charitable and impact investors. These are the prime stakeholders with a mandate to strive towards clean energy access in the public interest, as well as the financial and technical acumen to deliver it.

In essence, public investors should drive the development of innovative financing mixes, crowding in private capital, boost their internal procedures, as well as set up mechanisms to de-risk investments in the off-grid sector. Initiatives such as the recent EU External Investment Plan and ElectrIF are great examples of how public bodies could design and implement such actions.

Secondly, current policy and regulatory frameworks constitute another major impediment to upscaling initiatives and clean energy access. Even though mini- and off-grid solutions are expected to deliver 71% of all new electricity connections in rural areas as the most cost-effective solutions, serving 485 million people by 2030 (IEA 2017<sup>5</sup>), the policy and legal context in which these will be deployed is still inadequate in many countries (see overview in e.g. Climatescope 2017<sup>6</sup>).

Regulations need to be clear, stable and incentivising both in terms of the business and investment climate, and for the generation and commercialisation of decentralised renewables. Off-grid renewables need to be mainstreamed in national rural electrification strategies. The playing field for mini- and off-grid solutions needs to be levelled both vis-à-vis the central grid and fossil fuels. Dedicated rural electrification agencies need to have a clear mandate, budget and decision-making power.

Decentralised solutions, like all technical equipment, need clear and enforced regulation on technical standards, to keep quality high and ban substandard products. Such standards also stimulate technology innovation to improve accessibility, reliability and range of electricity services. Off-grid entrepreneurs and actors need to, as already identified in the 2014 Mini-Grid Policy Toolkit<sup>7</sup>, know how to set tariffs, what happens if and when the central grid arrives, what is the national grid extension plan, and so on.

Some practitioners also suggest that governments could develop a 'package regulation' for rural services covering electricity but also services like appliances, internet and water. This would also boost cross-sectoral partnerships and integrated planning. Taken together, the policy and regulatory framework should create an ecosystem to accelerate the deployment of decentralised renewables.

Thirdly, practitioners face a variety of other issues slowing down project implementation. There needs

<sup>5</sup> IEA, Energy Access Outlook 2017: From Poverty to Prosperity, 2017, pp. 11, 53. Available on <https://www.iea.org/access2017/>

<sup>6</sup> Climatescope 2017. Available on <http://global-climatescope.org/en/>

<sup>7</sup> RECP, EUEI PDF, ARE, REN21, Mini-grid Policy Toolkit: Policy and Business Frameworks for Successful Mini-grid Roll-outs, 2014, <http://www.minigridpolicytoolkit.euei-pdf.org/>

to be more investment in education and capacity building to complement existing local knowledge with technical and business skills. Greater roll-out of affordable telecom services, particularly the internet, would help address this as well as enhance the connectivity of the communities. Women and youth need to be empowered as key change agents to achieve SEforALL objectives<sup>8</sup>. Measures to address these issues would also build trust in decentralised solutions and make it easier to reach the last mile.

In short, while all sector stakeholders have a role to play, the public sector in particular has a decisive impact to bring all the pieces together. We thus invite all policy makers and development bankers to consider the breadth of concrete recommendations put forth by the companies themselves, as well as by the contributing partners in the editorials.

Finally, in the spirit of matchmaking, we encourage all interested parties to get in touch with us and the companies showcased in this publication to scale up off-grid renewables and boost off-grid markets!

Wishing you pleasant reading.

**Marcus Wiemann**  
Executive Director, ARE



**David Lecoque**  
Policy and Business Development Manager, ARE



<sup>8</sup> See also the ARE position paper on Women & Sustainable Energy on <https://www.ruralelec.org/publications/are-energia-position-paper-women-and-sustainable-energy> and Best Practices & Key Recommendations from Young Leaders in Energy Access on <https://www.ruralelec.org/publications/best-practices-key-recommendations-young-leaders-energy-access>.

# PROJECT LOCATIONS IN AFRICA



## PRESENTATION

## 1. Comparisol

- Organisation name: **Comparisol**
- Home base: **London, United Kingdom**
- Incorporation: **July 2017**


 **Company**

Comparisol is a mobile application for both feature and smartphones which improves market awareness and education on sustainable solar home systems in rural and peri-urban areas of Sub-Saharan Africa.

 **Challenge**

In its target market Rwanda, 59% of the population do not have an electricity connection. As a result, consumers use stopgap technologies such as kerosene lamps, which increase the poverty premium affecting healthcare, education and CO<sub>2</sub> emissions.

On the flipside – 80% of Rwandans own a mobile phone, most likely a feature phone. Bringing these facts together, Comparisol increases awareness of a much cleaner solution, namely off-grid solar, using mobile phones.

 **Value Proposition for Customers**

The value proposition of Comparisol is to help upgrade the lifestyle of the customers looking for solar products. The USSD/SMS platform of Comparisol is the innovative aspect. Consumers do not need to use the internet to access the platform. Solar Home Systems (SHS), pico lanterns and possibly appliances will be available on the platform.

Target consumers are rural and peri-urban communities in which 92.3% of consumers (8,6 million people) do not have access to electricity. The average household size is four persons, with an average annual income of USD 400. These consumers typically spend USD 100 – 140 per year on kerosene lamps and candles and another USD 15-25 every time they charge their phones – potentially daily.

Connection to the national grid would cost on average USD 2,000. Going off the grid with a PAYGo SHS powering a few lights and a phone charger costs USD 250 and can be paid incrementally. Comparisol will provide a platform to compare PAYGO SHS and solar lamps, which have over 100 different offerings.

 **Value Proposition for Investors**

Comparisol is looking for funding of EUR 100,000 to build the team and develop a very robust platform. We can offer equity in the company. Our scalable business model can help accelerate the adoption of off-grid solar to the 600+ million people in sub-Saharan Africa who are not connected to the electricity grid.

 **Business Model and Impact**

The business model is articulated around three pillars:

1. Commissions earned on sold products;
2. Platform for awareness programmes funded by donors;
3. Leveraging data of the platform users, particularly towards donors, NGOs and solar companies.

The app is free to use for customers. By facilitating 200,000 customers to go from kerosene to solar, we can save a minimum of 200,000 tonnes of CO<sub>2</sub> emissions over a five-year period. Through the learning we can also communicate the benefits of solar power for households and businesses.

 **Constraints and Recommendations**

Comparisol notes a lack of funding in the off-grid market and considers key challenges to be reaching the last mile, the lack of awareness and the lack of trust in solar products. However, Comparisol backs a top-down approach to boost solar in Rwanda and to reach the government target of 100% electricity access by 2024.

 **Contact**

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## Project Showcase

Title: **Comparisol Application Development - Pilot**

Location: **Rwanda**

Start date: **15 September to December 2018**



## Organisation

See above.



## Challenge

See above.



## Opportunities for Renewables

See above.



## Renewable Solution

Comparisol is a mobile marketplace in which solar shoppers can search and purchase verified solar providers within their financial capabilities.

An integral part of the mobile marketplace functioning is the application development of Comparisol. The app will run on web, mobile and (Unstructured Supplementary Service Data) USSD, a technology ubiquitous in developing nations.

The app will have to have the following features (in all formats):

- An algorithm that calculates the best three products for a customer from dozens based on location, credit score, product quality, budget etc.
- Location tracking of the customer: this is needed for the algorithm to find suitable solar providers based on the customer's location.
- Credit scoring facilities: needed to assess the customer's eligibility to purchase a solar product.

An important module in the application will be the awareness programme designed to provide knowledge about solar energy and solar products to customers.



## Project Financing and Costs

Project total investment is EUR 80,000. So far, Comparisol has received the following investments pledges:

- Scottish Enterprise: GBP 15,000;
- Early investor/Advisor: USD 5,000;
- Partners: Renewables in Africa, Scottish Enterprise, Statera Capital, Challenges Worldwide, Africa's Talking, Climate-KIC.



## Project Outcome

The pilot project will be aimed to serve around 50 to 100 people. Feedback and Lessons learned will be used to refine the market. Comparisol should be able to provide more updates by early 2019.



## Contact

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[www.comparisol.com](http://www.comparisol.com)

## PRESENTATION

## 2. Eco-V

- Organisation name: **Eco-V**
- Home base: **Pretoria, South Africa**



### Company

Eco-V provides renewable hot-water and electricity solutions for communities (homes, hospitals and schools) and industries in the form of affordable containerised hybrid solar micro-grids that are affordable and easily transportable. A typical BlueGreenTower micro-grid pays back over five years using award-winning and patent-pending GreenTower Technology with 90% energy saving. The company was awarded the “Finalists, 2016 Royal Academy of Engineering’s Africa prize” in 2016 and the “Winner, Swiss Social Innovation in Housing challenge” in 2017. \*Eco-V is an alumnus of GCIP South Africa.

### Technology Stage

Technology Readiness Level<sup>9</sup> (TRL) 9 (Market application)

### Investment mobilised to date

Investment: USD 450.000

### Sales

- Turnover 2015 – Feb 2018: USD 510,000
- Projected Turnover Mar 2018 – Feb 2019: USD 2 million (Scale-up)

### Technology



Sustainable community solar and vertical axis wind turbine

BlueGreenTower™ technology achieves 90% in energy saving for heating water compared to electric boilers by harvesting and storing solar power while conserving water using an internet-based software management platform to optimise performance not provided by any of its competitors. The modular BlueGreenTower™ design incorporates containerised micro-grid units, each providing off-grid hot water for up to 16 homes

making its solution more affordable than competing solutions. By incorporating multiple micro-grid units, BlueGreenTower solutions can be scaled to serve any size community, hospital or school that requires domestic hot water as well as factories that require 80 °C process hot water.

GreenTower micro-grid installation at an old-age home in Pretoria



### Impact

The explained solution contributes to the following SDGs:

- SDG 3: Ensure healthy lives and promote well-being for all at all ages
- SDG 6: Ensure access to water and sanitation for all
- SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all
- SDG 8: Promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- SDG 11: Make cities inclusive, safe, resilient and sustainable
- SDG 13: Take urgent action to combat climate change and its impacts

and helps to mitigate GHG:

- GHG offset as at Feb 2018 (20 GreenTower installations) - 200 tonnes per year
- Water saving - 6,000 kilolitres (kl) per year

Eco-V aims to replace one million electric boilers in Africa (at corporate buildings, shopping malls, educational institutions and government agencies) over the next 10 years with BlueGreenTower Microgrids, achieving an annual GHG reduction of more than 3 million tonnes by saving the utility grid about 3,000 million kWh in energy and more than one GW in peak demand.

Eco-V also creates jobs:

- 10 (5 full-time, 5 part-time)
- Building further capacity in SA to serve markets in Southern African Development Community (SADC) countries

### Contact

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<sup>9</sup> The website of the European Commission’s DG Research, Science and Innovation defines TRL as: “Technology Readiness Levels (TRLs) are indicators of the maturity level of particular technologies. This measurement system provides a common understanding of technology status and addresses the entire innovation chain. There are nine technology readiness levels; TRL 1 being the lowest and TRL 9 the highest. », see <https://ec.europa.eu/research/participants/portal/desktop/en/support/faqs/faq-2890.html>

## PRESENTATION

## 3. EcoCinetic



- Organisation name: **EcoCinetic**
- Home base: **La Rochelle, France**
- Incorporation: **2011**



## Company

EcoCinetic, a French technology-driven micro-enterprise, has developed a disruptive set of hydrokinetic turbines (2 to 24 kW power output) that harness the energy from the available flow of canals, rivers, and estuaries to generate electricity.

Through its four products: HydroBox, HydroBunch, HydroCanal, HydraWatt, EcoCinetic turbines are adapted to the majority of river conditions, from very shallow waters to slow or fast currents, and users' needs in both developing and developed countries. Specifically designed for water, EcoCurrent technology is price competitive, eco-friendly, compact, robust, efficient and easy to install and operate, thus suitable for either rural off-grid communities in developing countries or riparian individuals or industries in Europe. The global energy system is changing and EcoCinetic can become a game changer by capturing part of the untapped energy from the rivers, thus enhancing the technology offer towards an optimized energy mix.



## Value Proposition for Customers

Over 1.1 billion people in the world – 16% of the global population – still do not have access to electricity. The majority of these people are located in remote and rural areas of Sub-Saharan Africa which is very rich in hydraulic resources and where conventional power grid extensions are not possible or are unaffordable.

These populations commonly use diesel generators, which are costly and highly polluting, or renewable technologies such as solar or wind, which produce highly variable energy and requires large parks of batteries, adding complexity and costs. Alternatively, rivers offer a free, natural and permanent hydrokinetic energy.

EcoCinetic technology requires being close to a river with an average flow higher than 1 m<sup>3</sup>/s, water velocity higher than 1.3 m/s and a water depth of at least 0.5 m. It estimates that a third of all villages located in subtropical off-grid areas have these

characteristics. EcoCinetic believes that about 25 GW can be harnessed by assuming 10% of the energy produced through its in-stream hydrokinetic picoturbines.



## Value Proposition for Investors

EcoCinetic's vision is to sell 8,500 picoturbines/year in the mature market by 2029: 6,000 in Africa, 1,000 in Asia and 1,500 in Europe (17% share of market). It anticipates an increasing demand for its turbines, thus reaching 2,600 units sold by 2024. Its target by 2022 is to reach an EBIT over EUR 1.5 million. By a permanent optimisation of its cost structure (average production cost of ~1 EUR/W by 2024), EcoCinetic expects to maintain a net margin between 18% - 23% over time from 2021, while keeping a highly competitive selling price (<2.5 EUR/kW). The payback period will be less than three years.

## Constraints and Recommendations

EcoCinetic expects to provide access to electricity to more than 10 million people in around 7,500 villages in off-grid areas, creating about one million jobs in developing countries and reducing approximately 660,000 tonnes of CO<sub>2</sub> emissions. EcoCinetic is now applying to the EU H2020 project phase 2 and seeks a financial partner to support its international growth. It is seeking financial investors on equity.



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More information: [Presentation of the pilot project in Moulenda \(Congo\) financed by the French Ministry of Finance \(2016/2017\) on request.](#)



## PRESENTATION

## 4. Ecoligo



- Organisation name: **ecoligo**
- Home base: **Berlin, Germany**
- Incorporation: **February 2016**



### Company

Ecoligo provides a fully financed solar-as-a-service solution for businesses in emerging markets. With a complete digital platform for financing and delivering solar projects, ecoligo removes the barriers that prevent such projects from being realised. Supplying businesses with affordable electricity enables them to grow and boost the local economy.

The solar projects are financed through the crowd investing platform [www.ecoligo.investments](http://www.ecoligo.investments), offering fixed and attractive returns to private investors. Investments start from EUR 500 and save tonnes of CO<sub>2</sub> emissions, enabling impactful citizen participation in the global energy transition.



### Challenge

Commercial and industrial (C&I) companies in emerging markets like Ghana and Kenya have high electricity costs. Using solar energy would cut their energy costs and increase energy security, however solar systems require a large investment and suitable financing options are not available. Additionally, companies do not want to manage the installation and maintenance of a solar system.



### Value Proposition for Customers

Ecoligo saves these companies up to 40% on their energy bills by providing access to hassle-free, affordable solar energy. Companies do not need to pay a large upfront payment. Ecoligo works with local partners to install and maintain a solar system on the property of the business, ensuring that the system is kept running smoothly without the need for the company to train or hire additional staff.



### Value Proposition for Investors

Ecoligo is raising equity in a Series A of EUR 3 million into the company. Proof of market of both the solar projects and the crowd-

investing model has been achieved. The total addressable market in Africa is EUR 114 billion and EUR 1,918 billion in all non-OECD countries. The company aims to scale globally with the Series A funding.



### Business Model and Impact

Ecoligo owns the solar systems and sells electricity to customers at a fixed price. Customers pay ecoligo on monthly basis securing a steady revenue which is used to repay the crowdinvestors. This results in a sustainable two-sided business model that enables faster solar project execution in developing countries.

Energy prices in these countries are rising, while the cost of solar power continues to drop; consequently, ecoligo can offer significant savings to the client while generating profits. High electricity prices currently hinder growth for these companies: by providing affordable power, ecoligo enables them to grow and create jobs and development in the local economy. Additionally, thousands of tonnes of CO<sub>2</sub> emissions will be saved.



### Constraints and Recommendations

Challenges of working in the current markets include lack of clarity of government policies regarding sale and generation of renewable energy as well as regulation of foreign business and investment. ecoligo strives to increase customer awareness of solar energy as well as facilitate training and education of partners and local installation companies, to bolster the solar industry in these regions and improve efficiency of business operations and partnerships.



### Contact

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## Project Showcase

Organisation: **Stanbic Bank Ghana/ecoligo**  
 Title: **40 kWp Solar Systems for Stanbic Bank**  
 Location: **Accra and Tema (Ghana)**  
 Start date: **July 2018**



## Organisation

Stanbic Bank Ghana is one of the largest banks in Ghana. The bank prides itself on being a customer oriented, business friendly and socially relevant bank, which has been at the forefront of the positive transformation of the banking and services industry in the country. The bank is committed to conducting its business in a socially, environmentally and financially responsible manner.



## Challenge

High energy costs are a well-known issue for businesses in Ghana. For Stanbic Bank Ghana, the problem is not only financial but also environmental: the bank wants to move towards more sustainable operations and cut CO<sub>2</sub> emissions.



## Opportunities for Renewables

The cost of solar energy is much lower than the cost of power from the national grid. Solar power is also more environmentally friendly than power from the grid.



## Renewable Solution

Solar power systems were installed on the roofs of Stanbic Bank's Tema, Kasoa and Dansoman branches. The systems at Tema and Kasoa have a capacity of 10 kWp, and the system at Dansoman has a capacity of 20 kWp. These systems provide 30% of the energy needed for each branch. At night or on cloudy days, electricity is procured from the national grid.

Ecoligo financed the solar system and worked with local partners to install the systems at the bank branches. As part of the project, ecoligo gave three trainings to the local partners and customers on the topics including: operation and maintenance of the solar systems, solar energy for commercial customers and the business model of a solar-as-a-service solution.



## Project Financing and Costs

The solar project was financed through the crowdinvesting platform [www.ecoligo.investments](http://www.ecoligo.investments), raising EUR 50,000 to finance three solar power systems for Stanbic Bank in Ghana. The campaign was backed by 42 private investors. Investors will receive 5.75% interest on their investments over the loan period of 12 years. The project is implemented by ecoligo in Ghana and is part of the dena Renewable Energy Solutions Programme. Stanbic Bank leases the solar system from ecoligo, making regular, fixed payments over a period.



## Project Outcome

The solar systems provide each branch with electricity from a zero-carbon source, helping the bank to operate more sustainably. The bank is one of the largest in Ghana and employs over 1,600 people at 39 branches. The current project represents the first phase of a larger initiative on green technology, in which ecoligo and Stanbic Bank work together to provide solar systems for other branches and offices of Stanbic.



## Contact

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## PRESENTATION

## 5. Elum Energy

- Organisation name: **Elum Energy**
- Home base: **Paris, France**
- Incorporation: **January 2016**



### Company

Elum is a software company that develops an energy management software able to monitor and control hybrid systems (PV + Gensets) to reduce fuel OPEX by 20% for industrial and telecom buildings in emerging countries. Elum is an alumnus of GCIP Morocco.

### Challenge

Professional buildings in Africa rely on diesel generators to supply its electricity demand. This electricity is expensive and is responsible for important greenhouse gas (GHG) emissions. However, with the decreasing price of photovoltaic modules (divided by five in five years), solar energy becomes cheaper and competitive to diesel costs. Elum energy provides them a software to manage energy between the solar panels and the diesel generators in order to maximize the potential of the installation.

### Value Proposition for Customers

Elum's value proposition is to reduce fuel costs for industrial and telecom buildings by 20% thanks to its optimisation algorithms. It helps them to provide highly competitive cost of energy for the final customer. Elum's target consumers are solar installers (EPC or IPP) that provide solar panels and batteries to the final customers and that integrate our solution.

### Value Proposition for Investors

The business model of Elum is scalable and can help material

providers and installers to accelerate the adoption of off-grid solar to the professional buildings that need a low-cost, reliable and local electricity provision.

### Business Model and Impact

The business model is a Software as a Service (SaaS) solution that is proportional to the size and sizing of the project. Generally, the project is between five years and 20 years.

The impact of Elum's solution is important:

- Reduction of fuel OPEX by 20%
- Reduction of GHG emissions by 30%
- Promotion of local energy and creation of green jobs locally
- High reliable and low costs energy can bring to new industries so creation of industrial jobs in Africa.

### Constraints and Recommendations

Elum notes that the market needs Solar PV solutions, however the decision time is very long and be problematic for SMEs.

### Contact

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## Project Showcase

Title: **Bonima Steri Project**  
Location: **Morocco**  
Start date: **May 2017 to now**



## Organisation

See above.



## Challenge

See above.



## Opportunities for Renewables

See above.



## Renewable Solution

Solar PV - Battery Storage - Diesel genset



## Project Financing and Costs

Project total investment is EUR 2.5 million, including private capital investment and subsidies coming from the French and Moroccan government.



## Project Outcome

More than 30 MW commissioned in monitoring or control solution in Africa in Morocco, Cameroun, Madagascar, Senegal and Tanzania.



## Contact

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## PRESENTATION

## 6. Energy Diverse Integrations Ltd

- Organisation name: **Energy Diverse Integrations Ltd**
- Home base: **Samfya, Zambia**
- Incorporation: **April 2015**



### Company

Energy Diverse Integrations is trying to bridge the gap in the energy sector through the deployment of renewable energy solutions for rural based communities often known as the Bottom of the Pyramid (BoP) clients. The company deals in a wide range of solar products and services such as solar home systems, recharge stations, solar lights, customised systems and micro-grid based technologies focusing on the water, buildings, ICT and agricultural sector.

### Challenge

The problem Energy Diverse Integrations helps to solve is energy poverty in rural and peri-urban communities through deployment of renewable energy solutions for residential and productive use of energy. In Zambia, rural electrification rate is very low at 4,5% and access to energy still remains a challenge despite grid extension programs currently being implemented as communities still live far apart making it costly for them to be connected and therefore relying on traditional energy sources like candles, kerosene lamps and generators.

### Value Proposition for Customers

Energy Diverse Integrations has developed a pilot solution utilising village solar recharge stations to enable communities to have access to reliable and affordable energy services for residential and commercial use. The company solution is innovative as customers - ranging from households, schools, shops, clinics and fish mongers and farmers - can provide us with sustainable options of deployment of energy to address their local needs. The goal is to reach out to all rural communities of Zambia by the year 2030. In the past 12 months, access to energy could be provided to 1,250 people through standalone systems relying on portable deep cycle maintenance-free battery storage back-up, which powers any connected facility that has internal wiring with inverter installed.

### Value Proposition for Investors

Energy Diverse Integrations is looking for a combination of debt

and equity finance to enable the company to cover the Northern villages of Zambia which spans a market value of EUR 106,400 monthly revenue.

### Business Model and Impact

The business utilises a DESCO business model approach which integrates innovation in revenue collection and relies on partnership approaches to reduce on operational costs with a focus to satisfy different customer segments guaranteeing a well-leveraged investment with less Capex but higher impact and higher return on investment. The revenue streams for the facility of the company will be anchored on productive use of energy, commercial users and residential clients, to diversify profit-generation thereby spreading the risks. The project avoids negative social or environmental impacts as the technology meets the Zambian environmental guidelines and positively contributes to enhancing the lives of communities.

### Constraints and Recommendations

Energy Diverse Integrations has plans to innovate the existing project by developing charging stations as a product that can be bought by community users and also to reach out to communities in fishing camps and islands characterised by high demand. The main current constraint has been access to finance for rural electrification. Therefore and based on the currently available resources, it has proved very difficult to achieve. Currently, with regards to renewable energy deployment, a light-handed policy has been developed in Zambia which accommodates the solution presented by Energy Diverse Integrations.

### Contact

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## Project Showcase

Organisation: **Kafita Cooperative Society Ltd**

Title: **Mpanta Solar Mini Grid Plant**

Location: **Luapula, Samfya (Zambia)**

Completion: **November 2013**



## Organisation

Kafita Multi-Purpose Co-operative Society is a non-profit organisation located in the northern region of Luapula province in Zambia at a place called Mpanta of Samfya District.



## Challenge

Kafita is currently spearheading the first ever 60 kW solar power plant in Zambia called the Mpanta Solar Mini Grid Project of which over 450 people are benefiting.



## Opportunities for Renewables

With the advancement of renewable energy technologies, it was now possible to integrate in the system three phase inverters to allow the deployment of productive use of energy by the organisation's clients as well as to improve on revenue collection through smart metering systems.



## Renewable Solution

The solution makes it possible to have 24/7 year-round electricity access. The project is a 60 kW PV system supplying a 936 kWh battery bank providing electricity through 4 X 15 kilovolt-ampere (kVA) inverters to 480 connections comprising a school, market, clinic, small shops, harbour depots, churches, residential and grass-thatched households. The plant has also integrated a

domestic ice plant to accommodate the ice needs of the fish traders. Circuit breakers are installed in every household to avoid overloads ensuring the life span of the plant is optimised. The partnership with the Zambia Ministry of Agriculture enabled the cooperative to benefit from a solar-powered milling plant which was installed next to the solar plant to address the food processing needs of the community. Furthermore, the Zambian Rural Electrification Authority trained staff on operations and maintenance of the project.



## Project Financing and Costs

The total project investment cost was USD 12,500 financed through a loan facility from UNIDO, GEF and the Zambian Government. The project is currently being run by the Kafita Cooperative under a partnership with the Rural Electrification Authority. The Cooperative received the milling plant and fundraised to develop small projects in fresh fish trading, fish farming, vegetable growing and chicken rearing. The tariff structure is based on a monthly fixed rate according to the estimated demand and ability to pay principle of different categories of consumers. Since this was a pilot project, the number of users currently connected under the current tariffs can only cover the cost of operations, however the cooperative is seeking more financing to allow an upgrade of the system to a hybrid for it to reduce battery replacement cost which is a major limiting factor for the economic viability of the plant. The project is expected to pay-off in 20 years.



## Project Outcome

A total of 2,280 people benefited from the project through energy access, lower cost of electricity, reduced indoor pollution and improved productivity of small businesses. Our project was able to collect data for the consumption trends of local communities and research achievable business models, for which it earned two international awards. In the future, we aim to connect more clients and build an industrial ice factory to boost fish preservation. The current licence enables us to extend the project to more villages, and we learnt from this project how to best prepare communities for the deployment of renewable energy, fostering local acceptance and sustainability.



## Contact

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## PRESENTATION

## 7. Ensol Tz Ltd



- Organisation name: **Ensol Tz Ltd**
- Home base: **Dar es Salaam, Tanzania**
- Incorporation: **January 2002**

**Company**

Ensol is a 100% Tanzanian company in business for the past 16 years. Ensol is a first class solar energy contractor and renewable energy project developer. Ensol does EPC for third parties and from its major focus of executing institutional projects, the company has executed projects with central and local governments in Tanzania and projects financed by renowned local and international organizations. Ensol has twice appeared in the list of the Top 100 Small-Sized Companies in Tanzania, in 2011 and 2012. Ensol currently engages 20 permanent employees and an additional 30 persons on contractual basis.

**Challenge**

Tanzania is one of the countries with a low electrification rate. Out of a population of 50 million, the average electricity access rate is 40%, with only 10% in rural areas where over 70% of the entire population lives. People in rural areas depend on hazardous fossil fuel and biomass for their energy needs. Though the government is putting a lot of effort in extending grid power to rural areas, unless alternative initiatives are employed, the situation will remain like this for a long to come.

**Value Proposition for Customers**

Since 2001, Ensol has been supplying customised Solar PV solutions to off-grid areas in the belief that this is the right technology to bring energy access to rural Tanzania. As per customer needs and based on field experience, we can offer pico-solar products, stand-alone systems, solar/inverter back-up systems and medium/commercial scale solar systems suitable for big businesses, financial institutions, health facilities, water pumping stations and solar street lights. Two years ago, the company decided to venture into mini-grids and have currently already commissioned a 48 kW solar hybrid mini-grid in one of the villages in remote rural Tanzania that will connect a maximum of 300 customers. Pipeline preparations for 15 more sites are on-going.

**Value Proposition for Investors**

Ensol is ready and flexible to speak to investors on terms that would

be win-win for both sides. Both, equity and debt, are welcome to finance our various activities.

**Business Model and Impact**

Ensol currently generates an income of about USD 2 million from its general activities like executing institutional projects and selling other products in small scale. In the case of mini-grids, the company sells electricity directly to customers. Ensol has designed service-level flat-rate pre-paid monthly tariffs at an average of USD 50/kWh. Thanks to regulations in Tanzania, a developer can design cost-reflective tariffs for a project below 100 kW.

**Constraints and Recommendations**

The major challenge for Ensol is access to finance. Working with institutions, the company needs to pre-finance all project activities and get paid after projects are commissioned. As there is a growing number of projects now upcoming, pre-financing for a number of projects together has been a big challenge. An equity investment or concessional loan of about USD 2 million would help to address this challenge.

For the mini-grid business, it is still difficult to access private funding as mini-grids are perceived as early-stage. As the pilot project has been in operation for one year now, Ensol is able to show that when investment is well arranged and mixed, also mini-grids can be a profitable business. Ensol needs to raise about USD 5 million to deploy 15 mini-grids in the pipeline.

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## Project Showcase

Organisation: **Ensol Tz Ltd in partnership with Trama TecnoAmbiental of Spain**  
 Title: **50 kW Solar Hybrid Electrification**  
 Location: **Mpale village, Korogwe, Tanga (Tanzania)**  
 Start date: **Commissioned in July 2017**



## Organisation

Ensol imports, supplies, installs and maintains solar PV products and systems of different sizes in the local market. In partnership with Trama TecnoAmbiental (TTA) from Spain and Studer Innotec from Switzerland, Ensol successfully commissioned a 48kW solar hybrid mini-grid. The project was chosen as "Best Off-Grid Project" at the Alliance for Rural Electrification (ARE) 2018 Awards.



## Challenge

Since its establishment in 1972, the 3,000 residents of Mpale village have never accessed electricity despite being a vibrant village. Kerosene was their main fuel source for lighting while biomass was the main energy source for cooking. The need for electricity was vivid from economic activities already existing in the village like milling, carpentry and small shops and tea shops.



## Opportunities for Renewables

Solar PV technology can be deployed anywhere where the sun is shining. Easy and quick to deploy, it does not need expensive transmission lines and can be designed to suit energy needs of a designated community. It can also easily be extended as more energy needs arise.



## Renewable Solution

The project deployed a 48 kW solar hybrid mini-grid that generates AC 3-phase electricity via a 5 km low voltage distribution line. High quality deep cycle batteries provide 265 kWh storage capacity, together with a 50 kVA back-up genset to guarantee 24/7 uninterrupted service to customers.

Three people from the locality, two operators and one administrator are permanently working for the project on operation and maintenance along with customer relation issues. An Electricity Committee with representatives from the village subsections has been formed and is instrumental in connecting the project with the community.



## Project Financing and Costs

Out of the total project investment of EUR 418,000, 63% was financed by the Energy and Environment Partnership Program (EEP), 22% by the United Nations Capital Development Fund (UNCDF) and the remaining 15% by Ensol itself. The project has now qualified for the Result Based Financing programme administered by the Tanzanian Rural Energy Agency (REA) and will be awarded USD 125,000 upon fulfilment of the intended 250 connections.

Service-level cost-reflective tariffs were designed and after lengthy negotiations and engagement with the community, flat-rate pre-paid monthly tariffs were applied. An average customer pays USD 5 per month for a consumption of up to 10 kWh per month. Payback is expected after seven years although this could take longer due to the slowness of customers to connect.



## Project Outcome

Out of the 250 targeted connections, 102 customers have already connected. This includes the establishment of more than 30 new businesses due to availability of electricity. A health facility can now offer uninterrupted service and effective diagnosis of diseases. Direct and indirect employment opportunities have arisen, with women also more engaged in economic activities. The concept will be replicated to 15 villages that have already been identified, provided Ensol USD 5 million in investment can be raised.



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## PRESENTATION

## 8. Entiba Energy

- Organisation name: **Entiba Energy, S.L.**
- Home base: **Madrid, Spain**
- Incorporation: **July 2013**



### Company

Entiba Energy is a developer, engineering and consulting firm devoted to renewable energy. Since its constitution the company look for the best solution in terms of sustainability, costs and benefits, and social impact for each energy challenge of our customers. In July 2017 Entiba Energy Zambia has been created to implement mini-grids in Rural Growth Centers (RGC) and SHS in its vicinity.

### Challenge

Entiba Energy is targeting rural areas in Zambia, where people are currently depending on the daylight, sharing that time for their domestic and agricultural tasks or learning activities at school. All tasks are manual and depend on the weather to grow one crop a year. In some places the only mechanised operation is the maize milling, and old diesel engines are used when fuel is available. They also use kerosene lamps and candles at night.

### Value Proposition for Customers

The mini-grid and SHS customers are the poorest among the poor with a variable income throughout the year, depending on harvest or touristic seasons. The innovative aspect is that Entiba Energy joins first class PV mini-grid technology to generate and supply electricity 24/7 and the appliances to consume it (adapted to each user's income), along with the capacity building to generate new business or improve the already existent economic activities.

The advantage of its mini-grid is the overlap capacity that makes the system more cost-effective (as the same power capacity can be shared among different customers at different times) and allows the installation of industrial-size motors and pumps. It is also less costly and quicker to maintain than SHS since it is confined to a reduced area. That means end user's costs for mini-grids will be less than costs for SHS and they will also have more capacity to improve their economies through more power availability.

### Value Proposition for Investors

To attract customers, Entiba Energy aims to mirror Zambia's grid tariffs (Zesco) during daylight and charge a higher tariff only when the use of battery is necessary. For the financing structure, it proposes a 22% non-reimbursable grant and three years grace period before starting to repay debt until the local economy has been developed and higher tariffs can be charged. The rest of financing project structure is settled as 15% equity, and 63% over 10 years debt. Entiba Energy is flexible and can offer participation in form of equity in company, SPV/project or debt.

Equity remuneration can vary between 10 and 16% depending on final interest rate applied to debt. The case considers an annual interest rate of 8.65% (libor swap rate 15 year + 6% margin), and in that hypothesis equity remuneration will be 14,5% Internal Rate of Return (IRR) at 15 years. The project will be paid off within 13 years.

Its market potential is enormous, since the project is easily scalable by adding new generation units in the RGC and easily replicable by building new ones in different RGC. Even if the company will only serve 10% of rural areas in Zambia, there is a potential market of one million people. The same scheme can be replicable elsewhere provided there is local regulatory support.

### Business Model and Impact

The business model of Entiba Energy foresees income generation from the very first year, which will come from connection fees as well as for fees for electricity consumption and for renting of appliances. From the third year on the business model will generate sustainably profits for paying back the debt and remunerate the equity. The environmental impact will be restricted to a small plot of land where modules, inverters, grid controllers, batteries and charge regulator are implemented. There are no water pollutants, and only noise and air pollutants when the genset is turned on (about 2% of the time). There is a very positive social impact with boosted economic opportunities, also for women, enhanced living standards, and improved health and education.

### Constraints and Recommendations

What is slowing down the project, is the lack of adequation between project conception and available funding. Also, grant ticket sizes are too high, and usually first require checked data on a demonstration pilot.

In addition, the Rural Electrification Authority needs to have a clear mandate and budget, as well as the possibility to set priorities, to provide accurate data on the rural growth centers and the potential target areas. Moreover, specific package regulation for rural services would be useful, as electricity is only a means to access services like appliances, internet, water etc. Finally, local education on business and finance should be boosted.

### Contact

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## Project Showcase

Organisation: **Entiba Energy Zambia**  
 Title: **Entiba Rural Improvement Project**  
 Location: **Mwanye Chiefdom, Eastern Province (Zambia)**  
 Tentative start date: **February 2019**



## Organisation

See above.



## Challenge

See above.



## Opportunities for Renewables

Having an area connected to a mini-grid will allow the population to organise their lives as well as in any other village connected to the national grid. Using a PV system will save them the cost and pollution from diesel (which is not always available) and from kerosene, which creates a toxic domestic environment.



## Renewable Solution

In Mwanje village, Entiba Energy Zambia will become the utility and perform O&M, after sales services including payment collection, solving technical issues at installations of customers and new business supervision. The main source of electricity will be a 100 kW off-grid PV system plus 230 kWh batteries for an area covering a radius of 1.5 km from the installation. Customers outside of that action radius will be supplied with a SHS. There will also be a small 25 kVAs diesel generator only intended for emergencies.

Training and local capacity building will be provided by a local NGO working with the population to be familiarised with electricity, to teach them how to use the appliances and to provide them ideas and tools and supervision to raise their own business. Some locals will be trained to perform O&M tasks to ensure the long-term sustainability of the project, whereas others (mainly women) will learn about aftersales service and payment collection.

Time frame will be at least 20 years, although it can be as prolonged as the owner desires. Changing solar modules after 20 years operation for more efficient ones will be less costly. The same can apply to batteries and electronic components of the installation. Wires, post, junction boxes and metres can have extended life service with the adequate maintenance.



## Project Financing and Costs

See above.



## Project Outcome

In Mwanje Chiefdom live around 5,000 people, thereof 950 attending primary school. They will have access to electricity for productive and domestic uses. They will save money on kerosene, candles, woods and diesel and they will be better served with reduced pollution. Their resilience will be increased since their crops will be less dependent on the weather, and they will be able to grow two crops a year generating more resources. They will have a better access to education and information, and electricity will provide ways for them to be more productive.

As long-term impact is expected that new business related to services are created, such as shops, restaurants, hair dressers, telecom providers, etc. In the future, we plan to upscale the installation to supply more power to the local economy and use it as a training center for nearby chiefdoms where new plants are planned to be built. All lessons learned from this first installation will be applied in the coming ones.



## Contact

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## PRESENTATION

## 9. Infinite Fingers

- Organisation name: **Infinite Fingers GmbH**
- Home base: **Crailsheim, Germany**
- Incorporation: **November 2016**



INFINITE FINGERS

 Company

Infinite Fingers is a Germany-based company that offers monitoring and control solutions for off-grid and hybrid power systems with special focus in Lithium-Ion batteries management.

 Challenge

The power sector has the biggest potential for replacing fossil fuels and cutting emissions thanks to renewable sources of energy. This will require strong investments to transition from the currently centralised electricity to a decentralised model and to provide large scale solutions for the management and control of the millions of future hybrid and off-grid power systems that will be required.

Moreover, these systems today are not ready for this step: due to its high versatility, which typically consist of dozens of different components from different manufacturers, there is currently no way of remotely controlling and connecting these components, i.e. there is a lack of general system management solutions.

 Value Proposition for Customers

Infinite Fingers have developed a solution for the needs of the world's future off-grid electricity: UMC, a Universal Monitoring and Control solution for hybrid and off-grid power systems consisting of a combination of a central hardware controller that allows the interconnectivity of all components in the off-grid system, a cloud server, and a software platform which is used for monitoring, control and data analytics.

Our main customers are hybrid and off-grid system operators/integrators that sell their solutions in different sectors, like micro-grids, telecom-towers, construction sites, emergency services, water desalination plants etc. These customers (which predominantly use wind-solar-diesel hybrid systems with other combinations such as solar-diesel hybrid or wind-hydro-diesel hybrid), have the following needs: (i) energy reliability, (ii) lower the O&M costs, (iii) expand system durability and (iv) hardware flexibility.

- (i) Energy Reliability: Thanks to the company's control algorithms, its technology is able to save at least EUR 2,500 / system during the entire life-span (average. total cost per system: EUR 50,000).
- (ii) O&M costs reduction up to EUR 5,000 /system during the entire life-span (up to 50% of O&M costs reduction).
- (iii) Increase lifespan up to 20%. This is mainly due to the reduction of the battery stress that our control algorithms allow.
- (iv) Manufacturer agnostic: The solution of Infinite Fingers allows full flexibility on component selection enabling competitive supplier stress. Cost savings due to this supplier stress can be up to EUR 2,500 per system.

 Value Proposition for Investors

Infinite Fingers is already generating some revenues through sales of the hardware controller or/and licences to get access to our online portal. The company has installed more than 80 prototypes for different purposes (mini-grid, off-grid systems, hybrid systems, water desalination plants) in different countries like Austria, Canada, Germany and United Kingdom, as well as in Colombia, Congo, India, Tanzania, Tunisia, and Uganda .

Besides the public funds, the incomes from those installations are contributing to finance the current development and tests of the system (circa EUR 40,000 so far). For its financial needs Infinite Fingers is looking for raising a seed-round of about EUR 400,000 to 600,000 via equity in the third quarter of 2018 or the first quarter of 2019 and raise an extra EUR 500,000 via other German or EU grants in the following months.

 Business Model and Impact

Infinite Fingers foresees three revenue streams for the commercialisation of its technology:

1. Hardware controller sales where revenues are based on sales of the controller hardware (one-time acquisition with limited software functionality);
2. Upselling via enhanced monitoring and control services based on a yearly fee or one-time fee for a time-limited software licence;
3. Data as a service where once large amounts of data related to complex systems is collected, the company can generate valuable knowledge that can be monetised.

All of its projects imply social and/or environmental impact, since they all help to reduce CO<sub>2</sub> emissions, and some of them are being deployed in developing countries creating a deep local social impact.

 Constraints and Recommendations

The market is relatively slow-moving, but still with lots of potential. There are no policies in place that directly affect Infinite Fingers, since it sells to operators and integrators in and outside the EU.



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## Project Showcase

Organisation: **Infinite Fingers GmbH and MFT**  
 Title: **Remotely Controlled Off-grid Water Desalination Plant Based on Reverse Osmosis**  
 Location: **La Guajira (Colombia)**  
 Completion: **End 2017**



## Organisation

For Infinite Fingers GmbH, see above. Membran-Filtrations-Technik GmbH (MFT Cologne) is a medium sized company based in Cologne, Germany with over 20 years of experience in the design, building and operation/servicing of membrane-based water purification systems for fresh, drinking, salt, process and waste water.



## Challenge

The aim of this project is to establish a proven operating model for providing clean drinking water from sea water in under-developed regions powered using only renewable energies. In order to do that, MFT Cologne and Infinite Fingers have led a project to develop and implement an innovative first pilot plant of a self-powered water desalination plant that is currently fully operational in a Colombian region called 'La Guajira'. Even though La Guajira is on the coast in the northeast of Colombia, it is a very dry area, and the local residents, many of whom are indigenous, are poor and suffer from a lack of clean drinking water.

This pilot is the first of a number of systems that will be distributed throughout Colombia (and potentially in other countries too). It aims to show that an operating model can be established in which both the social and environmental impact of such projects is maximised, with a private and/or public finance model in place.



## Opportunities for Renewables

La Guajira is a very windy and sunny area of north of Colombia. These resources can be used to power the water desalination plant, and make it work potentially 24/7.



## Renewable Solution

MFT Cologne and Infinite Fingers have developed a desalination system that produces up to 120 litres drinking water per hour from any sea water source (up to 20-metre depth water intake) based on reverse osmosis membranes. The required electrical energy will be provided solely from renewable energy consisting of wind power and solar panels and lithium ion battery storage in order to have the capacity to operate 24/7.

The key feature is that this new technology can be 100% remotely controlled and monitored where all relevant parameters from both the energy system and the water plant are automatically uploaded into the "cloud". From the cloud we can offer web-based or app-based data access to all interested parties and can even remotely access the system for upgrades and other active control features.

The ultimate benefit for consumers is to have clean drinking water with almost zero operating costs almost anywhere where only polluted water is available. Consumers also have complete peace of mind that the system will continue to offer trouble-free long-term operation, since an external service company will be providing preventive services. This first pilot unit has been donated to a school in La Guajira in collaboration with 'Colenergy', a local partner in Colombia.

The companies trained local Colombian staff in Cologne and also provided further training for maintaining and troubleshooting the system at the installation site. Although only low maintenance is needed, it is the intention to ensure that the beneficiaries are ultimately autonomous and responsible for the long-term operation themselves.



## Project Financing and Costs

In February 2016, the German government agreed to 50% co-fund a EUR 400,000 research and development project through KfW, to develop a new stand-alone technology with the purpose to desalinate sea water and to produce clean drinking water.

As a proof of concept, with the pilot unit a business model based on bottled water sales to the community in gallons was also implemented, which will provide the school with an additional income. This model could potentially underpin these types of systems, allowing for not only a long-term social and environmental impact, but also the potential for an economic return on investment, depending on the financiers and the project framework.



## Project Outcome

The "RO 100 Sea" system is currently operational and supplying hundreds of school kids and their families with clean drinking water. If the drinking water quality falls below a certain limit, the system switches off automatically to prevent unfit water from being supplied to consumers. The goal is to operate and to monitor a large number of decentralised, stand-alone and CO<sub>2</sub>-free drinking water systems via a centralised, cloud-based platform, powered exclusively by renewable energy.

Many different applications of this pilot unit are possible. It will be possible to mix and to match different raw water qualities (sweet/salt water) and different water output quantities. By adjusting power production and power usage, this system can easily be used for different purposes, such as water purification or micro water and energy grids that are fully accessible remotely.



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## PRESENTATION

## 10. LED Safari



- Organisation name: **LEDsafari SA**
- Home base: **Lausanne, Switzerland**
- Incorporation: **April 2016**

 **Company**

LEDsafari is a clean-tech social start-up based in Lausanne, Switzerland that develops innovative digital products to help solar companies and organisations to manage their staff and assets. LEDsafari uses its innovative solar kits for education purposes, online training platform for skill development and IoT sensor for online monitoring of the solar devices (SmartHelio©).

 **Challenge**

LEDsafari is targeting capacity building and O&M issues for solar installation. Currently, organisations use informally trained people for this purpose. Further, the quality training is time consuming.

 **Value Proposition for Customers**

LEDsafari has a unique integrated solution to support solar companies in the formation of skilled employees and in the tracking of their asset performances. Its main customers are solar installers, distributors and manufacturers in developing markets. LEDsafari is starting with India and East Africa where the market is quickly growing and bigger solar systems are becoming of common use (<10 kW). The LEDsafari IoT sensor (HelioHealth©) enables companies to track the performance of their solar panels individually and its online platform (HelioLearn©) has an innovative and pedagogical approach that covers from electrical fundamentals to installation and maintenance of a SHS, microgrid to business subjects.

 **Value Proposition for Investors**

We are looking for equity from a strategic investor (telecom, solar manufacturer etc). We are offering 15-20% in equity. The market size is USD 10 billion globally, including remote monitoring and digital training in the utility sector.

 **Business Model and Impact**

LEDsafari has a B2B SaaS business model and addresses distributor companies working with small-scale solar (<10 kW) systems in emerging economies (Africa, South Asia, South East Asia, Latin America). Until last year, it had 40% grants and 60% revenue and it is expected to have 100% revenue within the next two years. LEDsafari also opens B2C model for youths in developing countries to use our platform to get a certification. This can directly impact the employment rate in the solar industry and can potentially be expanded to other sectors.

 **Constraints and Recommendations**

The two main challenges are firstly lack of access to finance and secondly of internet penetration. However, as solar demand is increasing, governmental policies on training specifically focused on renewables, will potentially give LEDsafari a boost.

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## Project Showcase

Organisation: **LEDsafari SA**  
 Title: **Solar Training in Uganda**  
 Location: **Uganda**  
 Start date: **June 2018**



## Organisation

LEDsafari is a clean-tech start-up with expertise in solar PV. Its products and services assist solar companies to increase the PV growth in developing countries.



## Challenge

Energy access is a challenge in the countries of East-Africa. In Uganda, only 26.7% of the population had access to electricity in 2017 and solar PV has become an important key to face this obstacle. However, there is a lack of trained people for solar installations, operations and maintenance. Within the next five years the solar industry will grow at 30% in emerging economies and 9.1 million people will be required to work in solar industry.



## Opportunities for Renewables

Uganda is located on the equator and its solar irradiation rates are

very favourable for PV technology. The solar market is also fast developing (10-15% CAGR) in the country.



## Renewable Solution

LEDsafari, in partnership with Enlight Academy, plans to train 150 technicians by the end of 2019. They started their work in June 2018 where they trained 14 people for two months in Mbarara. The goal was to train skilled professionals to grow the solar market in Uganda. The training covered from basic fundamentals in electricity to the installation, operation and maintenance of a PV system. In addition to the theory in class, the training was provided with practical sessions simulating the challenges that they will face when working in real market.



## Project Financing and Costs

The project initial cost was USD 150,000. This was co-financed by Swiss development agency, Swiss Re foundation and Signify (former Philips) lighting foundation. The trainings are now used by their partners.

LEDsafari runs a SaaS model where customers (solar companies, organizations and vocational institutes) pay per user access price of USD 5-30 for a year. Since, the system is online, the overhead costs is low. However, the main costs are the course development and sales & marketing.



## Project Outcome

The training was based on the main skills needed for professionals of local solar companies. The final assessment score of the participants showed that all of them are prepared to install, operate and maintain solar PV systems in Uganda.



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## PRESENTATION

11. START Africa Pvt Ltd +  
Windkinetic Italy

- Organisation name: **START Africa**  
(Sustainable Transformation of Africa with Renewable Technologies)
- Home base: **Harare, Zimbabwe**
- Incorporation: **November 2017**
- Organisation name: **Windkinetic**
- Home base: **Florence, Italy**
- Incorporation: **April 2015**


 Companies

START is founded on the integration of hybrid renewable energy technologies and smart agriculture applied to connected villages, radically transforming living conditions in rural homes. Solar-biogas micro-grids are used for lighting, to power appliances as well as to power boreholes. As a result, the quality of life in the homesteads will be revolutionised and so will be the development impact. Diligently supervised and executed by on-site agronomists, conservation agriculture brings sustainability. Stored water in overhead tanks is consumed in homes, while enabling drip irrigation in the fields for the summer and winter crops, ensuring the commercial viability of START.

WindKinetic Off-Grid Power Systems is a Florence, Italy based company incorporated in 2015 and specialising in renewable energy off grid power systems. It designs and produces innovative solutions for renewable energy distributed power generation for off-grid applications and micro-grids. It operates worldwide as technology suppliers, system integrators and engineers often on EPC basis. The systems offered by the company are deployed in different fields and markets worldwide: NGOs, rural electrification, mining industry, oil & gas offshore, telemetry, disaster relief and civilian use. Its main markets are South-East Asia, Sub-Saharan Africa and Asia. WindKinetic Off-Grid Power Systems addresses key issues on renewable energy generation such as energy cost and system reliability. Its warrantied micro-grids are standardised modular systems, easily scalable, super serviceable.

 Challenge

Life in rural Zimbabwe (and Sub-Saharan Africa) is characterised by extreme poverty. Household incomes from farming are less than USD 30 per month, massive deforestation is rampant to sustain open-fire cooking, resulting into smoke inhalation and health problems. Water collection from wells, homesteads having unpowered agricultural production and subsistence level farming being the norm condemn entire communities to poverty.

 Value Proposition for Customers

Renewable energy from solar PV and bio-digesters is well understood. The innovation of START arises from the combination of renewable energy with conservation agriculture, a game changer that provides greatly improved income for homestead owners and their contract labour. This in-turn provides the stimulus for economic development in the surrounding communities.

Summer and winter cash crops have been selected based on adaptability. Highly viable prices are paid to START by six companies whose business either entails the packaging and distribution into retail supermarkets or their end-user markets.

 Value Proposition for Investors

There are two elements planned for financing: the one being through grants at nominal interest, from at least one of the several funding sources, such as the Global Climate Fund or Norad's EEP and the other is through their crowd-funding initiative. KPMG has been approached to undertake the role of Grant/ Fund Managers. Substantial seed capital was provided by Engineer Trust Chifamba, whose village homestead became the proof of concept for all elements of START.

 Business Model and Impact

The target markets are the affluent supermarkets in Zimbabwe. Those supermarkets currently import high volumes of vegetables from South Africa. Hence START's production will largely be import- substitution. As Conservation Agriculture methods are fully implemented, the use of all fertilisers and chemicals will fall away, opening the way to achieving organic status, and major export opportunities.

The detailed financial models of the companies show that sustainably high profits and return on investment can be achieved with enhanced social and environmental conditions.

 Constraints and Recommendations

Securing the necessary finance is the main constraint. Thereafter all tasks can be executed in the normal course of business. There is no public policy which impedes the implementation of START.

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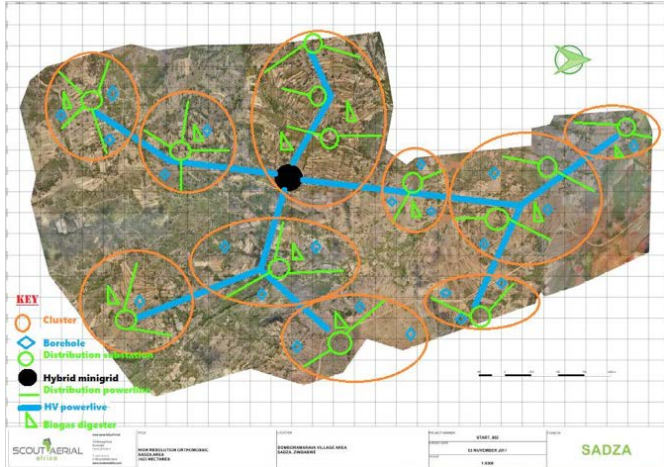
## Project Showcase

Organisation: **START Africa Pvt Ltd**

Title: **Domboramavara Area Proof of Concept**

Location: **45 km from Hwedza Centre, Mashonaland East (Zimbabwe)**

Completion: **1 October 2018 to 30 May 2019**



## Organisation

START Africa was incorporated in November 2017. It employs six full-time experts, including an electrical engineer/energy expert, an agronomist, a management consultant, and a development studies expert.



## Challenge

The Domboramavara Project Area has 92 homesteads, two schools and a rural shopping centre. The villagers practice subsistence agriculture which is very inefficient and has low productivity (less than USD 200/hectare per annum). They have no access to ground water, which is otherwise plentiful, as there is no electricity to pump into overhead tanks. Massive deforestation for firewood, and poor women's health are the respective deleterious outcomes.

The electricity from the hybrid micro-grids will be used for water pumping, lighting, and small appliances. Biogas from locally available cattle will be used for cleaner cooking, as well as running the generators which will be complementing the solar micro-grids. Major obstacles to overcome will be securing project development funding and finance for training the villagers to practice smart agriculture, for learning efficient uses of electricity and gas, as well as for securing higher level local government buy-in.



## Opportunities for Renewables

Hybrid renewable micro-grids will provide electricity for water pumping, as well as biogas for cooking, thus making water available all year round, as well as changing the cooking methods

to cleaner ones. Thus, abundant and hitherto untapped renewable energy will achieve what grid electricity has failed to do: change livelihoods and end poverty sustainably and in a commercially-viable way.



## Renewable Solution

START Africa has adopted a design of nine micro-grids, each serving a cluster, which will also have boreholes and biogas digesters (see map above), serving an area 9.2 km<sup>2</sup>. The locals are being trained in conservation agriculture methods which will provide the productive use of energy. Local youths will be trained to render basic maintenance of the energy and water infrastructure. The agricultural productivity of the area will jump from USD 40,000 per annum currently to about USD 2.2 million per annum, feeding guaranteed local and regional markets, giving employment to villagers. The Domboramavara Project will be implemented over six months.



## Project Financing and Costs

The Project has a CAPEX of about USD 2 million. The agricultural inputs, villager training, and operating costs (OPEX) will be about USD 1.5 million. The project will be financed using a combination of crowd-funding as well as funds from the Green Climate Funds. There will be an indicated tariff as energy supplied will be metered and offset by agricultural produce. The project has an IRR of 18% and a simple payback of four years.



## Project Outcome

The project will benefit a total of 1,200 people who will have access to electricity, cleaner water, less polluted kitchens, and vastly improved nutrition and disposable incomes. Apart from the health benefits, and generous incomes, the villages now have much improved resilience to climate change as effects of droughts and bad seasons will be mitigated. A proof of concept at two Chifamba Homesteads in the area has been very successful, bringing employment to six people, biogas for cooking in two kitchens, and viable yields exceeding 600% over previous years.

The Domboramavara project will be replicated in nine districts located in nine provinces of Zimbabwe. The same renewable technologies will be used, and the economy of Zimbabwe is expected to jump from the current USD 10 billion to USD 40 billion in 10 years. Access to funding has been the biggest barrier to providing this sustainable concept, and this remains the biggest obstacle.



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## PRESENTATION

## 12. Sustainability Professionals

- Organisation name: **Sustainability Professionals**
- Home base: **Mbombela, South Africa**



### Company

Sustainability Professionals (Pty) Ltd is a social enterprise focusing on solving the cooking needs of rural schools and communities in the Southern Africa Development Community (SADC). It sells fuel-efficient Mashsha Stoves that cook with large pots for institutional use, and medium-sized ones for household use. The company's stoves use biomass/wood fuel, but use half of the fuel normally required with open fires and are a lot safer to use, as we used a closed gasification process for combustion.

In 2016, the company won the "GIBS Festival of ideas: Social Impact winner" and "SA Breweries Award at the SA Innovation summit: Social Impact winner". In 2017 Sustainability Professionals won the "Envirologic award: Merit award in the Energy Efficiency category", the "African Entrepreneurship award winner- Education category" and also secured a grant from the Diageo Empowerment Trust Fund, allowing for the purchase of biomass briquetting equipment, more R&D and job creation.

### Technology

The Mashsha metal cook stove burns with a clean hot flame using gasification techniques. It saves 56% fuel, is nearly smoke free and halves the cooking time. The stoves are also safer to use, thanks to a closed gasification process.

Briquettes are produced as a supplementary fuel made from waste cardboard, which beneficiaries are taught to make - large biomass briquette composition ratios are currently being finalised before getting the product to market and expanding the product range. The niche is the novel invention that has provided clean, stable energy for low-tech household and/or mass use in a culturally appropriate way.

The value chain is a combination of innovative production (Mashsha/briquettes) with low-technology selling channels, suitable to African markets.

### Impact

#### SDGs supported

The product supports Sustainability Development Goals 3, 5, 7, 12 and 13, which address good health and well-being, gender equality, access to energy, mitigate climate change and responsible production and consumption.

#### Job Creation

To date, six out of 10 new created jobs have been for women. Sustainability Professionals are empowering women through providing a product that reduces the amount of wood and time needed for preparing food, thus freeing the womens' time for other activities, including education. Sustainability Professionals are providing skills development through creating employment opportunities for women. Sales women are trained in the use of the stove, sales techniques and good business practices.

#### Environmental Benefits

- 34,500 rural schools in South Africa rely on wood to prepare food for learners daily. Because the Mashsha stove uses half the amount of wood compared to an open fire, there is the potential to save 33,000 tonnes of wood from being burnt, which will also prevent 52,000 tonnes on CO<sub>2</sub> being emitted.
- Additional environmental benefits include preventing deforestation, biodiversity loss and mitigating climate change.
- The quality of the environment in which the cooks operate are also improved in that they are not exposed to huge amounts of smoke.



## PRESENTATION

## 13. Tiger Power



- Organisation name: **Tiger Power**
- Home base: **HQ in Belgium, permanent office in Uganda**
- Incorporation: **December 2016**

 **Company**

Tiger Power is a Belgian manufacturer of renewable energy solutions. It offers containerised and plug-and-play energy solutions. This allows for increased mobility, quick installation and gradual increase of power generation.

 **Challenge**

Tiger Power aims to electrify off-grid customers: off-grid communities, telecom towers, man camps and agricultural applications by replacing diesel generators with renewable energy solutions. It is currently active in Belgium and France as well as in India, Senegal and Uganda, and it aims to work in any country which needs quality electricity.

 **Value Proposition for Customers**

Tiger Power offers pre-engineered, pre-manufactured and assembled energy solutions to off-grid users which are installed in less than one hour. Its foldable solar solution with a lead crystal battery bank is called the Sunfold. To ensure 100% uninterrupted electricity to customers, Tiger Power has also developed a long-term hydrogen back-up solution, the Storager.

The combination of Sunfold and Storager allows to guarantee its off-grid customers 100% uninterrupted, renewable and high quality electricity. For customers like telecom towers, Tiger Power significantly reduces their operating costs by replacing diesel generators, which require high maintenance and fuel costs. For users like lodges, the aspect of 100% renewable energy, i.e. the sustainability factor also contributes to their company image which attracts environmental-sensitive clients.

 **Value Proposition for Investors**

Tiger Power is currently building three mini-grids in Kyenjojo, Uganda. Its aim is to significantly increase this number by

developing commercial projects and thus, it needs access to project finance. Tiger Power is happy to collaborate with investors to develop a 'scalable finance product' dedicated for mini-grid development in collaboration with investors.

 **Business Model and Impact**

Tiger Power sells its equipment to off-grid users which guarantees uninterrupted electricity supply with 100% renewable energy. This allows the company to provide power to its customers without emitting a single gram of CO<sub>2</sub>, thereby, having a positive environmental impact. The significant economic impact comes from strongly reduced operating costs.

The ability and willingness to pay for electricity in rural villages across Sub-Saharan Africa is low. Tiger Power will, therefore, both sell electricity and additional high value services through a separate entity to ensure a high revenue stream to run a healthy business.

 **Constraints and Recommendations**

First, Tiger Power is looking for financing solutions which would enable it to start small (from 1-10 commercially operated mini-grids) and to grow large (to around 200-500 mini-grids) so it can employ economies of scale to its business. Secondly, the policy framework for mini-grid development in Sub-Saharan Africa lacks clearance and predetermination. An improved licensing process will certainly strengthen the confidence of investors in the sector.

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## Project Showcase

Organisation: **Tiger Power**  
 Title: **Mini-grids in Kyenjojo**  
 Location: **Kyenjojo (Uganda)**  
 Start date: **October 2018**



## Organisation

Tiger Power is a Belgian manufacturer of renewable energy solutions. Next to manufacturing the renewable power plant, Tiger Power also operates the mini-grids to distribute electricity in the communities where the plant is installed.



## Challenge

Three trading centers in Kyenjojo, Kyaburyezibwa, Mukiti, and Nyamicu in Uganda do not have access to electricity. Kyaburyezibwa is home to about 1,000 households and a number of small size businesses like shops, hotels, bars and a miller. The community is currently served by a small number of solar home systems.

However, the businesses and social institutions such as the health center are in need of quality electricity to grow and contribute to the community development.

It has been a challenge to get the Ugandan Rural Electrification Agency to sign a contract stipulating the responsibility of Tiger Power to provide the power generation and to build the distribution grid by itself.



## Opportunities for Renewables

The renewable energy solutions of Tiger Power bring high-quality

and affordable electricity to the community. In this way, the community can develop in an environmentally responsible way.



## Renewable Solution

Tiger Power will bring a number of Sunfolds and Storagers to the trading centers of Kyenjojo. The Sunfold is a foldable PV-array including a lead-crystal battery bank. Tiger Power will assist the REA for a year in training local technicians and maintaining the power plant. Afterwards, the REA will be responsible for operations.



## Project Financing and Costs

The total cost of the project is EUR 600,000. Tiger Power has received a grant from the Belgium government for this project. During implementations it cooperates with the University of Southampton in the United Kingdom to conduct the feasibility study and measure the socio-economic impact of the mini-grids in the community. After installation, the mini-grids are transferred to the REA who is responsible for operation and hence price model.



## Project Outcome

The beneficiaries are the households, businesses and social institutions who thanks to the solution provided by Tiger Power will have access to affordable and uninterrupted electricity. The health, socio-economic and environmental impacts, such as the elimination of the diesel powered engine of the miller and the availability of more advanced equipment in the health center, are paramount.

Tiger Power is currently shortlisted for a tender to develop and to operate 25 mini-grids in Northern Uganda. With the Kyenjojo projects implemented and operational, Tiger Power has a proof of concept which helps winning this tender. Such a proof of concept will also allow for further large upscaling. It shows the Ugandan government that Tiger Power is engaged to invest in Uganda. Moreover, it also shows potential investors its capabilities. Finally, it shows that Tiger Power can replicate this approach in other countries.



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## PRESENTATION

## 14. Virunga Power

- Organisation name: **Virunga Power**
- Home base: **Nairobi, Kenya**
- Incorporation: **November 2011**


 **Company**

Virunga Power was formed in 2011 as a developer, investor and operator of renewable power projects and rural distribution grids. Its focus is on megawatt-scale rural utility projects across several countries in East Africa and beyond with a goal of bringing high-quality and low-cost power to rural communities, wholack reliable access to modern energy. The Virunga Power team consists of experienced professionals in development, finance, contracting, construction and operations to apply a flexible, hands-on approach have enabled the company to become an attractive platform for other regional developers and financiers alike.

 **Challenge**

Virunga Power aims to serve the 600 million people that live in Sub-Saharan Africa (mostly in densely populated rural areas) and lack access to low-cost and reliable power. At current population and electrification growth rates, the number of people without access to power is only increasing. Virunga Power recognises that the region's electrification market is virtually inaccessible to the estimated USD 4 trillion in global infrastructure investments each year. Through its innovative "grid-as-anchor" model, focused on East African market (Kenya, Tanzania, Zambia, Burundi & Rwanda), the company hopes to unlock these pools of international capital to address rural electrification in the region.

 **Value Proposition for Customers**

Virunga Power's small hydro focused "grid as anchor" approach allows it to provide power to its customers at unparalleled low-cost and quality. When this power is used for productive uses in the East African rural setting, customers can capture significant additional economic surplus from the agricultural value chain.

 **Value Proposition for Investors**

Through a potential framework agreement with the Virunga Power Platform, an investor (or a consortium of investors) has the opportunity to deploy capital efficiently and at scale into the East

African small hydro (5-20 MW) and distribution space. The Virunga Power Platform's experienced development, finance, contracting, construction, and operations team grant investors unique access to a regionally based team that is capable of streamlining truly bankable high-quality small hydro projects to international standards with attractive return profiles.

 **Business Model and Impact**

The "grid-as-anchor" model of Virunga Power is underwritten by cash-flows from projects with long-term contracted USD denominated PPA's, signed with national utilities and insured by multi-lateral institutions. The revenues from project cashflows are further supplemented by prepaid power sales through our grid-adjacent mini-grids and service fees for development, financial services & management, O&M, and construction management. Each of our projects is designed to incorporate local ownership and direct employment, effectively converting untapped local renewable energy resources into locally owned and managed economic resources, providing significant social benefit to the local and regional communities.

 **Constraints and Recommendations**

For developers, access to flexible and quickly deployable capital is the limiting factor in East Africa small-scale renewable energy development; while investors struggle to find opportunities with sufficient scale and bankability in the small-scale renewable energy space. By establishing a robust relationship and framework-financing agreement with Virunga Power, investors can deploy capital efficiently in the small-scale renewable energy space and Virunga Power can accelerate its development pipeline.

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## Project Showcase

Organisation: **Virunga Power**

Title: **“Songa Energy” Small Hydro Projects**

Location: **Burundi**

Start date: **Construction starts in 2019**



## Organisation

Songa Energy and Virunga Power have established a partnership to jointly develop, to own, and to operate a portfolio of small hydropower projects in south-central Burundi with the ambition to operate a private rural utility concession supported by those projects in the region. By leveraging Songa Energy’s understanding of local context and established local relationships, and the small hydro development platform of Virunga Power, the pair hope to pioneer the development of the first privately-owned small hydro projects in Burundi.



## Challenge

The projects are based in Burundi – which ranks third worst in the world for access to electricity, with only 5% of the population able to access electricity in their homes and 95% of this electricity utilized in the capital city of Bujumbura. Recent political instability, incomplete or unclear power regulations and laws, and lack of precedent private renewable energy projects make development in Burundi challenging. However, a recent gathering of political goodwill around private-sector investment in energy development has opened the door to new participants.



## Opportunities for Renewables

Given the lack of electrification in Burundi, small hydropower development is ideal considering the country’s natural resources, characterized by consistent surface water flow and mountainous terrain. Projects designed as “run-of-the-river” hydro plants, capable of being constructed with local labour and materials, present an opportunity for clean power generation and economic development.



## Renewable Solution

Songa Energy has successfully advanced development work and established key relationships with the local community and government regulators in Burundi. Due to the nascent nature of the power market, the company must engage collaboratively with local stakeholders to draft key project documentation and regulations pertaining to the renewable energy space. By partnering with Virunga Power, their expertise in contracting to work with key stakeholders (including Power Africa) could be leveraged by Songa Energy to draft legislation and key contracts to attract development and construction capital.



## Project Financing and Costs

The first two small hydro projects are expected to cost a total of USD 32 million. Virunga Power and Songa are seeking financing for the construction of the two projects.



## Project Outcome

Following successful completion of these two projects, Songa Energy and Virunga Power plan to develop additional renewable energy projects and inter-connected distribution assets anchored around these projects. The pair intends for these inter-connected distribution and generation assets to form a rural utility through a private concession in the country.



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## PRESENTATION

## 15. Wagienience (WHC)



- Organisation name: **Wagienience (Pty) Ltd (WHC)**
- Home base: **Pretoria, South Africa**

### Company

WHC was founded in 2007, trades as WHC and is registered as Wagienience (Pty) Ltd, which is derived from Water, Hygiene and Convenience. Water represents our substance focus, Hygiene represents the Green Economy we serve, Convenience represents the innovative solutions and services to sustain our environment.



The company was established by Paseka Lesolang at the age of 18, with the intention to solve socio-economic problems, save water, sustain the socio-cultural environment and contribute to communities at large. Initial inventions and operations were in the garage of his grandparents' house in Ga-Rankuwa, a township in Pretoria.

WHC (Pty) Ltd was selected as partner in the MassMart Supplier Development Programme, with a view to providing the units to outlets in 40 countries, including the USA. (MassMart's parent company is Walmart, with a 51% shareholding). MassMart announcement and advertisement, October 2017: "MassMart is committed to supporting and developing local manufacturers. This is why we are investing in Paseka Lesolang, Founder of the WHC Leak-Less Valve™. He is an innovator and partner in the Massmart Supplier Development Programme; just another way we create opportunities to prosper."

The company won numerous awards including "One of Top 3 Most Disruptive and Promising Water Startup in the World" in 2015 in Spain, and the following ones in South Africa:

- Technology Top 100 Company Winner (2014)
- The Innovation Hub Entrepreneur of the Year (2014)
- Recipient of the inaugural GreenOvation Start-Up Green Entrepreneur Award (2015)
- Recipient of the Eco-Logic Awards certificate (2015)
- Green City Startup Winner (2015)
- The Independent Media TYI (The Young Independents) Top 100 Young Inspiring and Aspiring Leaders 1st Prize Winner in the Innovation Category (2017)

### Technology stage

TRL 9 (Market application)

### Technology

The WHC Leak-Less Valve™ is a water control device that can detect and save up to 70% of water currently lost through toilet leaks and saves the money that is used to pay for this water. A toilet is the single largest water consumer in the house, accounting for ~28% of overall usage. A leaking toilet can waste 30 litres - 700 litres (approximately 7 bathtubs) of water per day.

Models of the product have been created to cater for 75% of the market (up from 30% during GCIP-SA participation in 2014). The total addressable market in South Africa is approximately 12 million waterborne toilets, in Africa approximately 150 million, in EU countries approximately 120 million, in USA approximately 320 million, in the BRIC (Brazil, Russia, India, China) countries alone there are approximately 750 million toilets. The total addressable market in the above-mentioned territories is approximately 1 billion, 352 million toilets that are eligible for the WHC Leak-Less Valve™.

### Impact

- End 2017 – Developed skills and created jobs for 26 people
- Public sector contracts will lead to the creation of 220 jobs for the duration of the contracts, in WHC's two factories and distribution activities.

### Links to SDGs

Environmental impact has been demonstrated and measured through various pilot plants in communities in South Africa, including:

- Savings verified through pilot project: 39 litres/day per installation (~6.072.300 litres of water {equivalent to 2.5 Olympic swimming pools} saved within six months through the installation of 865 WHC Leak-Less Valves in one community)
- Encouraging behaviour change facilitated by 26 women and youth trained as plumbers to install the units and educate communities, as well as through the results of baseline studies (ultrasonic metering of toilets equipped with and without the Leak-Less Valve)

### Contact

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## LIST of ABBREVIATIONS

AC	Alternating current
Ah	Ampere Hour
AEEP	Africa-EU Energy Partnership
ARE	Alliance for Rural Electrification
CAPEX	Capital expenditure
CO <sub>2</sub> eq	Carbon Dioxide Equivalent
CSO	Civil Society Organisation
DC	Direct Current
EUR	Euros
GCIP	Global Cleantech Innovation Programme
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GSM	Global System for Mobile Communications
IRR	Internal Rate of Return
KES	Kenyan Shilling
Kl	Kilolitre
kVA	Kilovolt-ampere
kW	Kilowatt
kWh	Kilowatt Hour
kWp	Kilowatt Peak
LCOE	Levelised Cost Of Electricity
LED	Light-Emitting Diode
LV	Low Voltage
MDB	Multilateral Development Banks
mW	Milliwatt
MV	Medium Voltage
MW	Megawatt
MWh	Megawatt hour
NGO	Non-Governmental Organisation
OPEX	Operating Expense
O&M	Operation and Maintenance
PV	Photovoltaic
RBF	Results-Based Financing
REA	Rural Electrification Agency/Authority
RGC	Rural Growth Center
SaaS	Software as a Service
SDG	Sustainable Development Goals
SDG7	Sustainable Development Goal Number 7
SEforALL	Sustainable Energy for All
SEPS	Sustainable Energy Project Support
SHS	Solar Home System
SME	Small and medium-sized enterprises
TRL	Technology Readiness Level
UN	United Nations
UNIDO	United Nations Industrial Development Organization
USD	US Dollars
V	Voltage
W	Watt
Wp	Watt-peak

# ENERGY ACCESS FROM THE BOTTOM UP:

START-UP AND SME  
SHOWCASE  
2018

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## With the collaboration and photos of

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## About AEEP

The Africa-EU Energy Partnership (AEEP) was launched by African and European Heads of State in 2007 at the AU-EU Summit in Lisbon. It is one of five priority areas under the Joint Africa-EU Strategy (JAES) and aims to connect the two continents in one mission: to increase the effectiveness of efforts to secure reliable and sustainable energy; to enhance access to modern energy services, and to expand renewable energy and energy efficiency in Africa.

The Partnership's Steering Group is comprised of the African Union Commission, the Common Market for Eastern and Southern Africa (COMESA) Secretariat, Egypt, the European Commission, Germany, and Italy.



## About UNIDO

UNIDO, the United Nations Industrial Development Organization, is the specialised agency of the United Nations that promotes industrial development for poverty reduction, inclusive globalisation and environmental sustainability. With its unique mandate to promote and accelerate inclusive and sustainable industrial development (ISID) in developing countries and in economies in transition, UNIDO contributes to the three pillars of sustainable development, as recognised by the recently adopted 2030 Agenda for Sustainable Development. UNIDO works to promote the related Sustainable Development Goals (SDGs), and in particular SDG-9 which calls on all to help "build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation".

Within this context, UNIDO supports the transition to a sustainable energy path, SDG – 7, as a key solution to a climate resilient and economically sustainable growth. UNIDO also accords high priority to technology innovation and transfer and capacity building of industries including small and medium sized enterprises. It supports projects and programmes that leverage the power of innovation and entrepreneurship to address the energy, environmental and economic challenges of today by empowering emerging clean-tech start-ups and bolstering the local entrepreneurial ecosystem and policy frameworks.



## About ARE

The Alliance for Rural Electrification (ARE) is an international business association that promotes a sustainable decentralised renewable energy industry for the 21<sup>st</sup> century, activating markets for affordable energy services and creating local jobs and inclusive economies.

For more information about the available renewable energy technologies and business solutions, please consult the ARE Off-grid Matchmaking Platform to contact ARE Members directly:

<https://www.ruralelec.org/matchmaking-platform>

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