Innuvation for Electrification

Renewable Energy Generation & Green Hydrogen

25 April 2024





Opening Remarks



Ms. Ling Ng
Director of Communications & Marketing
ARE

Agenda



Opening remarks 5 minutes	Ms. Ling Ng Director of Communications & Marketing, ARE
Facilitator	Mr. Deepak Mohapatra Senior Officer – Business & Market Development, ARE
Pitch 1 10 minutes	Mr. Norbert Taphorn Area Sales Manager Asia/Pacific, SkySails
Pitch 2 10 minutes	Mr. Quentin De Hoe Senior Investment Officer, EDFI Management Company
Pitch 3 10 minutes	Mr. Brendan Cahill Director of European Development, ORPC
Pitch 4 10 minutes	Mr. Pek Seck Wei Technical Director, H2 Energy
Pitch 5 10 minutes	Mr. Alessandro Medici Managing Director, Power-Blox
Pitch 6 10 minutes	Mr. David Smith CEO & Founder, enee.io
20 minutes	Audience Q&A
Closing remarks 5 minutes	Mr. Deepak Mohapatra Senior Officer – Business & Market Development, ARE

About ARE



The <u>Alliance for Rural Electrification</u> (ARE) is the global association for the decentralised renewable energy (DRE) industry, catalysing private sector-driven markets for sustainable electricity services, creating jobs and powering equitable green economies.

> **Global DRE** association

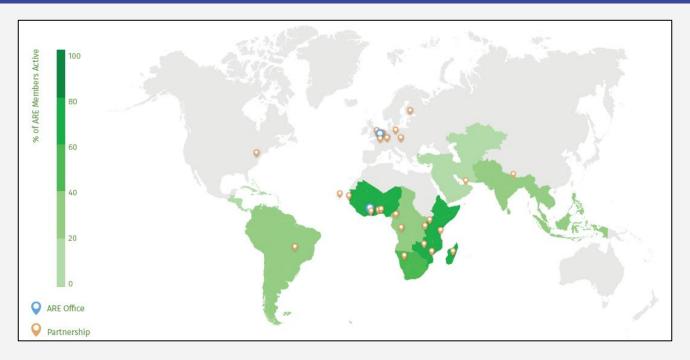
200+ Members

55+ Countries

Continents

ARE Members Regional Focus & Expertise





ARE Members **Technologies**













ARE Members **Systems**





ARE Membership Services



1. Business & Market Development



3. Policy & Advocacy

4. Communications & Marketing











Facilitated by



Mr. Deepak Mohapatra
Senior Officer – Business & Market Development
Alliance for Rural Electrification







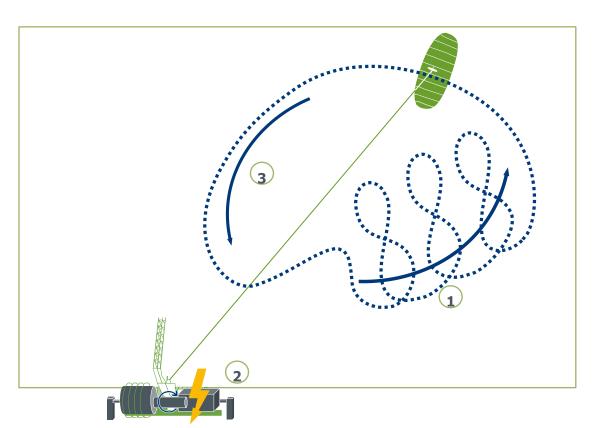
Mr. Norbert TaphornArea Sales Manager Asia/Pacific
SkySails





HARVESTING WIND IN 3 DIMENSIONS - THE WAY WE PRODUCE ENERGY





OUR POWER CYCLE

Power phase

- 1 The kite unwinds a tether of 800 m length from a winch.
- A generator inside the winch converts the rotational movement into electricity.

Retum phase

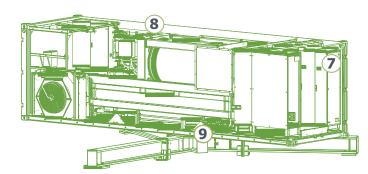
3) The generator now acts as a motor and reels-in the tether, consuming only a fraction of the energy generated during the power phase.

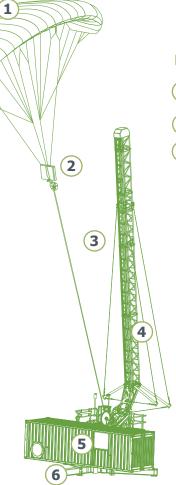
SKYSAILS PN-14

Skysails is the first company in the world with airborne wind energy systems that are ready to order!

The SKS PN-14 onshore wind power system provides clean electricity wherever it is required:

- as a reliable island solution in remote areas lacking a stable grid connection
- as an economic and independent solution for industry, agriculture, tourism, or telecommunication infrastructure
- as a supplement to existing energy projects such as solar park or other renewables.







FLYING SYSTEM

- 1 Kite
- 2 Control Pod, Autopilot
- 3 Tether

GROUNDSTATION

- 4 Launch and landing mast
- Container
- 6 Foundation/Tripod

INSIDE GROUNDSTATION

- Control cabinets
- Winch with generator and gearbox
- **9** Energy supply

OUR IMPACT AT A GLANCE



+50 % increased yields

By stronger wind in higher altitudes.

24/7 continuous power generation

Independent of the sun. Day and night.

5 years
of proven operation

Two installed systems, accumulating to >5 years of operation, feeding electricity into the grid.

>2 MW

Our business draws on 20+ years of basic research and applied engineering. The System size can scale >2 MW.

2¢/kWh

According to Fraunhofer Society for the Advancement of Applied Research our technology has the potential to produce electricity for less than 2 cents/kWh.

+80 international patents

We hold more than 80 patents in 13 countries.

90 %

less material input

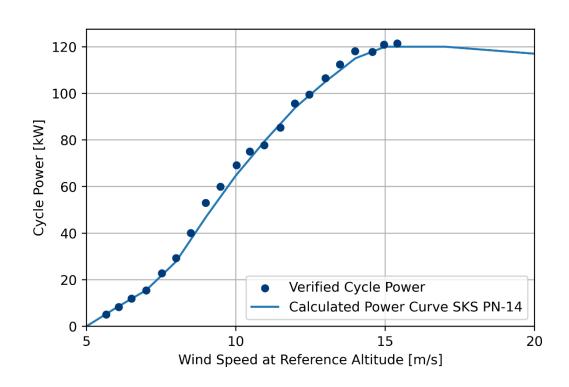
Airborne Wind Energy (AWE) reduces material input by 90%.

>60% capacity factor

By our advantageous production profile. This makes us competitive with other renewable energy systems.

BREAKTHROUGH IN AIRBORNE WIND ENERGY





120 kW

15.5 m/s wind speed

Maximum rated cycle power of altitude above ground level.

400 MWh/a

verified power curve

At the site in Northern Germany, Klixbüll, the verified power curve corresponds to an expected annual yield of 400MWh/a.

WE ARE MARKET READY



Building the Path to Gigawatt-Scale Wind Farms with Multi-Megawatt System

Market entry Existing PN-14 system



Growth phase 1Next generation product



Growth phase 2 > 1MW system



LCOE >20 ct/kWh



LCOE >10 ct/kWh



LCOE <5 ct/kWh



Decreased Levelized Cost Of Energy (LCOE) by over 200%





Thank you for your interest. LET'S TALK!

Norbert Taphorn

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Mr. Quentin De HoeSenior Investment Officer
EDFI Management Company





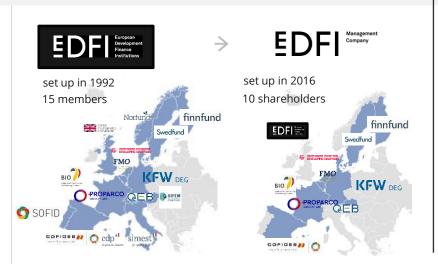
EDFI Management Company



EDFI MC was created in 2016 by the EDFI Association on behalf of the 15 European DFIs to deliver development finance solutions that **enable DFIs and private sector investors to invest more and in higher risk projects** than they would otherwise be able to do.

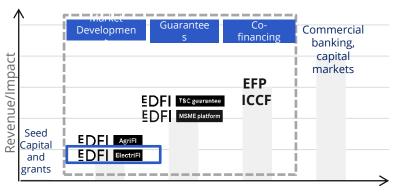
A common platform

EDFI MC plays a role in managing facilities complementary to DFIs, developed under EU funded programmes



A range of development finance solutions

Focus on investments that crowd-in capital from European DFIs and other investors and address market failures, ranging from early-stage or market creation to corporate growth and expansion



Incubation Early stage Growth stagexpansion stager stage



Investing where others cannot

ElectriFI is a closed-ended facility focused on access to energy

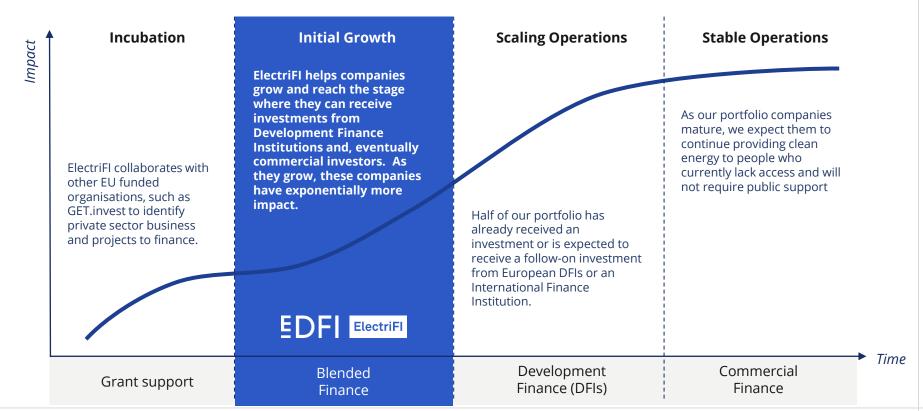
- Investing in early-stage companies and projects
- Financing the private sector
- Aiming at creating new or improved connections to clean and reliable energy
- Adding new generation capacity from sustainable energy sources
- Active in emerging markets







ElectriFI intends to play a catalytic role





Eligibility criteria and offering



Renewable energy

Investing in clean energy access for developing countries



ESG standards

Commitment to high international standards and sound banking principles.



Business model

SHS, IPP, Mini-grid, C&I, others (energy efficiency, cooking stoves,...)



Track record

Credible professional trackrecord, alignment of interest. Early investor, not seed capital



Commercially viable

Financially viable with a clear path to profitability, scalable and/or replicable



Offering

Flexible structuring debt to equity, price adaptive to market / funding circumstances. Investments EUR 0,5m-10m up to 50% of funding round



ElectriFI unique value proposition

A blending facility dedicated to accelerate clean energy access by de-risking private sector projects.





Investing in clean energy access for developing countries

75% of ElectriFl's portfolio is invested in sub-Saharan Africa





Investing where others cannot

ElectriFl's investments have leveraged an extra EUR 420m





Offering flexible products that meet the sector's need

More than 60% of the portfolio is invested in equity and quasi-equity





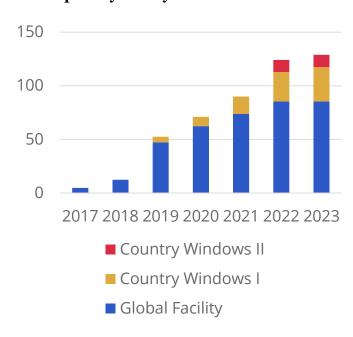
Building and accelerating markets through partnerships.

30% of the investments are coinvestments with EDFI members

ElectriFI in figures

- ElectriFI Global Facility (EUR 126m)
- **ElectriFl Country Windows** allocated to:
 - Zambia (EUR 31m)
 - Nigeria (EUR 30m)
 - Côte d'Ivoire (EUR 10m)
 - Benin (EUR 5m)
 - Pacific (EUR 8m)
 - Kenya (EUR 48m)
 - Burundi (EUR 9.3m)
 - Eswatini (EUR 5m)
 - Uganda (EUR 5m)
 - Benin 2 (EUR 12m)
 - DRC (EUR 15m)
 - Mozambique (EUR 15m)

Breakdown of the committed capital by facility







EDFI ElectriFI | Portfolio | Overview 2023

Portfolio growth



Breakdown per business model

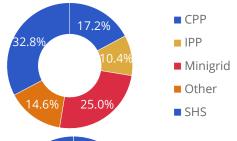
Committed amount

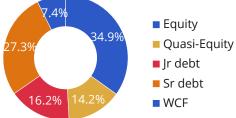
Breakdown per investment type

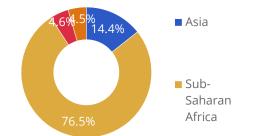
Committed amount

Breakdown per geography

Committed amount







EDFI ElectriFI | Impact | Overview 2023



of CO2 emission

avoided



of energy

produced





direct

investment









Nuru, a mini-grid operator in the Democratic Republic of Congo (DRC), faced a daunting challenge in 2018: a volatile security situation and an ongoing Ebola outbreak. Despite these risks, ElectriFl committed € 1.28 million, combined with co-investors additional € 2.55 million, enabling Nuru to build its first mini-grid project and replace diesel generators with clean solar power. This bold move signalled confidence in Nuru's vision and the potential of DRE solutions in high-risk environments.

ElectriFI's early investment proved catalytic, attracting € 36.55 million in additional investments 4 years later, significantly amplifying Nuru's reach and impact.





- € 1.28 million
- Equity
- Democratic Republic of Congo

Catalytic effect



- Proparco has invested a total of USD 4,7m (CN in and Shares M1) and IFC USD 10m (2021 in a total amount of USD 5,9m (as per MRC memo's)
- € 36.55 million







Husk

Husk Power Systems, a leading provider of decentralized hybrid mini-grids in India, faced challenges in securing funding due to the nascent nature of the DRE sector in the region. ElectriFl stepped in with a € 5.89 million commitment in 2022, followed by an additional \$ 4 million in 2024. This investment not only provided crucial capital but also served as a powerful validation for Husk Power Systems' model.

Their strong track record, bolstered by ElectriFl's initial investment, attracted further investment (€ 24.54 million) from Development Finance Institutions and other investors. After ElectriFl's involvement, Husk Power Systems secured a significant € 96.45 million in additional funding. This exemplifies how early-stage investments can unlock a cascade of financing for promising DRE companies.



2022 investment



• € 5.89 million

2024 investment

• \$4 million

Catalytic effect

- € 96.45 million
- (Com

A 100m USD round significant funding round comprises \$43 million in equity investments and \$60 million in debt with equity from STOA Infra & Energy, USDFC, Proparco, Shell Ventures, Swedfund, and FMO; and debt from EIB and IFC.







Sistema.bio

Sistema.bio, a company manufacturing biogas digesters for small-scale farmers in Latin America, East Africa, and South Asia, required capital to scale their operations and expand their reach. ElectriFl's € 2.4 million investment in 2019 and 2020 provided the initial momentum together with additional € 5.38 million from co-investors. This not only supported Sistema.bio's operations but also signalled the viability of their innovative biogas model to other investors.

Following ElectriFI's involvement, Sistema.bio later secured an € 23.27 million in additional investments. This surge in funding allowed Sistema.bio to empower countless rural communities with clean energy solutions. Through Sistema.bio ElectriFI is contributing to 480,000 beneficiaries.



2019 investment

• € 2.4 million

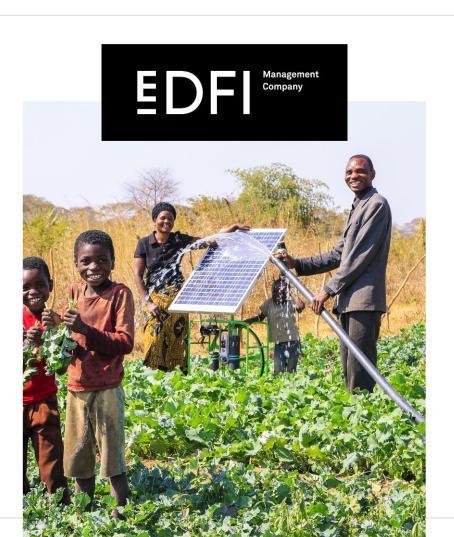
Catalytic effect

• € 23.27 million



 Kawisafi, AXA, etc. have done a USD 15,6m round in 2022, later Native has invested USD 10m and FMO website mentions a total USD 4m invest in Sistema.bio





EDFI Management Company

- Rue du Trône 41000 Brussels
- www.electrifi.eu







Mr. Brendan Cahill
Director of European Development
ORPC



Sustainable, Off-Grid Energy for Communities from River Hydrokinetic Power Systems

Brendan Cahill
Director of European Development

ARE Innovation for Electrification (I4E) Webinar April 2024



Patented technology, proven through 17 successful deployments since 2010

ORPC

Who we are

- Founded 18 years ago, in Portland, Maine, US
- 45 employees, with subsidiaries in Canada, Ireland & Chile

What we do

- Convert kinetic energy in water currents into clean, predictable, affordable sources of renewable electricity
- Provide smart microgrid solutions powered by ORPC power systems

ORPC's objectives

- Develop clean energy solutions for remote communities and critical infrastructure
- Create local jobs for installing and maintaining equipment





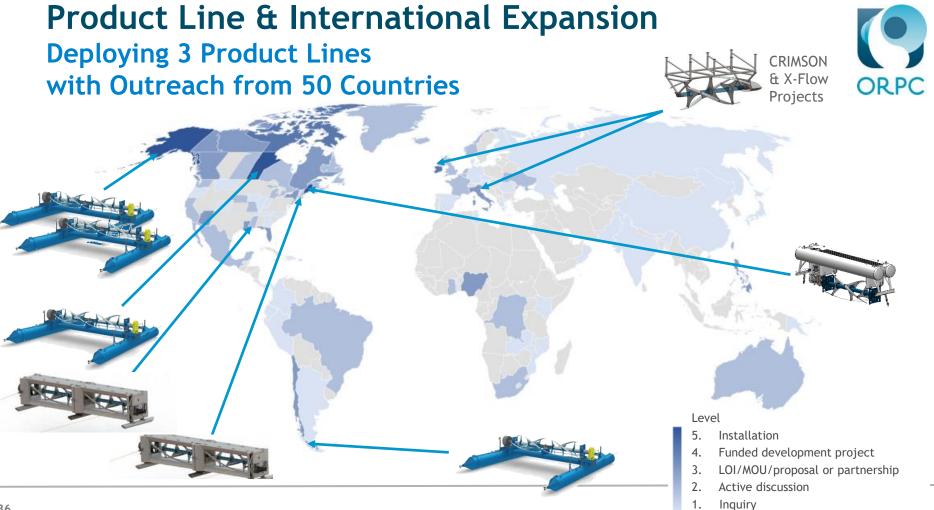












RivGen® energy production potential in a typical river





2 to 6 public buildings (7,200 sqft - 15 kWh/sqft)



One RivGen® powers (200 to 600 MWh/year)



25 to 75 times around the world in Tesla (31 kWh/100 miles)



550 to 1600 homes (0.37 MWh/year)









Igiugig Hydrokinetic Project

Two RivGen® devices deployed to power an off-grid community





Microgrid and energy storage system developed with Schneider Electric will relegate diesel generators to backup only.

https://www.youtube.com/watch?v=GxiELfnX5xc

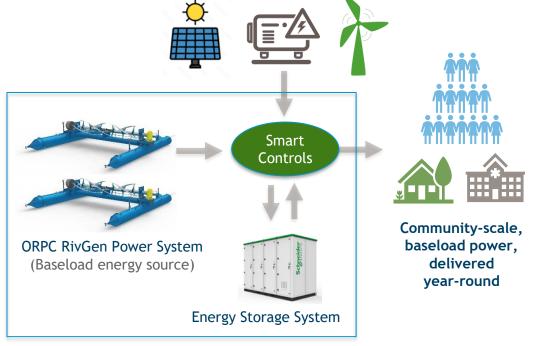


Photo Credit: Igiugig Village Council (2023)

Baseload renewable energy from free-flowing rivers and tides

OR PC

- A smart microgrid powered by an ORPC Power System will relegate diesel generators to backup only.
- Energy storage and smart controls, coupled with ORPC baseload power system, allow incorporation of intermittent sources like wind and solar.



ORPC's RivGen Power System is an ideal power solution in challenging deployment locations



- Modular, decentralized generation capacity: can be deployed as individual units, small arrays, or largecapacity arrays, depending on the available resource and the needs of communities and end-users
- **Proven in challenging environments:** Operated through multiple Alaskan winters, with -40°C temperatures and with the river freezing over the device.
- Ease of Logistics: RivGen systems can be shipped on standard trucks or containers, and assembly, installation, O&M uses local equipment and skills.





Deployment











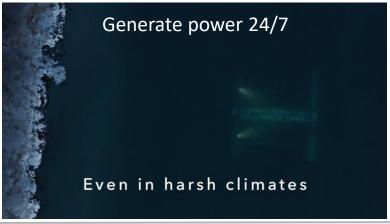
Deployment





ORPC





LCA Results: ORPC Power Systems significantly reduces emissions in off-grid communities.



Installing a RivGen in a diesel-powered community in Alaska reduces emissions per MWh of electricity generated from 1,345.45 kg CO_2eq^1 to 20.81 kg CO_2eq^2 [98% Reduction]

Over its 20-year life, RivGen helps the community avoid up to 9,277 metric tons of CO_2 eq emissions.²

That's equivalent to saving over 3.4 million liters of diesel.3



Advantage of River Hydrokinetic Energy Projects



If you compared a wind, solar, and river hydrokinetic project of the same rated capacity (40 kW), you might see the following:



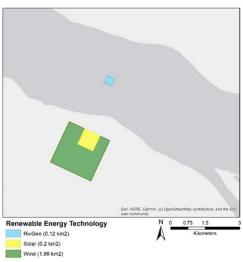
A hydrokinetic project produces 227 MWh per year, with a capacity factor of 65%, with a footprint of 0.12 km²



A wind project produces <u>124</u> MWh per year, with a capacity factor of 35%, with a footprint of 1.99 km²



A solar PV project produces <u>87</u> MWh per year, with a capacity factor of 25%, with a footprint of 0.20 km²



If you wanted 1,000 MWh, you would need....

- 175 kW hydrokinetics
- 322 kW wind
- 458 kW solar









Mr. Pek Seck Wei
Technical Director
H2 Energy



PROBLEM WITH EXISTING ELECTRICITY GENERATION



Diesel Generator



- Requires frequent maintenance
- **▶** High pollution and noisy
- ▶ Expensive fuel cost
- ▶ High running cost
- Stale fuel replacement costs



Solar Battery (Lead Acid)

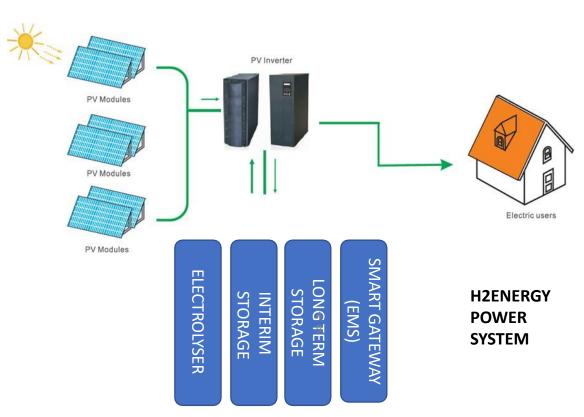


- ► Short life span: 3-to-5-year maximum
- ▶ High replacement cost
- ► Easily damaged due to overcharged
- ▶ Poor performance at low temp & high 4 temp, air-conditioning sometimes needed
- **▶** Environmental concerns with used batteries

SOLUTION



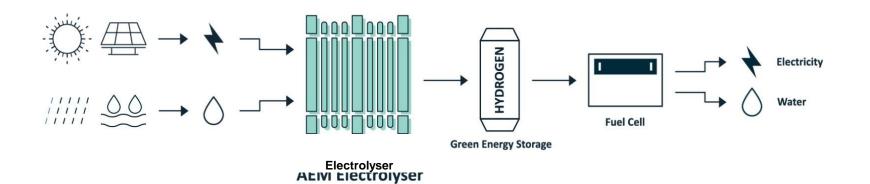
- FULLY Compatible with existing PV setup.
- Direct replacement
- Robust not susceptible to damage due to overcharge
- Small footprint
- Long lifespan: >15 year
- Very low running cost
- Minimum maintenance
- Cost effective



OUR OFFERING

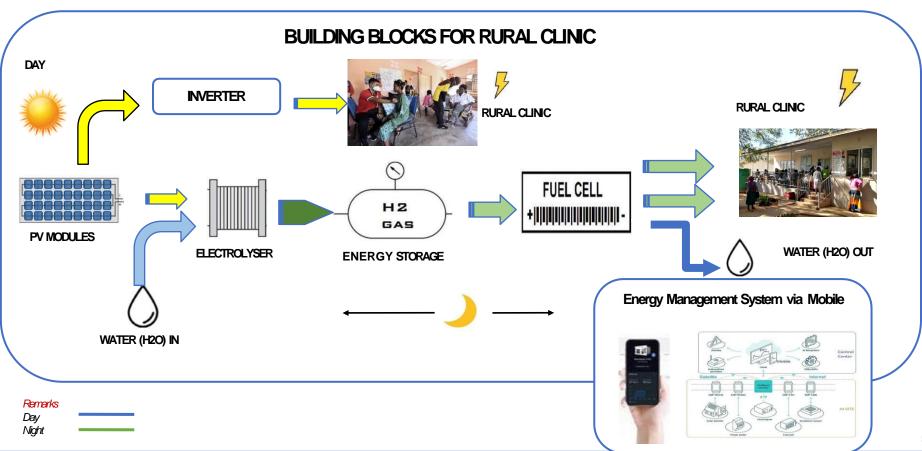


H2E SYSTEM - HIGHLY SCALABLE SYSTEM



OUR OFFERING





H2E SYSTEM COMPONENTS

Interior











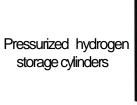
Fuel cell



Inverter



Electrolyser



H2E SYSTEM HOUSED IN ELECTRICAL CABINET



Water tank module









WIDESPREAD APPLICATION FOR H2E SYSTEMS GLOBALLY







TARGET MARKETS

Clockwise from top left corner –
Settlements, army outposts, farmhouses,
telco towers, health facilities, schools,
mining accommodation

















Mr. Alessandro Medici
Managing Director
Power-Blox







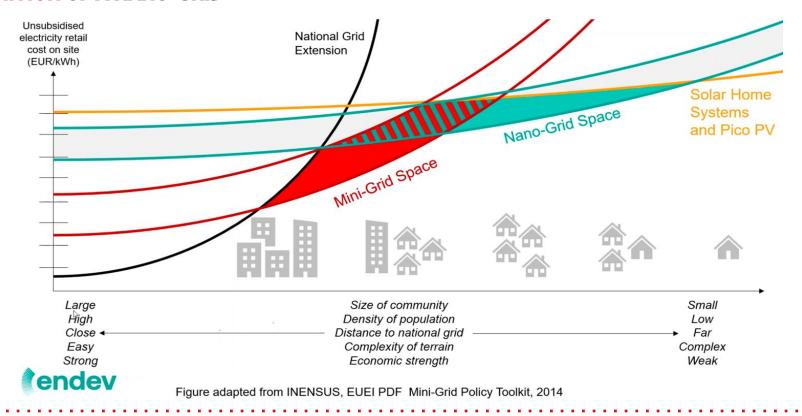








DEFINITION OF A NANO-GRID





ELECTRIFICATION REQUIREMENTS

- > Electrification is dynamic and not a snapshot story
- > Energy requirements grow over time
- > No dead-end strategies and stranded assets
- > Alternating current right from the start
- > Nano-Grids as the «spearhead» of electrification







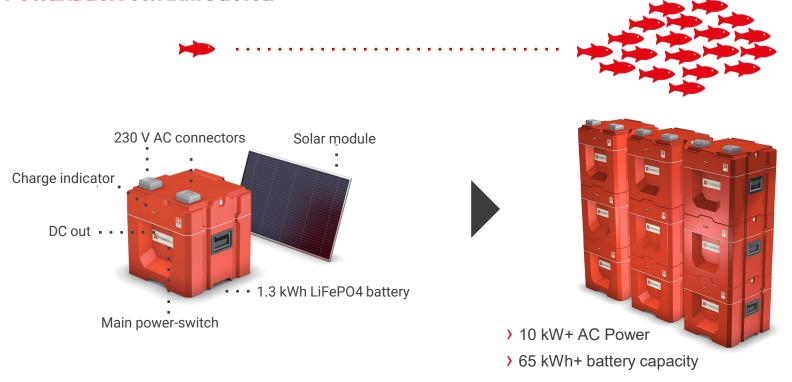
Mini-Grid



Public-Grid



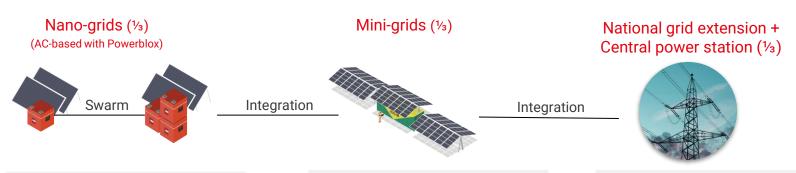
POWERBLOX SWARM DEVICE





HOW TO PROVIDE ELECTRICITY TO 600 MILLION PEOPLE

Decentralized PV + battery systems in combination with AC-based swarm Powerblox are the most eco- & cost-effective way to electrify and empower Africa.



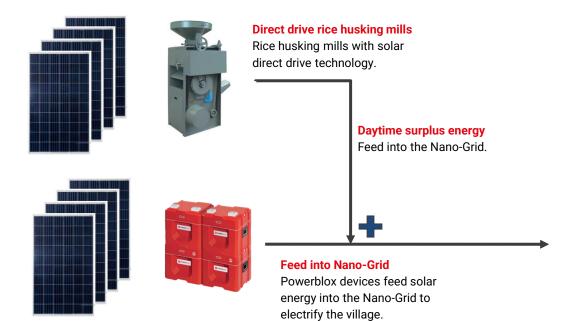
- + low connection cost per household
- + affordable tariff for private households
- + productive use possible
- + scalable according to demand
- + low service cost
- + fast roll-out
- + high reliability
- + easy to integrate (AC based)

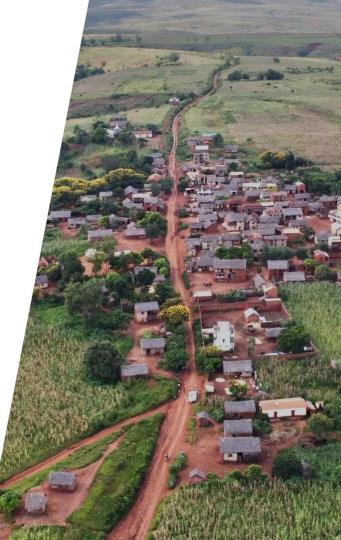
- + easy to integrate (AC based)
- + productive use possible
- + reasonable price per kWh
- + fast roll-out
- + high reliability
- engineering needed
- special service knowhow needed
- minimal demand needed

- + low end customer tariffs
- + productive use possible
- very expensive for rural electrification
- very slow roll-out
- not suitable for tier 1 tier 3 customers
- often unstable due to power cuts
- voltage peaks and brown-outs

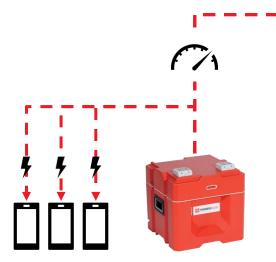


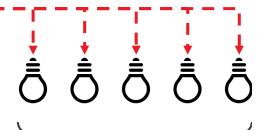
PRODUCTIVE USE WITH DIRECT DRIVES





THE LEASE TO OWN NANO GRID MODEL





up to 20 Households per Powerblox device

Core Business

Phone Charging, DSTV, Barber, Printing, Restaurant, Grocery Shop, etc.

Side Business

Selling electricity to private households (around 5h per day, only light, fixed monthly rate of around 2\$ per HH and month)



NANO-GRID PROJECT WITH CARITAS IN ETHIOPIA











87

PBX installed

49

Locations

1500

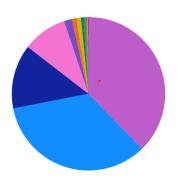
Mobiles charged per day

620

Lamps powered

92%

Loan payback



- Phone Charging
- Lighting
- TV
- Sound System
- Barber Shop Tools
- Computer

- Rechargeable Lighting
- TV Utilities
- Battery Charging
- Othe
- Labor Equipment
- Printers/Copy



NANO-GRID PROJECT WITH CARITAS IN ETHIOPIA



Barber Shops



Restaurants



Health Centers



Grocery Shops



Video Halls



Charging Stations



CONTACT US



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Hauptstrasse 44 5070 Frick Switzerland

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Mr. David Smith
CEO & Founder
enee.io

enee.io energy monitoring

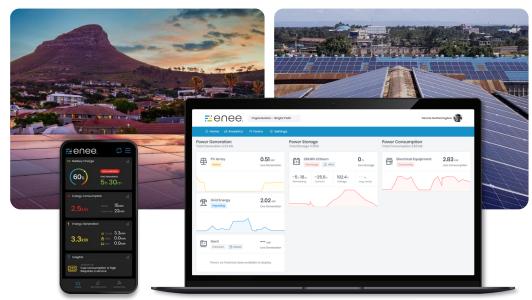
Transforming battery replacement for C&I Users in Africa

Speaker: David Smith, CEO david.smith@enee.io









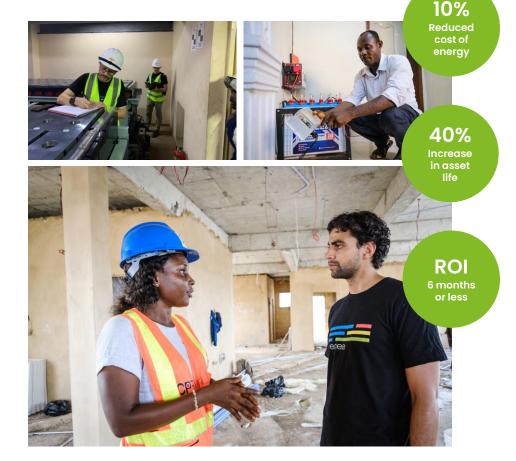
WHO WE ARE

Welcome to enee.io, where we bring innovation into the energy industry through our state-of-the-art energy monitoring platform.

We are the fitness tracker for energy systems, on a mission to increase access to reliable energy in regions with inadequate grid supply.

Through plug-and-play sensors, mobile phone applications and web-based reporting, enee.io provides customers with the information they need to optimize energy usage, improve energy system health and safeguard backup power supplies.





THE PROBLEM

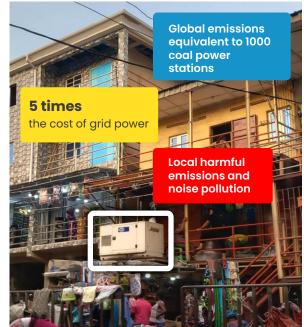
Globally 1 billion people suffer from daily power outages

In regions with inadequate grid supply, people turn to highly inefficient and highly polluting generators for back-up power.

Renewable power + battery storage is a green and financially viable solution, but....

- Inefficiencies and issues go undetected
- Increased costs of energy & maintenance
- Reduced confidence in renewable power







THE SOLUTION

Simple & Low-Cost

Plug-&-play sensors, quick to deploy and built for the mass-market

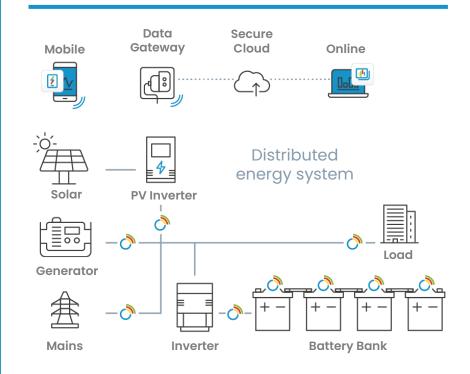
Technology Agnostic

Works with any type, age, make and model of energy asset

Advanced Algorithms

Provide early identification of issues, allowing for corrective action to be taken

Insights and alerts via web & mobile app





Wireless IoT sensors fitted to each energy asset

KEY FEATURES

Centralized Dashboard

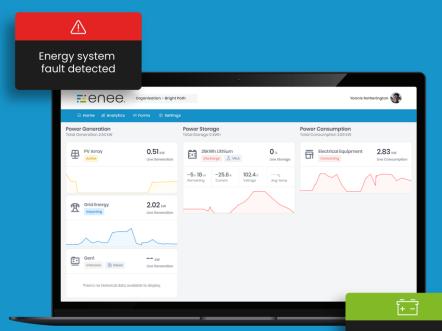
Monitor all energy inputs and sites in one place.

Managers can view which sites are underperforming and where to send engineers.

Live alerts inform customers where inefficiencies lie with corrective action steps to take.

- Streamline maintenance times
- Boost customer experience
- Timely information for corrective action

Generation > Storage > Consumption



Your battery needs charging

KEY FEATURES

Battery State-of-Health

Providing users with the remaining capacity and lifespan left in a battery bank.

Works for both lead-acid & lithium battery banks.

Allowing customers to:

- Plan for replacements
- Understand how multiple sites are performing from one centralized dashboard
- Make energy savings





Energy intelligence made simple

CASE STUDY

Objective:

Optimize a 48V battery bank at a branch of a bank in Lagos (24 x 2V 1000ah VRLA cells).

Issues identified:

Overcharging - dry out and a reduction in lifespan.

During charge the battery bank reached a maximum of 2.35vpc (56.4v), which it remained indefinitely, even after the battery became fully charged.

The prolonged period of charge resulted in excessive energy being put into the battery after reaching full charge, resulting in increased heating of the battery and a loss of energy.

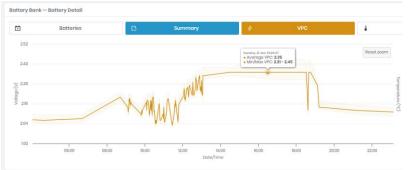
Consequences:

Increased

Plate corrosion

Increased energy cost Dry-out / Water

Battery bank remaining at 2.35vpc



Individual battery dry out



CASE STUDY

After corrective action steps given by enee.io:

Extended remaining battery life from 2.1 to 4.0 years. Estimated saving of \$4.64 per day.

Reduced energy requirements resulting in reduced diesel spend.

Estimated saving of \$2.48 per day.



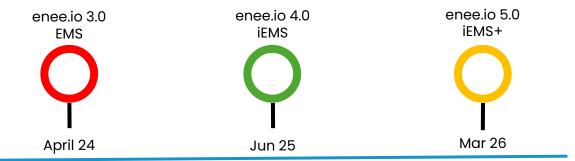
Total Savings:

Extended battery life \$2.48 + Energy savings \$4.64 = \$7.12 per day

FUTURE ROADMAP

enee.io is introducing AI & Machine learning for the next generation of software solutions

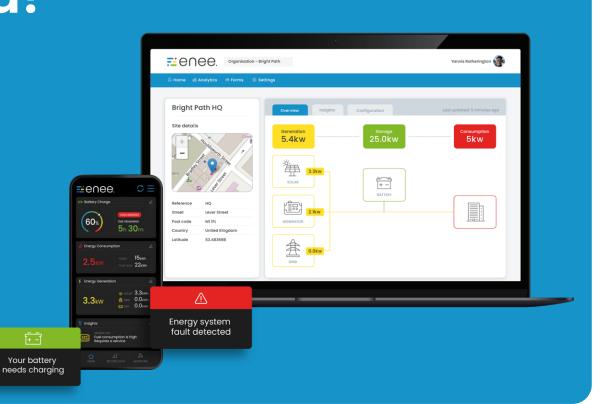
- Calculate the actual cost of energy
- Integrate environmental data to inform best energy optimization solutions



Thank you!

We've love to hear from you...

sales@enee.io



Audience Q&A



I4E Series: 'Renewable Energy Generation and Green Hydrogen'

Panelists

Facilitator



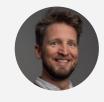
Mr. Deepak Mohapatra
Senior Officer – Business & Market Development
Alliance for Rural Electrification



Mr. Norbert TaphornArea Sales Manager Asia/Pacific SkySails



Mr. Pek Seck Wei Technical Director H2 Energy



Mr. Quentin De HoeSenior Investment Officer
EDFI Management Company



Mr. Alessandro Medici Managing Director Power-Blox



Mr. Brendan CahillDirector of European Development
ORPC



Mr. David Smith CEO & Founder enee.io



Closing Remarks



Mr. Deepak Mohapatra
Senior Officer – Business & Market Development
Alliance for Rural Electrification



See you at the next I4E showcase webinar on 5 September 2024

Innevation for Electrification

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