Opening Remarks

Ms. Ling Ng
Director of Communications & Marketing
ARE
## Agenda

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<td>Director of Communications &amp; Marketing, ARE</td>
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<td><strong>Facilitator</strong></td>
<td>Mr. Deepak Mohapatra</td>
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<td>Senior Officer – Business &amp; Market Development, ARE</td>
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<td>10 minutes</td>
<td><strong>Pitch 1</strong></td>
<td>Mr. Norbert TAPHORN</td>
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<td>Area Sales Manager Asia/Pacific, SkySails</td>
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<td><strong>Pitch 2</strong></td>
<td>Mr. Quentin De Hoe</td>
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<td>Senior Investment Officer, EDFI Management Company</td>
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<td>Mr. Brendan Cahill</td>
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<td>Director of European Development, ORPC</td>
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<td>Mr. Pek Seck Wei</td>
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<td>Mr. Alessandro Medici</td>
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<td><strong>Pitch 6</strong></td>
<td>Mr. David Smith</td>
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<td>CEO &amp; Founder, enee.io</td>
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The Alliance for Rural Electrification (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.

About ARE

#1
Global DRE association

200+
Members

55+
Countries

3
Continents
ARE Members Regional Focus & Expertise

ARE Members Technologies

ARE Members Systems

Bioenergy  Hydro  Wind  Power Components  Energy Storage  PV

Standalone  Mini-grid
ARE Membership Services

1. Business & Market Development
2. Capacity Building
3. Policy & Advocacy
4. Communications & Marketing
Facilitated by

Mr. Deepak Mohapatra
Senior Officer – Business & Market Development
Alliance for Rural Electrification
Mr. Norbert Taphorn
Area Sales Manager Asia/Pacific
SkySails
HIGH ALTITUDE WIND ENERGY: PROVEN AIRBORNE WIND TECHNOLOGY

April 17, 2024  NORBERT TAPHORN | ARE Webinar - Innovation for electrification
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.
2. A generator inside the winch converts the rotational movement into electricity.

**Return 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
5. Container
6. Foundation/Tripod

INSIDE GROUNDSTATION

7. Control cabinets
8. Winch with generator and gearbox
9. Energy supply
OUR IMPACT AT A GLANCE

+50% increased yields
By stronger wind in higher altitudes.

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

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

24/7 continuous power generation
Independent of the sun. Day and night.

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

>60% capacity factor
By our advantageous production profile. This makes us competitive with other renewable energy systems.

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

+80 international patents
We hold more than 80 patents in 13 countries.
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 1**
Next generation product

**Growth phase 2**
> 1MW system

- Diesel Generator Hybridization
- Onshore Wind Farm
- Floating Offshore Wind Farm

LCOE >20 ct/kWh  →  LCOE >10 ct/kWh  →  LCOE <5 ct/kWh

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

SkySails Power GmbH
SEIZE THE MOMENT:
PARTICIPATE AIRBORNE WIND ENERGY OPPORTUNITY NOW
POWERFUL. INNOVATIVE. FUTURE-PROOF.
Thank you for your interest.
LET´S TALK!

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www.skysails-power.com
Mr. Quentin De Hoe
Senior Investment Officer
EDFI Management Company
Renewable Energy Generation & Green Hydrogen webinar

25 April 2024
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.
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

ElectriFI helps companies grow and reach the stage where they can receive investments from Development Finance Institutions and, eventually commercial investors. As they grow, these companies have exponentially more impact.

Half of our portfolio has already received an investment or is expected to receive a follow-on investment from European DFIs or an International Finance Institution.

As our portfolio companies mature, we expect them to continue providing clean energy to people who currently lack access and will not require public support.

ElectriFI collaborates with other EU funded organisations, such as GET.invest to identify private sector business and projects to finance.
Eligibility criteria and offering

**Renewable energy**
Investing in clean energy access for developing countries

**Business model**
SHS, IPP, Mini-grid, C&i, others (energy efficiency, cooking stoves,...)

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

**ESG standards**
Commitment to high international standards and sound banking principles.

**Track record**
Credible professional track-record, alignment of interest. Early investor, not seed capital

**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.

Impact first
Investing in clean energy access for developing countries
75% of ElectriFI’s portfolio is invested in sub-Saharan Africa

Go-to-place
For catalytic investments
ElectriFI’s investments have leveraged an extra EUR 420m

Fit for purpose & scalable
Offering flexible products that meet the sector’s need
More than 60% of the portfolio is invested in equity and quasi-equity

Additional & collaborative
Building and accelerating markets through partnerships.
30% of the investments are co-investments with EDFI members
ElectriFI in figures

- ElectriFI Global Facility (EUR 126m)
- ElectriFI 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

- Country Windows II
- Country Windows I
- Global Facility
EDFI ElectriFI | Impact | Overview 2023

- 76% of our portfolio qualifies under 19.3 million beneficiaries
- 1.967 kTons of CO2 emission avoided
- 449 GWh of energy produced
- 130 m direct investment

4.2 x leverage
Catalysed capital in € million

- DFI
- Others
- EDFI MC
Nuru

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, ElectriFI 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.
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. ElectriFI 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 ElectriFI's initial investment, attracted further investment (€24.54 million) from Development Finance Institutions and other investors. After ElectriFI'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
- A 100m USD 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. ElectriFi’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.

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
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

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
Product Line & International Expansion
Deploying 3 Product Lines
with Outreach from 50 Countries
RivGen® energy production potential in a typical river

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

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

550 to 1600 homes (0.37 MWh/year)

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

Benefits

Baseload power

Minimal land impact

Coexists with marine life
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=GxjELfnX5xc

Photo Credit: Igiugig Village Council (2023)
Baseload renewable energy
from free-flowing rivers and tides

- 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 large-capacity 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

Transport

Unload and assemble

Set anchor and mooring

Move device to water
Deployment

Attach power and data cable

Deploy device to river bottom

Generate power 24/7

Bring electricity to shore

Even in harsh climates
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$_2$eq$^1$ to 20.81 kg CO$_2$eq$^2$ [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.$^3$

---

1 Carbon dioxide equivalent emissions (CO$_2$eq)
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 124 MWh per year, with a capacity factor of 35%, with a footprint of 1.99 km².

- A solar PV project produces 87 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
Thank You

Brendan Cahill,
Director of European Development
bcahill@orpc.co

Climate Change Solutions

Clean Jobs
Domestic supply chain for huge global export market

Energy Equity & Environmental Justice
Mr. Pek Seck Wei
Technical Director
H2 Energy
GREEN POWER
ANYTIME, ANYWHERE

GREEN HYDROGEN for OFF-GRID ENERGY ACCESS
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 temp, air-conditioning sometimes needed
- Environmental concerns with used batteries
• 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

Electrolyser
AEVI Electrolyser

Green Energy Storage

Hydrogen

Fuel Cell

Electricity

Water
H2E SYSTEM COMPONENTS

- Solar panels
- Inverter
- Pressurized hydrogen storage cylinders
- Fuel cell
- Electrolyser
- Water tank module

H2E SYSTEM HOUSED IN ELECTRICAL CABINET
No Batteries, No Diesel Generator, No Fuel
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
RURAL ELECTRIFICATION WITH NANO-GRIDS
DEFINITION OF A NANO-GRID

Figure adapted from INENSUS, EUEI PDF Mini-Grid Policy Toolkit, 2014
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
POWERBLOX SWARM DEVICE

- 1.3 kWh LiFePO4 battery
- Solar module
- 230 V AC connectors
- Charge indicator
- DC out
- Main power-switch

› 10 kW+ AC Power
› 65 kWh+ battery capacity
Decentralized PV + battery systems in combination with AC-based swarm Powerblox are the most eco- & cost-effective way to electrify and empower Africa.

**Nano-grids (1/3)**
- AC-based with Powerblox
- + 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)

**Mini-grids (1/3)**
- + 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

**National grid extension + Central power station (1/3)**
- + 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

**HOW TO PROVIDE ELECTRICITY TO 600 MILLION PEOPLE**
**PRODUCTIVE USE WITH DIRECT DRIVES**

Direct drive rice husking mills
Rice husking mills with solar direct drive technology.

Daytime surplus energy
Feed into the Nano-Grid.

Feed into Nano-Grid
Powerblox devices feed solar energy into the Nano-Grid to electrify the village.
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)

THE LEASE TO OWN NANO GRID MODEL

up to 20 Households per Powerblox device
NANO-GRID PROJECT WITH CARITAS IN ETHIOPIA

- PBX installed: 87
- Locations: 49
- Mobiles charged per day: 1500
- Lamps powered: 620
- Loan payback: 92%

- 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

Health Centers

Video Halls

Restaurants

Grocery Shops

Charging Stations
CONTACT US

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POWER-BLOX AG

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www.power-blox.com
enee.io energy monitoring

Transforming battery replacement for C&I Users in Africa

Speaker: David Smith, CEO
david.smith@enee.io
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.
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
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
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
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
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:
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
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
I4E Series: 'Renewable Energy Generation and Green Hydrogen'

Panelists

Mr. Norbert Taphorn
Area Sales Manager Asia/Pacific
SkySails

Mr. Quentin De Hoe
Senior Investment Officer
EDFI Management Company

Mr. Pek Seck Wei
Technical Director
H2 Energy

Mr. Alessandro Medici
Managing Director
Power-Blox

Mr. Brendan Cahill
Director of European Development
ORPC

Mr. David Smith
CEO & Founder
enee.io

Facilitator

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

www.ruralelec.org