

United Nations Development Programme

Financial Innovations for Clean Energy in Africa

Presenting the Seven Innovations Supported
by UNDP's Climate Aggregation Platform



January 2024





UNDP

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The Climate Aggregation Platform (CAP)

The Climate Aggregation Platform is a Global Environment Facility (GEF) funded flagship initiative of UNDP, which seeks to support the structuring and deployment of innovative business models and financial mechanisms to accelerate energy access and a just energy transition.

The CAP seeks to advance and raise awareness for innovative solutions to market barriers for financial aggregation in the small-scale, low-carbon energy sector – with the goal to increase access to low-cost financing for clean energy in emerging markets.

Learn more at <https://www.undp.org/climate-aggregation-platform>



GEF

The Global Environment Facility (GEF) is a family of funds dedicated to confronting biodiversity loss, climate change, pollution, and strains on land and ocean health. Its grants, blended financing, and policy support help developing countries address their biggest environmental priorities and adhere to international environmental conventions. Over the past three decades, the GEF has provided more than \$23 billion and mobilized \$129 billion in co-financing for more than 5,000 national and regional projects.

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The CAP Financial Innovation Challenge

UNDP's Climate Aggregation Platform

Last year marked the halfway point towards the 2030 deadline for achieving the Sustainable Development Goals (SDGs).¹ While considerable progress has been made towards the SDG 7 targets on clean and affordable energy, in particular in relation to energy access (7.1), 675 million people remain without access to electricity and a further 2.3 billion have no access to clean cooking solutions.² Based on the current pace of progress, efforts must be significantly ramped up to achieve the SDG targets by 2030.³ What's more, although clean energy is a crucial element of most NDCs, more ambitious targets are needed to keep us below the 1.5 °C threshold.⁴

Distributed renewable energy (DRE) solutions such as mini-grids or off-grid solar are poised to play a key role in our path towards universal energy access; they represent the least-cost option for addressing a large portion of the electricity access gap.⁵ Looking back at the DRE sector's remarkable growth over the past decade, there is reason to be optimistic about its future. However, we must also recognize that there are still many hurdles to overcome if the DRE sector is to achieve its full potential.

The sector remains notably underfunded, with the bulk of investments being concentrated in a few geographies and market players. We need to significantly ramp up the level of

public and private investment in DRE. To achieve this, new approaches are needed to de-risk investments and crowd in new sources of capital and make financing accessible to more players in the space.

For that reason, the Climate Aggregation Platform (CAP), a GEF-funded flagship initiative of UNDP, aims to support the structuring and deployment of innovative business models and financial mechanisms to accelerate energy access and a just energy transition.

More specifically, the CAP seeks to advance and raise awareness for innovative solutions to market barriers for financial aggregation in the small-scale, low-carbon energy sector⁶. By fostering innovative finance, we can increase the availability and reduce the cost of financing for clean energy, and ultimately, we can help make clean, reliable, and affordable energy accessible to everyone. Sustainable energy is a key enabler for achieving the Sustainable Development Goals (SDGs) and delivering the goals of the Paris Agreement.

Learn more about the **CAP** at:

www.undp.org/climate-aggregation-platform.

Contact us at energy@undp.org.

1 UN News, 2023, 'Halfway to 2030, world 'nowhere near' reaching Global Goals, UN warns', 17 July 2023 ([Link](#))

2 IEA, IRENA, UNSD, World Bank, WHO, 2023. Tracking SDG 7: The Energy Progress Report. World Bank, Washington DC. © World Bank. License: Creative Commons Attribution — Non-Commercial 3.0 IGO (CC BY-NC 3.0 IGO). ([Link](#))

3 Ibid.

4 International Renewable Energy Agency (IRENA), 2023. ([Link](#))

5 International Energy Agency (IEA), 2020. ([Link](#))

6 Within the small-scale, low-carbon energy universe, the CAP is agnostic with regards to technology sectors (e.g., off-grid solar PV, mini-grids, electric mobility, etc.) and business models.



Photo: UNDP/Karin Scherbrucker

What is financial aggregation?

One of the inherent characteristics of the DRE sector is the small-scale and distributed nature of the energy assets or projects in question. While this represents a key advantage, notably contributing to the cost-effectiveness and rapid deployment of such solutions^{7,8}, it also brings about challenges when it comes to financing. In general, financing large numbers of smaller-scale projects and businesses in emerging markets is challenging and not unique to energy⁹ but sector specific barriers exist, including the particularly capital-intensive nature of certain business models such as Pay-As-You-Go (PAYGO). UNDP worked closely with the Climate Bonds Initiative to document such barriers and potential market enablers in the joint flagship report '[Linking Global Finance to Small-Scale Clean Energy](#)'.

This same research and subsequent market assessments undertaken by the CAP in East Africa show that financial aggregation could help counter some of these barriers. It could notably help reduce the mismatch between DRE funding needs and investor requirements, and in turn, increase investments in such solutions.

In essence 'financial aggregation' is used to create scale by combining small-scale energy assets, projects, or aspects of projects into a portfolio in a process known as bundling.¹⁰ Larger-scale financing can then be provided across these bundled assets based on their future cash flows.

[Financial aggregation](#) can occur at multiple levels: e.g., on the balance sheet of a PAYGO solar company; on the loan book of a domestic commercial bank; and in more mature financial aggregation markets, via public securitizations from either project developers or commercial banks, in this way accessing institutional investors.

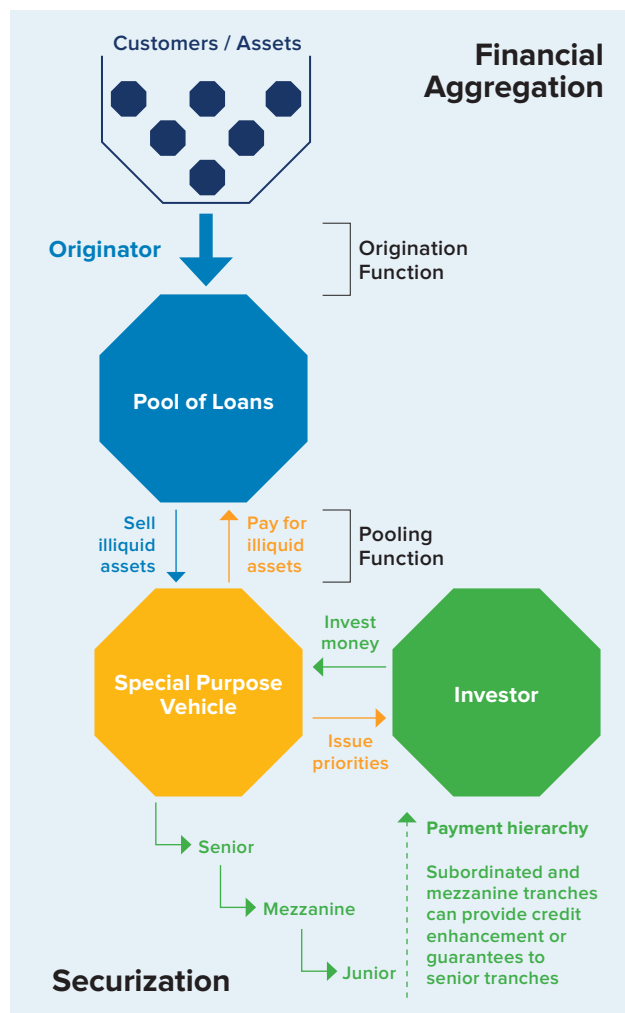


Figure 1: Diagram of Financial Aggregation and Securitization process

It can take the form of securitization of future cash flows (i.e., accounts receivables) and the aggregation of these into pooling structures, typically Special Purpose Vehicles (SPVs). It can also take the form of aggregation of projects into portfolios for project finance purposes. Securitization of receivables is more commonly performed in product-based sectors, for example Solar Home Systems (SHS), while project aggregation is more commonly deployed in project-based sectors, mainly mini-grids and captive power.

In addition, financial aggregation can also be complemented through mechanisms such as carbon credits and renewable energy certificates. Finally, the concept of aggregation can be considered more broadly to include other approaches such as 'bulk procurement' (i.e., aggregating equipment orders across companies to enable economies of scale) or aggregating information via digital platforms¹¹, etc.

When designed correctly and deployed in suitable markets, financial aggregation instruments can offer faster and more affordable access to capital. However, these need to go hand in hand with adequate credit risk management and consumer protection practices¹², and the necessary safeguards, to ensure that end-users continue to benefit from quality energy services they can afford, and the sustainability of the businesses being financed, while also protecting investors.

⁷ REN21. 2019. Renewables 2019 Global Status Report. ([Link](#))

⁸ More information on the advantages of DRE solutions can be found [here](#).

⁹ IIED. 2019. Inclusive finance for universal energy access. ([Link](#))

¹⁰ National Renewable Energy Laboratory. 2018. Financial And Operational Bundling Strategies For Sustainable Micro-Grid Business Models. ([Link](#))

Source: Adapted from Green Bank Network, 2019. Green Bank Insight: Aggregation and Securitization. ([Link](#))

¹¹ IIED. 2017. Turning up the volume: Financial aggregation for off-grid energy. ([Link](#))

¹² CGAP (2021), Two Sides, One Coin: Credit Risk Management and Consumer Protection. ([Link](#))

The need for information sharing about innovative financial aggregation models and structures

Financial aggregation holds great potential to unlock new sources of capital for the DRE sector in emerging markets. The CAP has documented several innovative financial structures involving some form of aggregation in the sector. But until very recently, there were few examples of transactions truly showcasing the potential of financial aggregation.

In 2023, two pioneering receivable securitization structures were announced involving market leaders in the off-grid solar sector in East Africa as the sole recipients.¹³ These transactions could potentially mark an inflection point and pave the way for future growth, but they also exemplify the concentrated nature of investments in the sector.

As highlighted in the [CAP's recently launched report series](#), financial aggregation instruments are complex, and their successful implementation depends on a favourable enabling environment. In that sense, the market is still nascent, and several barriers must be addressed if financial aggregation is to be widely employed in the DRE sector and scaled up, rather than confined to a few geographies and market leaders.

Furthermore, one of the key findings from the research and extensive consultations undertaken in the context of the CAP is the need to demystify financial aggregation transactions. More specifically, while there has been pioneering work done by leading DRE companies, arrangers, and investors to close such transactions, this work is typically done in siloes. As a result, there is limited knowledge dissemination on how to structure and close such transactions.

¹³ See the press releases from Sun King and Citi [here](#), and from African Frontier Capital (AFC) [here](#) and [d.light here](#).

To that effect, the CAP has notably published a [white paper](#) as part of its 'Financial Aggregation for Distributed Renewable Energy' report series as an initial attempt to shed light on the main ingredients involved in closing cost-effective and scalable DRE financial aggregation transactions, and to share insights and lessons from real-life demonstration examples. This was also a key motivation behind UNDP's CAP Financial Innovation Challenge.

You can find the CAP's Report Series on 'Financial Aggregation for Distributed Renewable Energy' [here](#) and the white paper on "Mainstreaming Financial Aggregation for DRE" [here](#).



Photo: UNDP/Karin Scherbrucker

The CAP Financial Innovation Challenge (CAP FIC)

In 2022, UNDP launched the CAP Financial Innovation Challenge to:

- > **Crowdsource and foster the development of Innovative Financial Aggregation Structures and Models** that can help increase the availability and reduce the cost of financing for clean energy in emerging markets. And, in doing so, help close the investment gap to achieve universal energy access.
- > **Facilitate the transfer of know-how and innovative solutions** that can help overcome development challenges in emerging markets and contribute to the achievement of the Sustainable Development Goals, notably **SDG 7 on clean, affordable energy for all** and **SDG 13 on climate action**.

Through the CAP Financial Innovation Challenge, UNDP aimed to support solutions at the design stage, so that novel financial aggregation structures and models can be developed that can lead to financially closed transactions in East Africa, in the near future. Moreover, this also offers an opportunity for information discovery on market barriers to financial aggregation – and possible solutions – which can in turn help guide possible interventions to address such barriers. This creates a ‘learning by doing’ experience to capture key insights and lessons learnt in a real-life context.

In response to the call for applications, UNDP received many submissions from around the globe, with very diverse and interesting innovations that target different energy sub-sectors and countries in East Africa.



Photo: UNDP/Karin Scherbrucker

The winners

Seven innovations were competitively selected as the winners of UNDP's CAP Financial Innovation Challenge. Each of them involves a different approach to financial aggregation to help unlock new sources of financing for the clean energy sector, including climate finance. They target different sub-sectors (e.g., off-grid and on-grid solar, mini-grids, productive use appliances, e-mobility and clean cooking, etc.) and could be deployed across different countries in East Africa, including Rwanda, Uganda, Kenya, Tanzania, Malawi, Ethiopia, Madagascar, Mozambique, and beyond.

UNDP provided an award of up to US\$40,000 to each of these innovators to develop a feasibility study for their Innovative Financial Aggregation Structure or Model – using that process to grow from a concept to a more defined solution and gain a better understanding of the opportunity, the requirements, and possible challenges to overcome to implement it. This also provided an opportunity to test the initial idea and assumptions so they can be tweaked – In some cases, this led innovators to pivot to an updated model, informed by the findings from the feasibility study. More importantly, the process enabled synergies between innovators, unlocking new opportunities for collaboration.

Over the past few months, UNDP has worked closely with the seven innovators to complete this process and promote the innovations to a broader audience and across its network.

This report provides a summary of each innovation and the outcome of the CAP Financial Innovation Challenge process, highlighting key lessons and takeaways from the feasibility studies, and the next steps defined by the innovators.

The seven feasibility studies resulted in over 300 pages of high-quality insights and assessment on financial innovations and aggregation models for energy access in emerging markets. The detailed feasibility studies and additional annexes can be requested from each of the innovators, whose contact details are provided in this document.

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Investing in sustainability

Climate Asset Financial Aggregation Solution by Mirova SunFunder

PJ & Co.

An Electric Vehicle Growth Fund by PJ&Co

Nithio

AI-Enabled Financing to Scale Energy Access by Nithio

A Financing Platform to Enhance Mini-Grid Utilization by Incharge Energy

SOLARIS OFFGRID

PAYGO Receivables Financing Platform by Solaris Offgrid

HYPOPORT AFRICA

Synthetic Securitization for Solar Home System Contracts by Hypoport Africa

4R DIGITAL

A Digital Platform to Bundle Debt and Results-Based Finance with Climate Finance by 4R Digital

Climate asset financial aggregation solution

by Mirova SunFunder

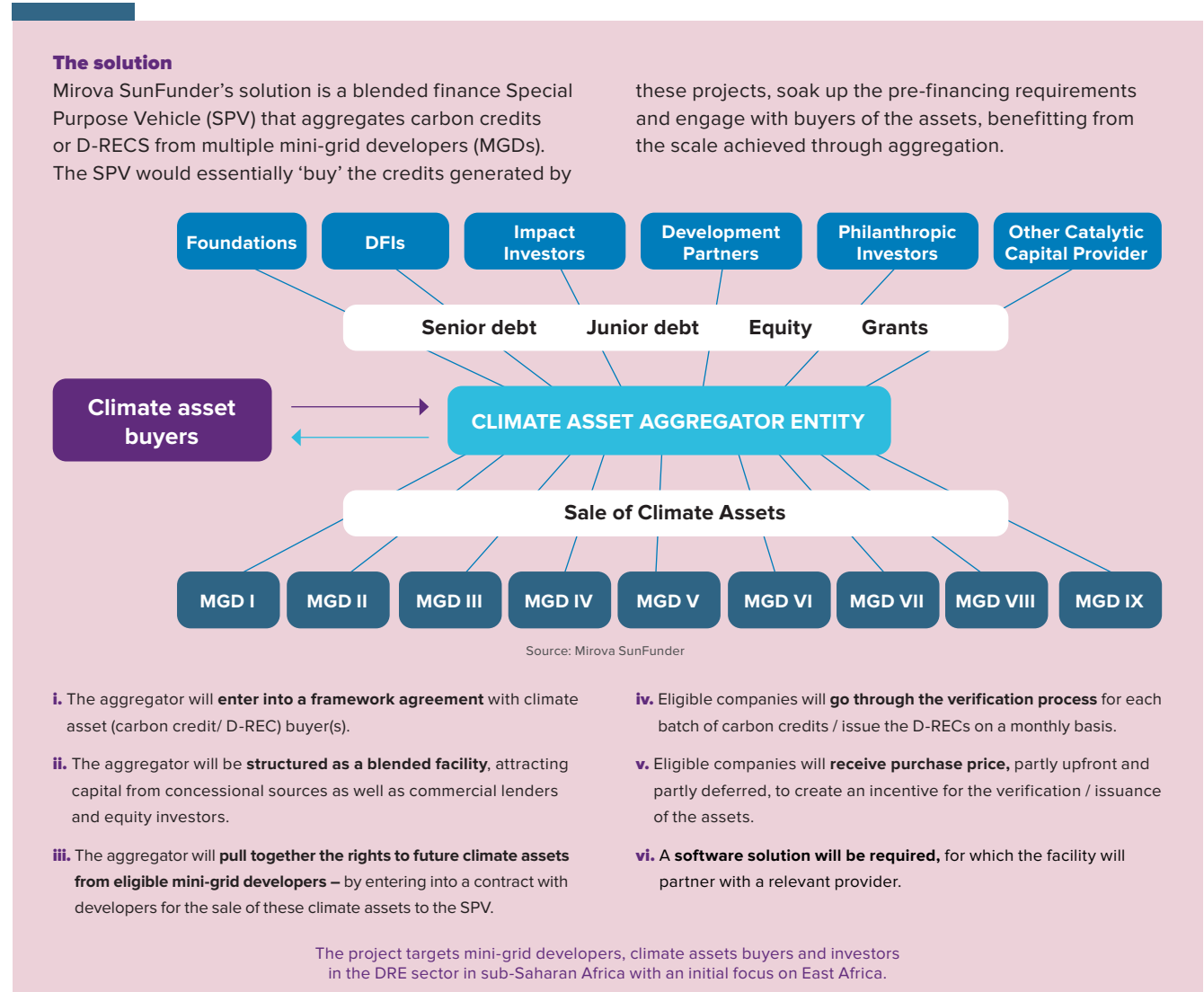
The problem

There is growing interest in climate assets – such as carbon credits and Distributed Renewable Energy Certificates (D-RECs) – as a means to offer an additional revenue stream for mini-grid companies, enabling them to improve their bankability, ultimately making clean energy accessible to a larger population.

However, the small scale of projects impairs developers' ability to seize the full benefits of climate assets, owing to the time and cost involved in developing carbon credit projects, and the high financing costs relative to the scale for both developers and lenders. It also limits the buyer pool for credits and certificates, given the relatively small quantities issued.

CAP FIC support

With support from UNDP's Climate Aggregation Platform, Mirova SunFunder embarked on research to assess the feasibility of pooling climate assets in the mini-grid sector as a means to i) optimize demand-side pricing by creating bargaining power through scale; ii) reduce the cost and burden of carbon credit or D-REC project development; and



iii) de-risk the investment, enabling capital providers to invest in the mini-grid sector and in an emerging financial product.

The study then focused on quantifying the percentage of Capital Expenditure (CAPEX) that could be financed with the climate assets, as the key metric to assess the financial appeal of the proposed solution for developers.

Over the last year, Mirova SunFunder engaged with stakeholders in the mini-grid sector including developers, capital and technology providers, as well as parties involved in both the carbon credit and D-REC sectors to understand the challenges, opportunities and requirements to ensure the feasibility of the aggregator.

Key lessons & takeaways

Results showed the clear benefit of aggregation: Whilst a single developer would only cover 0.92 percent of its initial CAPEX through the sale of carbon credits, that ratio improved to 1.72 percent with the aggregation approach. When considering D-RECs however, a single developer would cover 2.34 percent of CAPEX, while the aggregator metric stood at 5.79 percent. On the basis of financial results alone, aggregating D-RECs would seem to be more economically beneficial for mini-grid developers.

Mirova SunFunder further concluded that a mix of the following elements would likely make a more significant mark on the sector:

- i) larger scale;
- ii) lower cost of capital; and
- iii) a partnership with a larger sales platform – enabling developers to access improved asset pricing through bargaining power.

This outcome justifies a holistic and blended approach to mini-grids financing, in which climate assets can be one of the sources of funding. According to Mirova SunFunder, there is immense potential to scale up the aggregator structure across different regions and sectors (e.g., Solar Home Systems (SHSs), clean cooking, Commercial and Industrial (C&I) solar, etc.).

“The aggregated solution enhances the sustainability of mini-grid operations by providing an additional revenue stream, improving the bankability of the sector.”

– Nicole Kugelmass, Mirova SunFunder

Next steps

- > Attract grant funding for design and structuring phase;
- > Sign a Letter of Intent (LOI) with mini-grid developers;
- > Sign LOI with financing partners;
- > Assess requirements and sign LOI with software provider.

The next steps will require support from:

- Capital providers – particularly concessional capital for i) a technical assistance facility to set up the project; and ii) a first loss tranche for the blended structure.
- Large corporates interested in offsetting emissions: Emissions Reductions Payment Agreements (ERPAs) or offtake agreements will de-risk the investment for lenders and capital providers.
- Stakeholders in the sector – Achieving scale requires coordination and alignment across stakeholders to avoid market fragmentation.

About Mirova SunFunder

Mirova SunFunder’s mission is to pioneer and scale climate investments in emerging markets by offering innovative financial solutions and advisory services to clean energy transition companies and projects in Africa and Asia. Their 40-person team, based in Nairobi, London and Paris, has built the most extensive track record of distributed solar investments in Africa – financing over 60 solar companies over the last decade.

SunFunder was launched in 2012 and in June 2022, it joined forces with impact investing leader Mirova to accelerate emerging market clean energy and climate investments as Mirova SunFunder.

Having been the first movers in financing off-grid solar, Mirova SunFunder is now scaling up its investments in new sectors and geographies with its new \$500 million Gigaton strategy.

Contact details: Nicole.kugelmass@sunfunder.com | www.sunfunder.com





Electric vehicle growth fund

by PJ&Co

The problem

The uptake of electric vehicles (EV) in Africa is expected to dramatically accelerate in the coming years, including in the two-wheeler, three-wheeler, and bus markets. This is a result of lower comparative costs to that of Internal Combustion Engine (ICE) vehicles, improved technology and accommodating government policies. However, one of the key obstacles to the sector's growth is a significant lack of financing: According to PJ&Co, approximately \$520 million¹⁴ investment is needed in just five markets in the next few years, but there is a lack of dedicated sources of capital to help EV firms scale up.

¹⁴ This refers to PJ&Co's estimated financing needs for the next 5 years (to the end of 2027) to reach 400,000 E2W in 5 markets. This only includes the capital needed for bikes and batteries; it excludes finance requirements for R&D, overheads and infrastructure charging and other items.

“It's hard to raise funding in the EV sector due to investor uncertainty about the technology and business models. We need flexible financing to build the ecosystem of vehicles, batteries, and charging infrastructure, to help EV firms scale up from pilot projects to national leaders.”

– Gregor Paterson-Jones, PJ&Co

The solution

The Electric Vehicle Africa Fund (EVAF) is a novel financing platform that will provide debt and equity capital to help EV firms scale up – EVAF will target firms with a proven technology, looking for Series B funding for national or regional expansion. EVAF will consider EV opportunities across Africa, especially in East and West Africa, and offer scale up investments of \$3 million to \$10 million, with a focus on Electric Two-Wheelers (E2Ws), e-buses, charging infrastructure and local assembly opportunities.

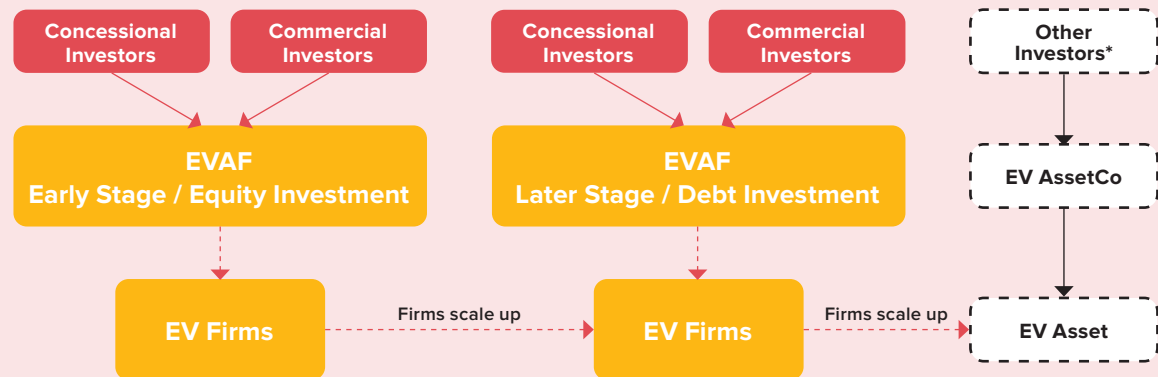
The objective of EVAF is to achieve a market return for investors while also supporting the long-term development of EVs in Africa and contributing to SDGs 1, 5, 7, 8, 9, 11 & 13. The Fund will use a blended finance structure designed to attract various types of investors by offering different classes of shares that align with their preferences. It will offer a junior share class to donors and organizations who are seeking to invest in projects with high social and environmental impact and therefore willing to take on more risk; this share class will absorb the first loss in the event of a default or insolvency of the Fund's portfolio companies. The Fund will offer a senior share class to institutional investors who are seeking a lower-

risk investment with a lower return. It will have priority over the junior share class in the event of a distribution. In addition, the Fund may offer a mezzanine share class.

Concessional funding is critical to ensuring that EVAF can offer patient capital, proactively help implement best practices among EV firms and potentially engage with critical “EV ecosystem” initiatives which will benefit end-users in the long term.

The Fund will consist of two cells: an equity-focused cell (and equity-like products) and a debt-focused cell (and debt-like products). These cells might have distinct shareholders but could invest in the same companies, sharing criteria for countries, markets, and businesses. They might also collaborate on certain instruments, like venture debt.

EVAF aims to help firms with funding at every stage of their growth, from equity funding at Series B rounds, to structured debt finance, and supporting large scale financial aggregation structures. This approach will help EV firms scale up quickly and use the most appropriate financing at each stage.



Source: PJ&Co.

EVAF's investment structure. *Potentially e-buses & E4W leasing.

When market conditions are suitable, EVAF will also support the aggregation of the financial assets of EV firms.

CAP FIC support

With support from UNDP's Climate Aggregation Platform, PJ&Co undertook a market assessment to understand EV financing needs and options, and which markets are mature enough for financial aggregation, if any. Given that the sector is still young, PJ&Co also undertook an assessment of the conditions needed for securitizations to be carried-out in the future. The results of the feasibility study were used to develop the investment thesis of EVAF.

- The feasibility study involved in-country visits to engage with key market players, financiers, development finance institutions (DFIs) and other stakeholders in the sector.
- It includes a financial model for EVAF, enabling tailored financing solutions for EV companies, such as debt and equity, to match their needs and growth stages.
- This approach addresses funding gaps affecting various EV firms – By supporting EV firms at different growth stages, EVAF can help accelerate the sector's expansion and promptly adapt its financing for new opportunities, thereby maximizing investor returns.

Key lessons & takeaways

- Based on observations and interactions with over 50 players in the African EV market, PJ&Co found that the key financial requirements of EV firms are grants and seed equity, which represent about 63 percent¹⁵ of transactions, series A equity funding for scaling up pilot projects, and series B funding – both equity and debt – which a few firms are currently looking at. According to PJ&Co, the median amount raised by EV firms is approximately \$950,000¹⁶.
- E-mobility requires significant capital investment to scale-up because it is an asset intensive industry. Different types of

¹⁵ Estimate provided by PJ&Co based on Africa E-Mobility Alliance (AfEMA) research.

¹⁶ Estimate provided by PJ&Co based on Africa E-Mobility Alliance (AfEMA) research.

capital in terms of risk and tenor are needed for different business models. As more EV firms transition from pilot to commercial stages, demand for financing will substantially increase.

- According to PJ&Co's calculations, the estimated amount of new capital needed in the 5 markets considered, until 2027, is approximately \$520 million for 400,000 bikes and batteries (and approximately \$5 billion until 2040).
- The feasibility study also finds that growth capital is a critical prerequisite to expanding the market, so it is ready for large-scale aggregation opportunities.

Next steps

- > Finalizing EVAF's investment thesis and financial model (this includes the scope and size of the debt and equity strategies).
- > Development of a more detailed and comprehensive investment pipeline. This will involve building out the regional investment team.
- > This is a key fork in the road that will be evaluated after PJ&Co finalizes the initial research, fund design and most importantly the first portion of fundraising.
- > Key LPs identified – At this point PJ&Co may choose to issue a Request for Proposal to identify a suitable fund manager or develop full fund manager infrastructure itself.
- > In the future, when market conditions are suitable, EVAF may also support the establishment of an AssetCo or securitization structure to streamline the capital raising process for EV firms, ensure lower cost financing, and mobilize new pools of capital.

About EVAF

PJ&Co's Electric Vehicle Africa Fund is dedicated to accelerating the uptake of electric vehicles in Africa. The feasibility study identifies significant potential in the E2W sector and PJ&Co is

working on a funding solution to provide flexible and founder-friendly growth capital to the e-mobility sector.

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AI-enabled financing to scale energy access by Nithio

The problem

The World Bank estimates that Rwanda is on track to achieve universal energy access by 2030¹⁷, however, with a substantial portion of the population still lacking access to electricity, mostly in rural areas¹⁸, there is a need to deploy off-grid solutions (e.g., Solar Home Systems (SHS)) at scale. At present, such solutions are used only by 14 percent¹⁹ of the population, but innovative financing mechanisms for distributors and off-grid solar companies could help make these more accessible in rural and remote areas of Rwanda – At the moment, opportunities for local or international credit remain difficult to access and, therefore, systems remain unaffordable for many Rwandans.

17 World Bank. 2023. Leveraging Resource Wealth During the Low Carbon Transition. Africa's Pulse, No. 27 (April). Washington, DC: World Bank. doi:10.1596/978-1-4648-1985-8. License: Creative Commons Attribution CC BY 3.0 IGO ([Link](#))
 18 IEA, IRENA, UNSD, World Bank, WHO. 2023. Tracking SDG 7: The Energy Progress Report. World Bank, Washington DC. © World Bank. License: Creative Commons Attribution–NonCommercial 3.0 IGO (CC BY-NC 3.0 IGO).
 19 National Institute of Statistics of Rwanda ([Link](#))

The solution

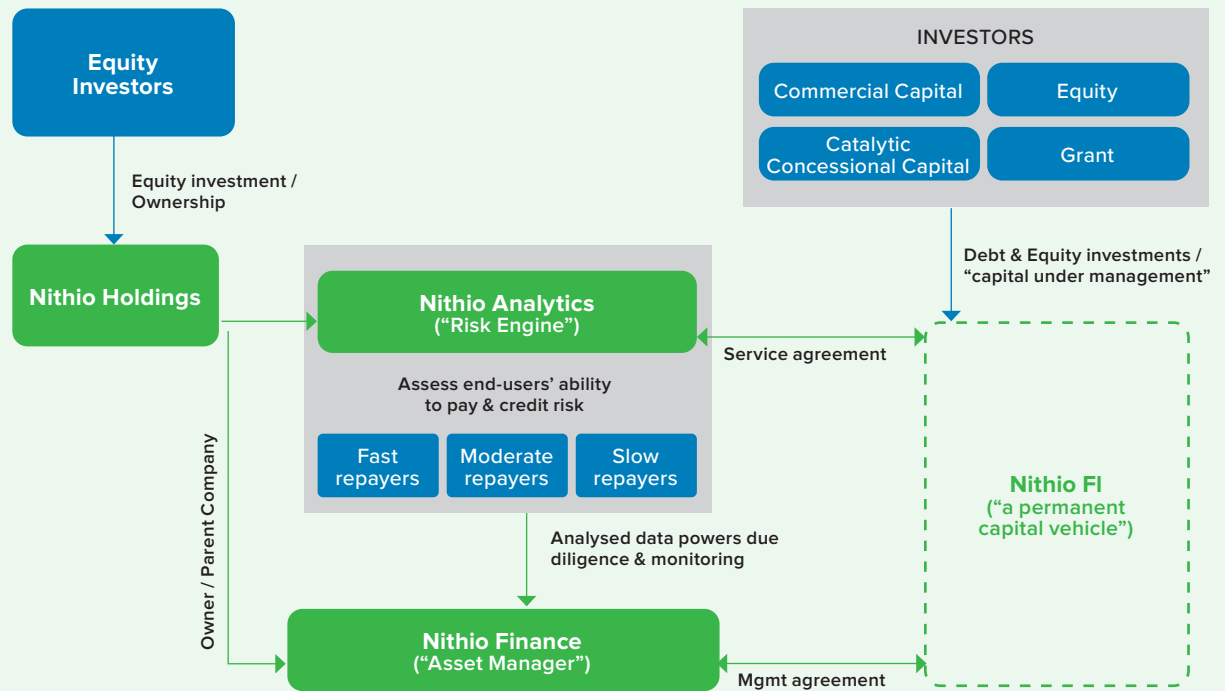
Nithio has built a scalable financial infrastructure to channel billions of dollars to climate change resiliency and energy access by investing directly in African off-grid energy companies. Powered by its Risk Analytics Engine, Nithio provides risk-informed debt financing (aggregated receivables-backed loans) to SHS and solar Productive Use Appliance (PUA) companies through its open-ended blended finance vehicle, Nithio FI. Nithio's Analytics enable it to provide sustainable financing both to large international companies and smaller, local companies that can reach last-mile customers and scale impact.

As Nithio continues to build a significant track record of fundraising for Nithio FI and disbursing loans, it seeks to expand its scope both in terms of targeted geographies and, potentially, in terms of the kind of products it

finances. Nithio does not currently operate in Rwanda but holds investments in companies operating in Kenya, Nigeria, and Uganda.

“ We analyse the end customer level repayment data and corresponding geospatial data to make accurate AI driven portfolio quality predictions. This innovative capability supports informed and proactive decisions towards investment.”

– Ardan Demirayak, Senior Investment Officer



Source: Nithio

CAP FIC support

Through the CAP FIC, in line with Nithio's strategy to expand its investment portfolio across sub-Saharan Africa, the feasibility study aimed to evaluate the financial potential, social impact as well as risk of investing in Rwanda. To that effect, Nithio carried out a detailed assessment of the conditions (e.g., market supply and demand for energy products, ability to pay and risk mitigation strategies) necessary to tailor its solution to the Rwandan market.

Leveraging its Data Analytics Engine, Nithio took an in-depth look at the potential number of beneficiaries, market dynamics, and competitors, to gain an understanding of the opportunities associated with investing in the country at this stage. Nithio also analysed the government priorities related to energy access, including national government and international donor-backed programmes, to assess how its approach could benefit Rwanda.

The feasibility study provided Nithio with insights on the financing requirements in the country, in particular, the need for more concessional capital to scale commercial financing for small solar providers.

Key lessons & takeaways

- According to Nithio the Rwandan market still requires subsidies since affordability issues persist in the country: 75 percent of the unelectrified population spends less than \$1.67 per month on energy²⁰ while the lowest priced Pay-As-You-Go (PAYGO) SHS currently sits at \$3.9 per month²¹.
- Different forms of capital such as commercial, concessional, grants and subsidies, are needed to ensure that no-one is left behind. Nithio's Risk Analytics and standardized customer credit risk assessments can help identify appropriate financing options and structuring, specifically for the Rwandan market.

²⁰ National Institute of Statistics of Rwanda (NISR), VUP Report, December 2018 ([Link](#))
²¹ Foreign, Commonwealth and Development Office (FCDO) Africa Clean energy technical Assistance Facility, Tetra Tech International Development, 2021. Stand Alone Solar (SAS) Market Update – Rwanda – March 2021. ([Link](#))

“The feasibility study has allowed Nithio to gain a broader understanding of the financing needs of small-scale providers in Rwanda. Additionally, it has enabled us to evaluate the potential of leveraging different types of capital, tailored to specific company profiles, in order to facilitate access to funds.”

– Grace Fenton Olatunji, Chief of Staff, Nithio

- Rwanda has a relatively low electricity consumption per capita. Based on Nithio's assessment, the addressable market size for stand-alone PV systems as the least-cost electrification technology is around 2.3 million systems, targeting a mostly rural population.
- The feasibility study shows that once needs and offering align, if Nithio began lending in the market, it would be able to impact more than 229,000 people at a baseline scenario of \$9 million debt investment in the next 3-5 years. However, it also suggests that the Rwandan market requires additional time to expand sufficiently for the sector to be able to absorb Nithio's competitive interest rates and ticket sizes, allowing Nithio to make a significant impact.

Next steps

While Nithio acknowledges the potential and opportunity to enter the Rwandan market, at this stage it lacks the capacity to meet the demand from small companies in need of more catalytic financing. Nithio's team will continue monitoring the development of the market and explore alternative avenues to support distributors in Rwanda. Nithio identified the following additional steps as requisites for it to effectively expand its operations in the country:

- > Expand Nithio's Pipeline: Nithio aims to scale its operations, increasing the number of investments, to further reduce transaction timelines and costs. Nithio will continue to track the Rwandan market for potential investment opportunities.

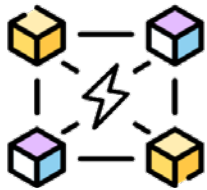
This expansion will allow Rwandan borrowers to access 'quicker, cheaper, and smarter' financing in the future.

- > Leverage concessional capital base: Nithio continuously seeks to make its lending more flexible by leveraging different types of capital (commercial, concessional, and grant) more efficiently. The goal is to be able to offer a range of capital that matches the specific needs of different borrowers. Nithio found that, in Rwanda, companies were seeking below commercial rates for financing. Nithio's approach can be tailored to the specific credit risk profiles and the underlying customer base of these companies.
- > Technical Assistance: Nithio seeks investment readiness support for solar distributors in Rwanda, enabling them to access and absorb commercial capital more easily. This will enable Nithio to move these companies through their pipeline more quickly and efficiently.
- > This will require new strategic partnerships with i) investors and grantmakers to expand Nithio's ability to provide catalytic financing to Rwandan companies; and ii) with government organization's aiming to increase energy access via subsidies (e.g., the Development Bank of Rwanda) to provide data-driven insights and enhance the efficiency of capital allocation.

About Nithio

Nithio is the data-driven solution to catalyse millions of dollars to address climate change impacts and energy access needs. Nithio addresses the key barriers to scaling energy financing and improving off-grid renewable energy access by using a data-driven approach to deploy capital and crowd-in investments. Nithio has established a blended-finance open-ended vehicle, Nithio FI (a Dutch BV), as a private investment intermediary, to provide assets-backed receivables to small, medium and large off-grid energy distributors that serve rural populations. Nithio FI invests in solar home systems, solar PUA, and microfinance institutions, financing their solar loans, by blending different sources of capital, including commercial, catalytic/concessional, equity and grant.

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Financing platform to enhance mini-grid utilization

by Incharge Energy

The problem

Mini-grids are a key technology to accelerate energy access in emerging markets, however, their economics are still hindered by high development costs and low revenue per connection. In addition, due to the high costs and the usually far-off location of mini-grid operations, tariffs can be quite high. This leads to a dependence on subsidies and makes it difficult for customers to afford the power that is available. Such issues must be resolved for the sector to scale to its full potential.

CAP FIC support

Powerblocks's feasibility study focused on assessing a Web3²² platform to engage digital currency capital into accelerating energy access. The Powerblocks' thesis is that flexible, dynamic, and modular computing loads can provide a much-needed base load for distributed renewables that maximize the power utilization of such installations. This project explored the proposed innovation through:

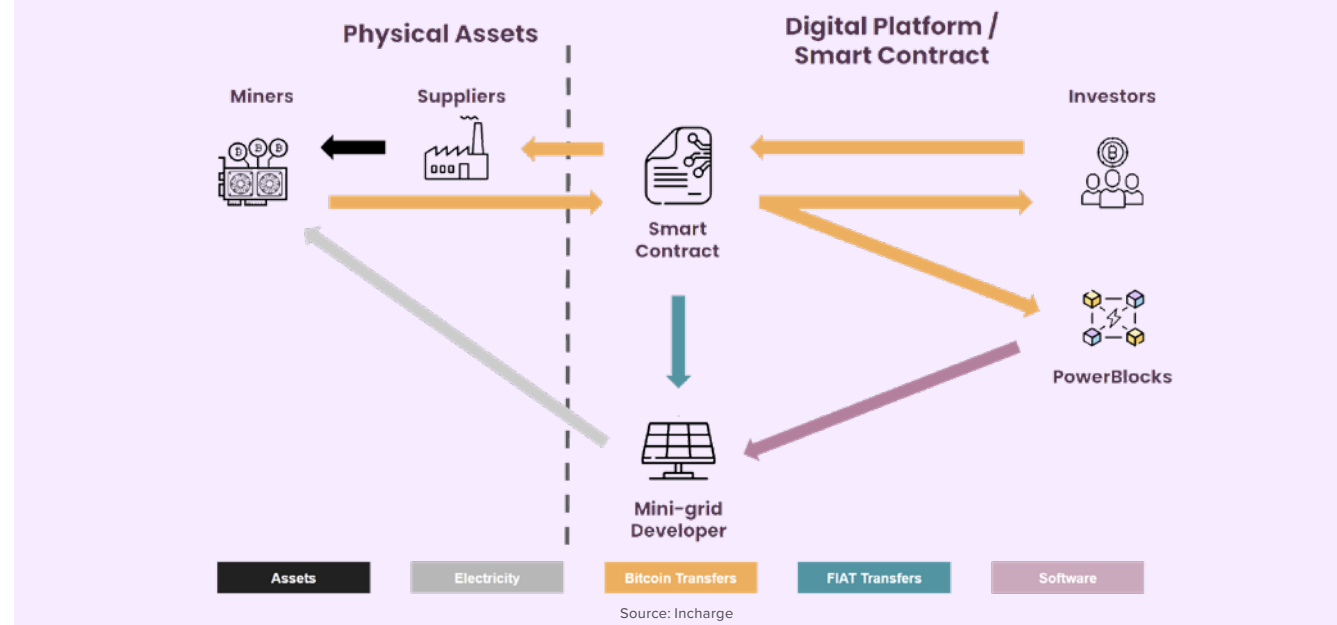
22 For definitions of 'Web3' and 'DeFi' see the UNDP report '#Web3for2030: How can Web3 help achieve the Sustainable Development Goals' (2022) [here](#).

The solution

Powerblocks is a novel financing platform by Incharge Energy that can attract private investors in a unique way to scale energy access. Powerblocks seeks to understand the type of productive use loads for solar mini-grids, that could fund the productive load and mini-grids themselves.

According to Powerblocks, Bitcoin mining can be a promising tool to help mini-grid operators consume excess energy, generate additional revenue streams,

and boost profitability. The technology is now relatively commoditized, and very modular in application. Furthermore, off-taker relations are not required since Bitcoin can be settled on digital exchanges. By using Bitcoin mining to enhance the base load of distributed energy installations, Powerblocks seeks to substantially improve the economics for mini-grid deployments, thus providing a unique model to drive SDG 7.



- Developing a model and feasibility for Bitcoin mining operations on mini-grids.
- Conceiving a platform for scaling Bitcoin mining on mini-grids via a Decentralized Finance (DeFi) tool – This also considers the technical requirements.
- Capturing lessons learnt from a Bitcoin mining-rig pilot site on an existing mini-grid in Uganda.
- Sector and technology research to harmonize project learnings and provide recommendations.

“The CAP FIC support has enabled us to quickly experiment with and improve our assumptions while gaining insights into novel challenges. As a result, our learning curve has been expedited, leading to positive transformations in our business model.”

– Incharge Energy

Key lessons & takeaways

- Computing loads such as Bitcoin mining can improve and maximize utilization of installed energy capacity for mini-grids. The characteristics of non-solar mini-grids present a range of opportunities for revenue, capacity utilization and novel methods of financing. However, specifically for solar mini-grids, the model is not feasible. It does not lead to substantial increases in revenue nor does it seem to bring additional project finance to solar mini-grid developers.
- With solar power only, the uptime is limited by the available installed capacity, insolation, and demand from the main mini-grid consumers. To extend the uptime, Powerblocks suggests that the mini-grid could make use of energy stored by batteries, however, this comes at a higher cost. Further analysis is required to assess the potential benefits of such an approach.
- The Bitcoin mining model requires number of preconditions to work, many of which are not given in the solar mini-grid setup:
 - A high enough uptime of 80 to 90 percent to recuperate the CAPEX investments – Solar mini-grids only supply up to 50 percent in an optimistic scenario.
 - A low enough Levelized Cost of Energy (LCOE) of \$0.12 per kilowatt hour (kWh) and below – Solar mini-grids have a LCOE of up to \$0.50 per kWh.
 - If the two conditions above are not met, a steep Bitcoin value increase would be required during the project lifetime, while the majority of the Bitcoin rewards are not being liquidated – This introduces unnecessary risks and volatility that many mini-grid operators are not willing to take.
- The Powerblocks model is not feasible on solar mini-grid sites in off-grid locations: Uptime is a significant variable impacting mining revenue for solar mini-grids, and this is a limitation that eliminates the effectiveness of the Powerblocks rig. With 40 percent uptime, the time required to achieve the same return on capital as 100 percent uptime is over 2.5-fold longer. Furthermore, the rig can only afford a lower power price, at approximately \$0.02-\$0.04 per kWh, which is far below the typical LCOE on a solar mini-grid today.

“From the feasibility study, Powerblocks envisions potential in deploying their platform to facilitate contracts, payments, demand assessment, etc. and in the future exploring hydropower mini-grids and C&I installations or with other energy-consuming services such as data centres.”

– Incharge Energy

The feasibility study concludes that it is too early to consider the platform approach, and further work is required to develop more robust project pipelines with stronger business cases such as industrial sectors that have a bigger market, bringing the economies of scale that a platform needs. A better understanding of the potential and risks associated with cryptocurrencies and Bitcoin mining is needed among stakeholders.²³ Powerblocks also recognize that financial and cryptocurrency regulations need to be better understood, specifically with respect to securities and investment regulations, in order to clearly define the operating model.

Next steps

- > Developing projects with other energy sources: From a business perspective, hydropower, biogas, wind (including hybrid projects), geothermal and waste-to-energy projects are of interest to Powerblocks, due to power generation that is more available through the day. The projects can be of almost any size range, since there is a modular and flexible demand. An initial investigation reveals the promise of hydro power projects within the 0.1-10MW range, with a potential of 12GW in Africa vs deployments of 500MW today²⁴. The proposed model may have better promise and application in this context, and further investigation is required to understand the opportunity, challenges, and application for energy access.

²³ The UNDP report on 'Cryptocurrency in Africa Alternative Opportunities for Advancing the Sustainable Development Goals?' (2023) ([Link](#)) provides an explanation of the regulatory uncertainties and key risks around cryptocurrencies.

²⁴ Korkovelos, A.; Mentis, D.; Siyal, S.H.; Arderne, C.; Rogner, H.; Bazilian, M.; Howells, M.; Beck, H.; De Roo, A. A Geospatial Assessment of Small-Scale Hydropower Potential in Sub-Saharan Africa. *Energies* 2018, 11, 3100. ([Link](#))

- > One way to diversify is by shifting focus from mini-grids to C&I plants. These larger-scale installations can cater to the energy needs of businesses and industries, providing a higher revenue potential compared to individual connections in mini-grids. By targeting C&I customers, Powerblocks can explore partnerships with businesses and industrial zones to develop and operate energy solutions tailored to their specific requirements. This diversification strategy can help tap into a market segment with higher demand and revenue potential.
- > According to Powerblocks, the platform is technically feasible with a large addressable capital pool. This presents a novel financing platform that can attract private investors in a unique way to scale energy access. Further work on a better fit project pipeline (such as with other productive users and/or energy sources that have generation across a day) and a detailed assessment for managing the financial structure must follow.
- > Beyond the pipeline, a community will also need to be established. Further work on identifying regulation and compliance on a specific business model needs to be established (for example selling hashrate²⁵ or colocation).
- > The application of a modular, flexible data centre that supports the growing demand for cloud services (storage and processing of information) is a related application that could directly displace Bitcoin mining providing a similar load profile. The data centres can be focused on machine learning applications where computing requirements can be batched.

About Incharge Energy & Powerblocks

Powerblocks was founded in 2022 with the vision of advancing clean energy by leveraging digital infrastructure, specifically by addressing the power demand gap that limit the business case for accelerating deployment of clean energy.

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²⁵ According to Incharge Energy, Hashrate is a measurement of the computational power used in cryptocurrency mining. It represents the speed at which a mining device or network can solve complex mathematical problems, known as hashes, in the process of verifying and adding new transactions to the blockchain.



PAYGO receivables financing platform

by Solaris Offgrid

The problem

Pay-As-You-Go (PAYGO) is a ground-breaking innovation bringing clean and renewable energy to underserved populations. Nearly 490 million people are accessing energy through Off-grid Solar (OGS) solutions worldwide – in Africa, about half of those customers would not have accessed OGS without flexible payment plans²⁶. This business model may

26 World Bank. (2022). Off-Grid Solar Market Trends Report 2022: State of the Sector. Washington, DC. [\(Link\)](#)

“Our **Bridgin platform** helps reduce transaction costs, simplify financial management and bridge the gap between investors and distributors, channelling funding towards companies serving the bottom of the pyramid so that people can access credit toward essential products such as solar home systems, farming inputs, and clean cookstoves.”

– Manon Dubois, Solaris Offgrid

have proven its potential for impact, but it remains complex to operate due to working capital constraints and irregular cash flows.

As a non-dilutive, untied and cash flow friendly funding option, receivables financing is gaining exposure. By raising cash over assets, PAYGO companies embrace their core business model and unlock trapped liquidity to finance their growth and impact. However, persistent challenges have prevented receivables financing from becoming a scalable financing solution across the off-grid solar industry.

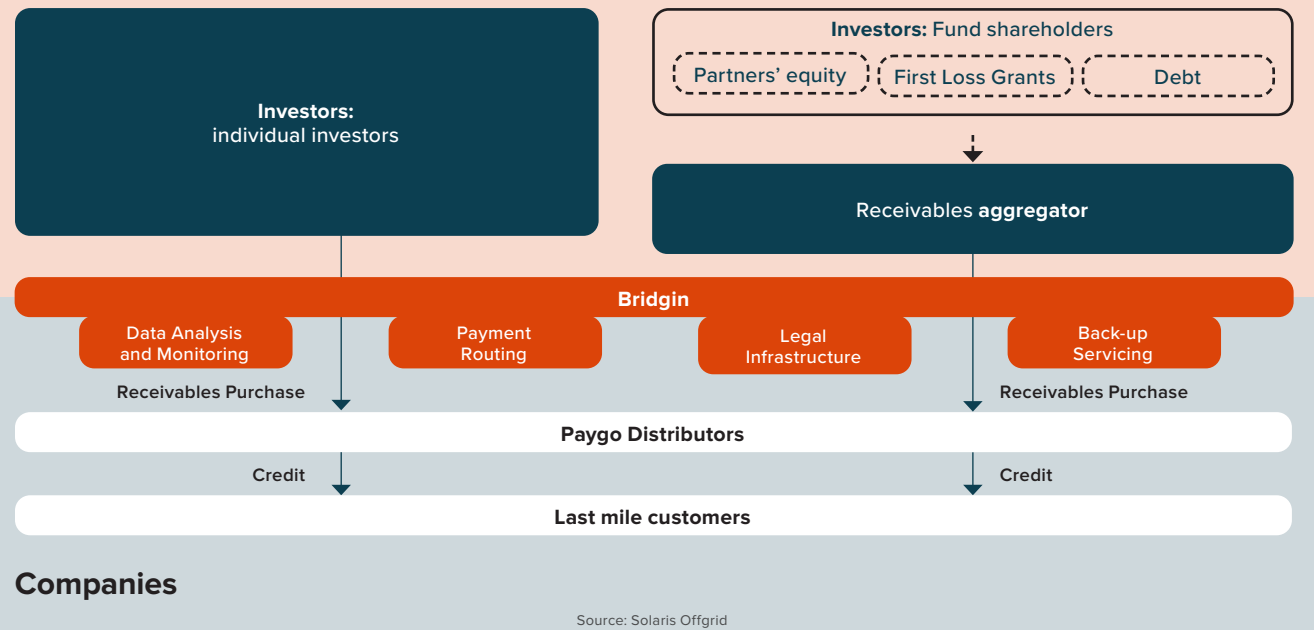
These challenges include the lack of standardization (of both investment data and legal frameworks), the existence of technical gaps around payment management, data integrity or live monitoring, and structural industry issues surrounding the setup of Back-Up Servicing (BUS) or the availability of affordable currency hedging solutions. While a great deal of work to make receivables financing available to last-mile and local distributors will need to happen at a strategic level, with respect to financial structuring, certain answers also lie in technology solutions, smart leverage of data, and underlying legal mechanisms, with a potential for aggregation.

The solution

Solaris' newly born product, Bridgin, is an interoperable, receivables purchasing marketplace and aggregation platform, through which investors can easily access and purchase pools of receivables from last-mile distributors who, in return, get instant liquidity to scale

their operations. Core features include a user-friendly business intelligence (BI) tool to facilitate data-driven investment decisions and track portfolio performance; automated payment routing; reusable legal frameworks; and technical BUS.

Investors



Source: Solaris Offgrid

CAP FIC support

Solaris' feasibility study explores how a third-party tool, such as Bridgin, can unlock receivables factoring and aggregation benefits. Through this off-balance sheet approach, both buyers and sellers can benefit from lower costs and more relevant ticket sizes to effectively channel funding toward the last-mile. The feasibility study highlights three approaches to unlock the potential of receivables financing for the space (fund, enabler, and BUS), ultimately focusing on the role of Bridgin as a transaction enabler and technical back-up servicer.

Through a case study on Uganda, using relevant stakeholder interviews and targeted legal counsel, the feasibility study highlights the challenges, opportunities, and requirements to scale receivables financing and Bridgin with private sector solar companies and investors.

Key lessons & takeaways

- **Receivables financing is gaining momentum, with individual and industry-level efforts to bring it to scale.** Strategic questions to answer at the industry level touch on the market size and demand for such financing, the structuring of the financing value chain, or answers to structural challenges such as field BUS or currency hedging. Bridgin, is addressing some of the frequently mentioned structural pain points, including data standardization, payment automation and legal harmonization.
- The **proposed legal solution** via Bridgin is feasible in Uganda – it would facilitate aggregation and can be used to carry out a transaction. However, some challenges remain: A short-term challenge touches on the taxation on true sale, though these costs can be offset down the road at the SPV level. A more strategic, forward-looking challenge touches on the replicability of the model, which could prove difficult due to limited harmonization of regulations across jurisdictions. This risk could be minimized if the SPV sat in an offshore location and purchased receivables in a similar fashion across jurisdictions – which could also help speed up the amortization of legal costs.

“The CAP FIC has been instrumental in connecting us to relevant industry stakeholders, supporting pivotal legal work to advance our rollout, and helping us enhance our offerings thanks to an in-depth feasibility study bringing us one step closer to our mission: bridging the finance gap in access to essential services.”

– Siten Mandala, Co-founder, CEO, Solaris Offgrid

- Bridgin's **BUS technical approach** seems feasible in Uganda and is awaiting live testing. Field BUS options have yet to be further investigated.
- Investors underline the **importance of impact data to orient their investments according to their mandate.** This includes both company level information (i.e. Environmental, Social and Governance (ESG)), but also specific granular data at the asset level, such as carbon offsetting, energy efficiency, gender-disaggregated portfolio data, or high-level indicators on poverty reduction and SDG progress enabled through energy access.

Next steps

- > Bridgin transaction in East Africa.
- > Rolling out Bridgin legal infrastructure in new regions which calls for additional legal work.
- > Upcoming users' onboarding of both distributors and investors.
- > Continuous platform improvement: Exploring new metrics to track, or features to include for optimal impact.
- > Industry involvement to participate in receivables financing initiatives and reflect collectively on remaining challenges (e.g., currency hedging and field BUS).
- > Bridgin is already operational in each of Solaris Offgrid's 38 countries as a pure data analytics platform. The payment

routing solution being developed can be easily implemented with banks that have unified Application Programming Interface (API) environments and harmonized policies across their countries of operation. As for the legal framework, rolling out requires replicability from one jurisdiction to the other. Priority countries would be primarily East African countries, in alignment with the current feasibility efforts; closely followed by West Africa, where there are several distributors keen to use the solution.

About Solaris Offgrid

Solaris Offgrid develops solutions for those at the Bottom of the Pyramid to access credit towards essential products such as clean cookstoves, farming inputs and solar home systems. Its flagship product is a B2B SaaS called PaygOps that enables last mile companies, product distributors, to provide products on an instalment plan. On top of the platform, Solaris Offgrid has developed Bridgin, a marketplace for credit that is generated through PaygOps, essentially allowing third-party investors to buy aggregated receivables. The company has 70 clients across 38 countries in Africa and has impacted over 4 million people.

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Synthetic securitization for solar home system contracts

by Hypoport Africa

The problem

In recent years, a wide range of innovations have emerged which have made it possible to substantially increase the number of people with access to electricity across the globe. In particular, different models now exist for the deployment of distributed renewable energy solutions such as solar home systems or mini-grids to deliver electricity to users in remote and underserved areas. However, several barriers persist that hinder the scale up of such models, notably the lack of adequate or sufficient financing.

CAP FIC support

Hypoport worked towards the development of a synthetic securitization transaction, which, in order to be implemented, requires developing and testing standardized metrics for data and reporting, based on a pilot transaction in Mozambique.

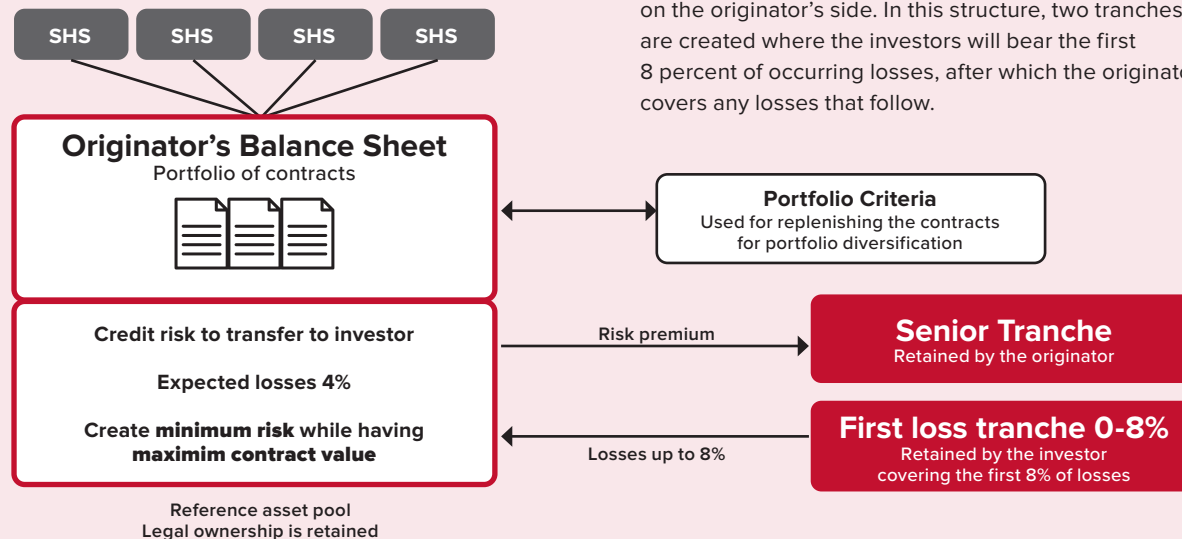
- Hypoport carried out a review of their previous experiences with large scale securitizations and gathered lessons from other projects that could be applied to smaller scale off-grid solar (OGS) aggregation in sub-Saharan Africa. These

The solution

Hypoport Africa is exploring a solution in the form of a securitization structure aiming to pool solar home system contracts from different originators. The proposed approach includes several features designed to tackle specific barriers, such as standardized reporting to increase transparency, the use of criteria to influence the diversity of the portfolio with a positive impact on SDG inclusion, as well as

data standardization to create more homogenous implementations from a business perspective.

Taking into account the complexities involved in implementing a securitization of renewable energy assets such as solar home system contracts, and building on lessons learned from previous experiences, Hypoport proposes a synthetic securitization transaction, where the legal ownership is maintained on the originator's side. In this structure, two tranches are created where the investors will bear the first 8 percent of occurring losses, after which the originator covers any losses that follow.



Source: Hypoport Africa

consisted of technology implementations – for the purpose of monitoring and analysis of loan and contract portfolios – and providing support for reporting and quality assurance for the full process.

- Furthermore, they carried out interviews with some of the main actors involved in these financial aggregation cases, and other actors in the OGS and financial aggregation sectors.

“ We are grateful to UNDP for giving us the opportunity to undertake this work. Hopefully it will contribute to the sector, bringing large-scale securitization of Solar Home System Receivables one step closer. ”

– Louise Pos, Hypoport Africa

- Hypoport’s feasibility study presents the proposed detailed quantitative characteristics of the transaction (e.g., average contract size, seasoning, and principal outstanding amount) based on a market assessment for Mozambique and previous experiences.
- The proposed structure is a replenishing deal, meaning that loans reside in a pool over time and new assets are purchased to replace contracts maturing (and repaid in full) or not deemed eligible. On a recurring basis, the pool is checked against eligibility criteria to make sure that the non-eligible contracts are repurchased. Afterwards, new eligible contracts are added to the pool to maintain the desired pool size and target amount.
- The model requires certain portfolio criteria and the use of replenishment strategies to maintain the portfolio within the established limits. To assess these limits, Hypoport used its previous credit scoring databases to suggest certain guidelines for the portfolios included in the aggregation pool. This decreases the overall credit risk of the portfolio, as diversification can be applied in the most efficient manner while still maintaining desired pool characteristics such as size, seasoning, and total principal outstanding amount.
- Standardization and transparency in reporting are another key pillar of the proposed model. Hypoport works with local institutions to standardize their loan information into a format that can be processed and monitored by its software. This allows Hypoport to adapt some of the lessons learned in the process and provides a basis for PAYGO companies to standardize their own receivables information for further processing and reporting. The goal is to provide a base model and/or guidelines for these companies to input their information in a way that enables clear monitoring and reporting.

Key lessons & takeaways

- For the sector to attract investment and lenders, it is necessary to have quality, real-time data of ongoing operations which allows for a clear understanding of the credit risk involved. This data collection generally requires

process automation and technology which can pose a problem for new, small and upcoming developers without the means or knowledge to invest in these systems. Furthermore, the data (when provided) is unregulated and not standardized across the industry. It is essential to identify and agree on basic standard information that all companies should collect that allows investors to develop a correct risk evaluation. From interviews conducted, it was observed that the problem lies not only in the lack of data, but also in the reluctance to share such information among industry competitors due to commercial sensitivities, and to protect the business model.

- Clear portfolio criteria and defined reporting points for originators are key to success. Establishing these guidelines enables the generation of a comprehensive and transparent portfolio report, facilitating accurate assessments. The reporting process should focus on essential factors such as defaults, losses, recoveries, and repossessions. Both the onboarding process and the resulting report must prioritize these critical characteristics. Inherently, this will provide clear information on the credit risk involved and thereby lead to more maturity in the sector and increased investor interest.

Next steps

- > Set up the legal structure; define the (final) size of the senior tranche and the first loss tranche; define the different roles for stakeholders; and describe the transaction and cash flow waterfall.
- > Analyse all the historic contracts including foreclosures, write-offs, arrears, finished and performing contracts.
- > Ringfence the selected contracts and define this as the “selected portfolio” including portfolio criteria for replenishment reasons.
- > Implement and define the structure in the technology platform to monitor the transaction for investors and regulators (STS Compliant).

Hypoport proposes a synthetic ringfenced structure for SHS contracts in Mozambique for multiple originators that will

support Distributed Energy Service Companies (DESCOs) in the country with their growth strategy. It is important that this structure has features such as replenishment and SDG portfolio criteria which can meet investor requirements and will make it easier to present its possible impact. A cost-efficient structure in local currency seems to be the way to go.

To implement the proposed structure an estimated budget of up to \$350,000 will be sufficient to execute a first transaction of \$15 million. Building on the proposed transaction, further transactions could take place in other African jurisdictions without significant start-up costs.

About Hypoport Africa

Hypoport Africa, based in Johannesburg, provides fintech services and advisory to clients in the financial sector. Hypoport provides financial software to support collateral reporting and analysis for securitization structures using their PRoMMiSe® technology platform. Hypoport has more than 60 institutional clients worldwide including investment banks, pension funds, development banks and asset managers. Hypoport has supported the African market for over 12 years and based on this experience and their extensive African network, they are excited to contribute to the further development of the off-grid sector.

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“Our solution focuses on managing the most optimal and diversified off-grid future receivables portfolio for originators and investors, thereby providing more funding opportunities for specific target groups such as women and youth. Real-time monitoring and structured reporting are both key to create the highest transparency standard in this solution.”

– Christiaan Pennekamp, Hypoport Africa

4R DIGITAL

Digital platform to bundle debt and results-based finance with climate finance

by 4R Digital

The problem

Despite improvements in the affordability of clean energy solutions stemming in part from the Pay-As-You-Go (PAYGO) financing model, many low-income households and micro-small businesses in sub-Saharan Africa remain unable to purchase and use such products. This leaves them tied to carbon-fuelled solutions and limits the extent of clean-energy related economic growth. Although wholesale debt providers have entered the PAYGO market to support sales of these products, many businesses are unable to achieve profitability, and the take-up of this debt finance is limited to a few larger actors.

Climate finance, available through the Voluntary Carbon Markets (VCMs), provides a new source of capital that can be used to further reduce the cost of clean energy solutions for low-income customers. However, climate finance needs to be complemented with additional financing to ensure the affordability of most products – aside from certain lower cost items such as cookstoves.

The solution

The Carbon Value Exchange (Cavex) is a digital platform that enables micro-small projects in emerging markets to access climate financing. It uses digital data to verify and validate greenhouse gas reduction and removal activities and make these available to buyers in the form of carbon credits through the VCMs.

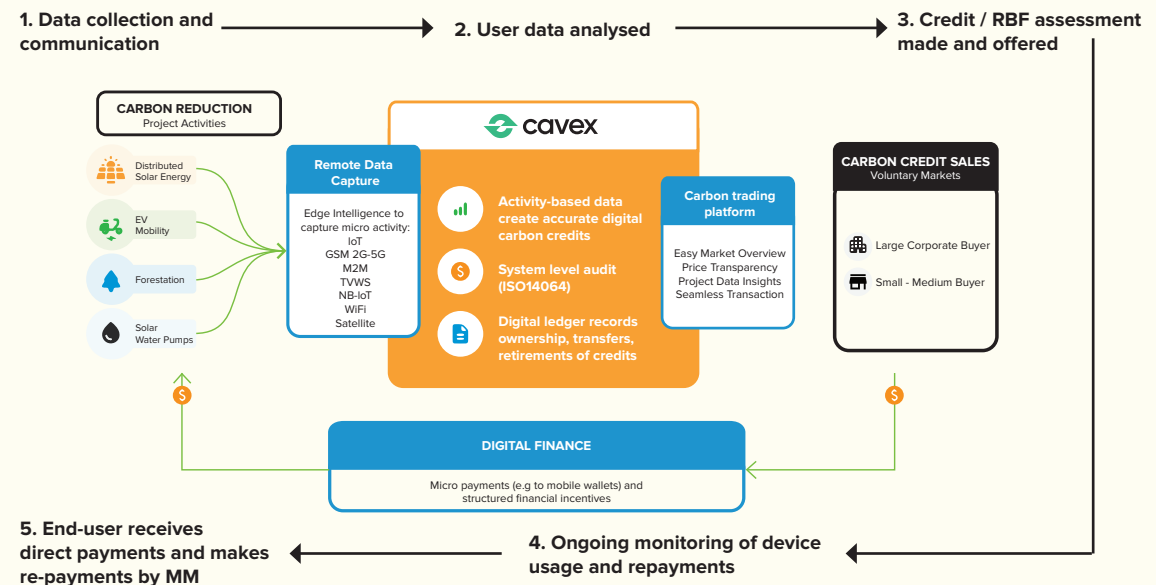
Financial institutions have expressed interest in using Cavex to identify and lend (at preferential rates) to projects selling clean energy assets to low-income customers. Similarly, Results Based Finance (RBF) providers could leverage the platform to reward users of clean energy assets (e.g., electric cookstoves, solar water pumps, etc.) that contribute to their objectives.

Cavex provides much of the underlying functionality that can enable both debt finance and an enhanced RBF methodology to be deployed. The platform already monitors units of activity in the process of creating carbon credits and collects a wide range of additional

data that can enable the verification and validation process. Cavex is also developing longitudinal monitoring tools that enable the verification that certain benefits have been experienced by participants over time, as is necessary for RBF.

The RBF provider would act as the “buyer” of the intended activities. These would be monitored on the platform using digital data submitted by participants, following the required methodologies and protocols. Once each relevant unit of activity has been validated, payments can be made to the nominated recipient per device (individuals, organizations, or businesses).

One possible application is in electric cooking in Kenya: Female end-users could receive financing through the sale of “gender-bundled” carbon credits sold on the VCMs. An additional layer of debt finance and/or RBF could be provided to further support the purchase and use of the device.



Source: 4R Digital

CAP FIC support

4R Digital's feasibility study explores the scope and scale of the opportunity to layer additional product financing (credit and RBF) from bank and non-bank financial institutions and development finance institutions (DFIs) on top of the carbon related payments generated through sales of carbon credits via Cavex. 4R Digital explored how the Cavex platform can be leveraged to enable this additional financing to low-income end-users. Cavex already tracks individual user accounts and records the activity of individual devices – converting activity to a carbon credit value. The feasibility study looks at how these functionalities could be extended to approve loans and/or payments to eligible participants and to implement payments through the system.

Key lessons & takeaways

- 4R Digital found that significant appetite exists amongst debt providers to provide asset financing to clean energy asset users due to the perceived reduction in risk, based on factors such as the availability of granular digital data on device ownership and usage, and the reduced cost of ownership that results from access to carbon finance.

“With the right type of R&D funding, the opportunity exists to increase access to debt and RBF for low-income asset users via the digital platform and tools, to increase visibility an effectiveness whilst reducing costs significantly.”

– Nick Hughes, Originator of M-Pesa, and Co-founder of M-Kopa, and 4R Digital

- RBF providers have also expressed strong interest in leveraging Cavex (and similar solutions) to deploy RBF because of the opportunity to financially reward outcomes (e.g., the use of an electric stove) rather than outputs (e.g., the sale of an electric stove). However, since there is a dominant design amongst RBFs which donors are largely comfortable with and for which there are established methodologies and processes, all parties interviewed have acknowledged that pilot testing and a proof of concept is required for a new approach. This may require a lead organization willing to innovate.

- Stakeholders consulted by 4R Digital suggested that the proposed approach is attractive because they are essentially:

- i) Pre-financing their future supply of carbon credits;
- ii) Lending to micro-enterprises/households where environmental, social and economic benefits will accrue, and obtaining a return on their capital.

Using one channel/platform to achieve these objectives is desirable in that it minimizes transaction costs and centralizes the processes of data collection and analysis for investment decision-making and monitoring.

- High-level projections suggest that (with the necessary investments in platform and methodology) over a five-year period (making cautious assumptions) it would be possible to finance 77,500 electric cookstove and solar water pump users and deploy \$22 million of credit and RBF to users.

Next steps

- > In partnership with financing partners, develop the detailed system design (building on the existing Cavex platform) and the associated software development backlog. Then undertake the necessary software development.
- > Pilot test with existing project partners (for example in e-cooking and solar water pumps) testing the response

of end-users, their use of the assets, use of funds and repayment behaviours.

- > Refine the operational and business model and amend the platform functionality as required.

This study has shown that significant opportunities exist to develop the debt and RBF solutions to the next stage of market testing. This will involve developing Minimum Viable Products (MVPs) separately for each solution and testing these in the market – with the objective of reaching approximately 100 users for each solution. Experience incubating similar solutions suggests that developing and fully testing each solution would require about \$500,000 (each) of product R&D funding. Such an investment would provide the necessary information to develop a business model that is ready for scaling.

The next stage will require close collaboration with interested RBF funders to develop and test the solution in a way that meets their needs, and with commercial financing partners that have an interest in providing clean energy asset finance to lower-income customers and in leveraging climate financing to improve affordability.

About 4R Digital

4R Digital is a B2B digital solutions provider bringing innovative and disruptive solutions to market, registered in the United Kingdom. 4R Digital's founders have extensive experience in developing innovative digital finance platforms having led the development of M-PESA and co-founded and grown M-KOPA.

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