



# IoT-enabled household battery distribution via micro-retailer networks in Senegal

## Pilot Summary

Start Date: October 2022

Completion date: November 2023

## The Problem

Lack of access to energy is a major problem for many low-income households and marginalised communities in Senegal, where 66% of the population living in rural areas do not have access to electricity.

In these communities, households may not have access to grid-based electricity and may rely instead on expensive and polluting energy sources such as kerosene or diesel generators.

A further obstacle is the cost of electricity provision, with connection costs representing more than one month's income for the poorest 40% of households in 'access-deficit countries'. While rent-to-own solar-panel systems are available in many areas, low-income households are largely unable to access them as they cannot afford to pay the initial deposit to sign up, a problem which is compounded by restricted access to finance.

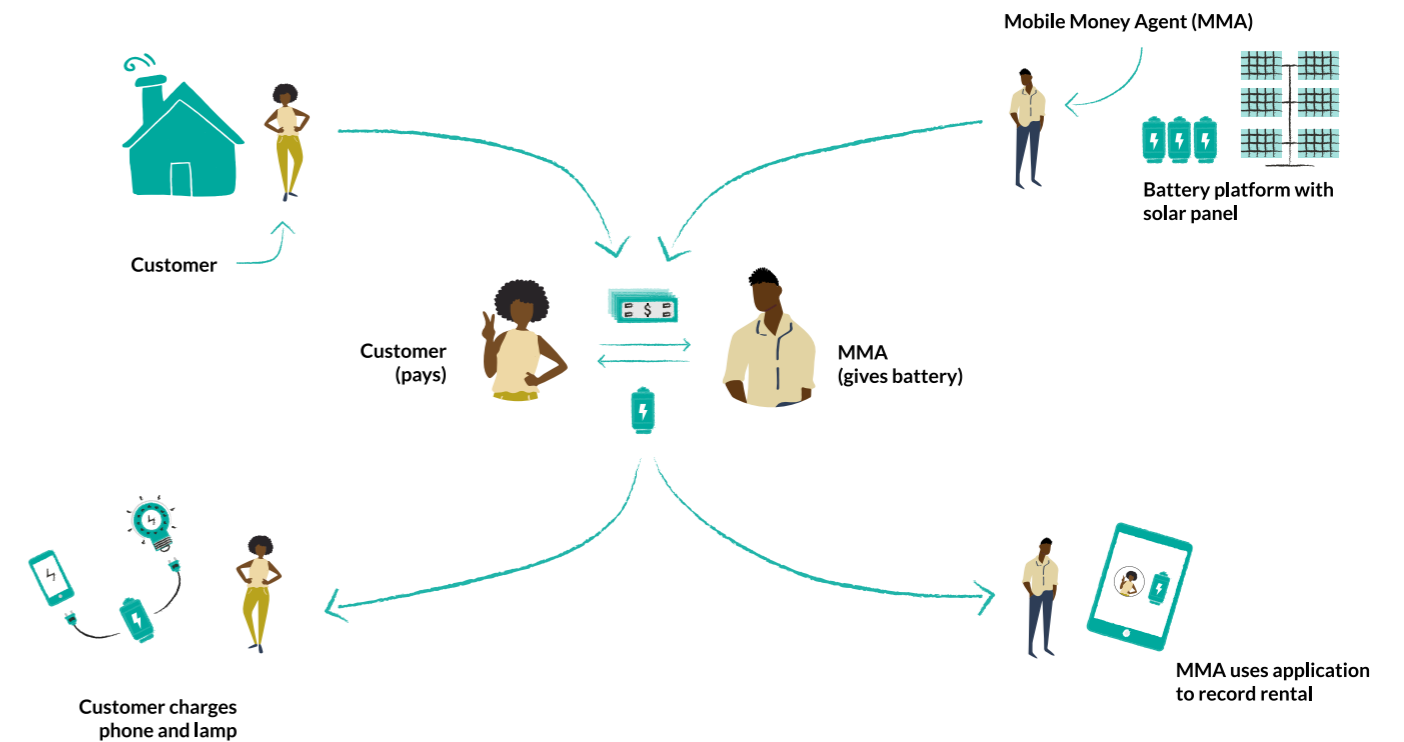
## The Solution

Through the Frontier Technologies program 4R Digital sought to develop and test whether digitally-financed clean energy charging stations could be made available via micro-retailers in Senegal, in order to meet the energy needs of low-income households. This pilot aims to serve those at the bottom of the pyramid and offer services to these households that cannot afford to pay the initial deposit to sign up to a rent-to-own solar-panel system

The pilot aimed to provide households with access to rechargeable batteries, which they could then use to power and recharge devices such as lights or mobile phones, via micro-retailers in rural Senegal, who would serve as charging and distribution points for batteries. In this case, mobile money agents or MMAs were chosen because they operate as part of wider distribution chains throughout Sub Saharan Africa, and are very localised and ideally situated to serving the needs of mass market and low-income customers.

The pilot sought to learn whether Mobile Money Operators (MMOs) could scale the technology via leveraging existing networks of MMAs, and whether MMAs would be incentivised to offer smart household-battery energy solutions, as a means of diversifying their income, and increasing revenues.

The pilot tested smart technology, where data was collected from depleted batteries each time they were plugged into the charging station at the micro-retailer shop, so that retailers could understand battery health and usage, and MMOs could receive intelligence on the demand for the solution.



## Goals of the pilot

Although the pilot aimed to provide affordable clean energy for those households that cannot afford to pay the initial deposit to sign up to a rent-to-own solar-panel system; the primary objective was to test whether a sustainable model for scaling smart household energy solutions to low-income households could be realised through validating that there were income generating opportunities for MMAs through a daily rental charged to end-users of the batteries.

The goals of the pilot were to test the following key questions:

1. Can rechargeable IoT batteries be developed and delivered to meet the energy needs of households in Senegal? And can solar-powered charging units be easily adopted by Mobile Money Agents?
2. Is there a viable business model for Mobile Money Operators to scale the technology through Mobile Money Agents in their network leasing batteries to households in rural Senegal.

## Key Activities

The pilot conducted a range of key activities, over the series of three sprints and a follow-on-phase. Broadly this consisted of:

- Engaging MMAs and their customers through research interviews to understand their needs and demand for adopting the solution.
- Conducting an iterative process of testing, learning and then improving the technical solution, through trialling with 2 MMAs in Senegal and their customer base.
- Building a business case for scaling the solution in collaboration with Mobile Money Operators and their networks. Including conducting research with agents and customers to identify potential price points for the solution, and modelling the costs associated with developing the technology and operating the proposed service model.
- Validating the incentive of MMOs to support the scale-up of the solution through engaging potential partners to assess interest.

## Outcomes - key findings from the pilot

### **The technical solution was easily adopted by Mobile Money agents, and rechargeable batteries met the needs of low-income households**

Through the testing phase the pilot team developed and deployed a technical solution consisting of rechargeable batteries, charging stations and a digital platform that collected data from batteries. Through the trial it was confirmed that batteries met the consumption needs of customers and were compatible with personal devices.

Agents were able to use the charging stations to meet the needs of their customers, and both agents that took part in the trial reported that they would be happy to offer the battery rental service as a commercial proposition to their customers. The team validated that it was possible to use the data collected via rechargeable batteries to support digital payments for battery usage, monitor battery health, and support mobile money operators to understand consumption patterns across their networks.

### **The pilot was able to confirm that there was considerable customer demand for the technology in the market, and identified that customers were able and willing to pay for a final product at a price point that worked for agents.**

Initial research showed that 77% of 118 households surveyed expressed demand for this kind of energy service; and during testing of the MVP product, 7 out of 8 customers said they would pay for the battery rental service at least 4 days per week. In terms of price point, 5 out of the 8 battery customers said they could pay up to \$0.25 per day, but all customers would be willing to pay between \$0.08 to \$0.15 per day. Agents expected a commission per swap of between expect a commission per swap of \$0.14 and \$0.19. The team identified that a price point of between \$0.15 and



MMA Kiosk in Guinguineo, Senegal

\$0.20 might work for both customers and agents.

### **The final business case developed by the team suggests that there is long term return on investment for both mobile money agents and mobile operators adopting the service.**

With opportunities for agents to generate additional revenues between \$168 and \$384 per year for the first three years, and revenues between \$600 to \$800 per annum, once they have completed a 3-year financing period for procuring the charging stations. For Mobile Money Operators, the business model indicated that if they were to help finance and scale the solution to 3,000 agents over a five-year period (with increasing number of agents onboarded each year), that they would begin to see a return on that investment by Year 7.

The business model developed through the pilot contained a large number of assumptions that to date have only been tested through a trial in which customers were not expected to pay for rentals. Consequently, further testing is required to validate the underlying assumptions within the model, including the willingness and ability for low income households to pay.

### **Without the right enabling conditions or buy-in from MMOs, it was deemed unlikely that the solution would scale, as envisioned, within the Senegal market.**

The pilot team were not able to engage MMOs over the course of the pilot to share the business model and secure support for scaling the solution. Analysis of existing market data indicates that the mobile money market in Senegal (and other Sahel countries) is still at a relatively nascent stage, and is unlikely to be well-suited to this initiative, as MMOs are currently largely focused on recruiting agents and scaling basic services and do not have the capacity to develop their product offering or the broader

