

When price isn't the whole story

Why rural consumers in Rwanda have low demand for electricity



In brief

- Electrification is considered critical for economic growth, as reflected by Rwanda's goal to hit 100% electrification by 2024, but providing poor consumers with access to electricity presents major challenges.
- This study examines consumer responses to a price incentive to pay for solar electricity among existing Pay as You Go (PAYGo) solar customers.
- Very few consumers responded to the incentive, and those who did were consumers who were already purchasing enough solar to have access to electricity on most days.
- Administrative and survey data highlight three possible explanations for non-responsiveness: consumers are uncertain about their future demand for solar, consumers are liquidity constrained, and/or consumers are not sensitive to the price of electricity.
- This study highlights the importance of non-price factors in designing policies that promote rural electrification.

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Overview of the research

Pay as You Go (PAYGo) solar is a way for households to benefit from having a solar home system without needing to pay for the expensive system at once. Households make a down payment to have a solar home system installed, then pay for days of system access using mobile money. If a household runs out of system access time without topping up their account, they are remotely locked out of their solar home system until they pay again.

PAYGo addresses key challenges to electrification such as high costs to purchase a solar home system and contract enforcement. However, many solar customers frequently miss payments. In the sample of consumers included in this study, the median customer goes 5-8 days a month without electricity due to non-payment. This study was designed to better understand why rural consumers in Rwanda exhibit such low demand for electricity. To do so, we partnered with a solar company to offer two types of incentives to randomly selected existing solar customers:

- *Buy 4 or 5 weeks of solar at once to get 1-4 days of solar for free.*
- *Buy 4 or 5 weeks of solar over the course of a month to get 1-4 days of solar for free.¹*

The purpose of the incentives was to answer the following questions:

- *Will solar customers purchase more days of electricity if they get better value for money (e.g., if the effective price of electricity is lower)?*
- *Will solar customers respond more to these price incentives if they can build up to them over time rather than having to make a single, large purchase?*

We observed customer's responses to these incentives between July, 2018 and February, 2019 by tracking their purchases in the solar company's administrative data. We also surveyed customers by phone after the incentives had ended in March, 2019.

We sent detailed SMS messages to these customers every week to remind them how to qualify for the incentive as well as how many free days they would earn if they succeeded in qualifying. The SMS messages came from the solar company, which the customers are accustomed to getting communications from regarding their accounts.

1. Note that consumers could choose to purchase up to eight weeks to receive even more days for free; however, in practice most consumers who qualified for free days only purchased the minimum number of weeks.

Policy motivation for the research

Rural electrification is a major policy priority for Rwanda, as it aims for 100% electricity access by 2024, up from 12% rural access in 2018. It follows that understanding the most efficient use of resources to achieve that goal is a key component of designing effective and feasible policies for rural electrification. Studying the drivers of demand for electricity among rural PAYGo solar consumers contributes to this goal in two ways.

First, Rwanda anticipates that 48% of connections will be off-grid, so studying PAYGo solar is important to understanding the future of off-grid access in Rwanda. In particular, it is critical to understand which consumers are profitable for private companies versus those consumers that will not be if every household is to be connected. Relatedly, identifying limitations to consumer demand that undermine profitability for private companies is a way to highlight areas for public-private partnerships that drive progress on rural electrification.

Second, PAYGo solar offers a way to understand consumer demand prior to making large infrastructure investments in rural areas that have been targeted for eventual on-grid connections. While solar home systems are smaller than eventual grid connections, understanding consumer ability and willingness to pay for solar provides a baseline to better understand what returns can be expected on infrastructure investments in terms of consumer demand.

Findings

Most existing solar customers did not respond to the incentives. The highest demand solar customers increased solar purchases by approximately 4% in response to both types of incentives offered. All other customers did not change their demand. We have identified the three most likely explanations (note that these are not mutually exclusive).

- 1. Consumers are uncertain about their future demand for solar.** We compare consumers with a high variability in the amount of electricity they actually use (in watt hours) when they purchase access to similar consumers with a lower variability in the amount of electricity they use. Consumers with higher variability are less likely to earn the incentive. This suggests that some consumers do not want to buy solar far in advance because they are uncertain about how much they will need it in the future.
- 2. Consumers are liquidity constrained.** We asked consumers how long it takes them to reach the nearest mobile money agent and how often they visit the mobile money agent to pay for solar rather than paying directly from their mobile money wallets. It takes the average consumer in our survey one hour and fifteen minutes to reach the nearest agent, but nearly all report going to the agent every time they pay for solar. This is consistent with liquidity constraints: consumers are unwilling to store money in their mobile money wallet, so instead they incur large

transaction costs to visit mobile money agents every time they have to pay for solar.

- 3. Consumers are not sensitive to price.** We cannot rule out that consumers are simply not sensitive to the price of electricity. They simply purchase what they need regardless of the cost.

Policy recommendations

- **Address market frictions that limit consumers' ability to purchase small quantities of electricity frequently.**

It is well known that poor consumers often need to make small purchases to manage small incomes. Currently, transaction costs and liquidity constraints may be penalizing consumers when they are forced to make many small purchases. Based on survey evidence, it appears that increasing the density of mobile money agents in rural areas and expanding access to credit to relieve liquidity constraints would both enable consumers to purchase more electricity than they are currently even if their incomes remain the same. Other policies could similarly achieve these goals. For instance, we are planning to test the effect of allowing customers to run negative account balances that they pay back later on demand for electricity. Like borrowing airtime, such an option could both reduce transaction costs and alleviate liquidity constraints.

- **Think broadly about complementarities between electrification and other policy priorities.**

Another way to reduce transaction costs and liquidity constraints would be to make mobile money more attractive to use. If mobile money could be used for a wide variety of purchases, consumers would be more likely to hold a balance in their mobile money wallets. With money in their mobile wallet, they would not have to visit an agent every time they need to pay for solar. Increasing mobile money penetration and use has long been recognized as a way to promote financial inclusion – here, we see that it may also have benefits for electrification. These types of positive spill overs between different policy priorities are exciting opportunities to drive progress on multiple fronts at once.