

MARKET MECHANISMS TO ENABLE OFF-GRID ELECTRICITY ACCESS FOR THE HARDEST TO REACH IN RWANDA

- Energy as a Service (EaaS) has the potential to increase the number of households willing to pay for a Tier 1 Solar Home System by 1.3 million.
- Combining PAYGo or EaaS with subsidies further increases impact. EaaS combined with a 50% subsidy can potentially increase access by up to 2.1 million households.
- Factors that hinder people’s ability to engage with market mechanisms, such as income variability, must be addressed for potential impact to be achieved in practice.

As of 2021, 51% of Rwanda’s population, around 1.6 million households, had no access to electricity. Market mechanisms (financial interventions designed to improve energy affordability) will be crucial in achieving universal access and ensuring that the 1.6 million households living in extreme poverty (less than \$2.15 a day), of whom 59% (920,000) lack access, are not left behind. Rwanda also hosts around 28,000 displaced households who also struggle to access electricity and require targeted support. This brief explores the ability of market mechanisms – both business models and external interventions – to increase the number of households willing to pay for a basic Tier 1 Solar Home System. It looks at total population, those in extreme poverty and displaced people.^{1,2}

Increasing access through business models alone

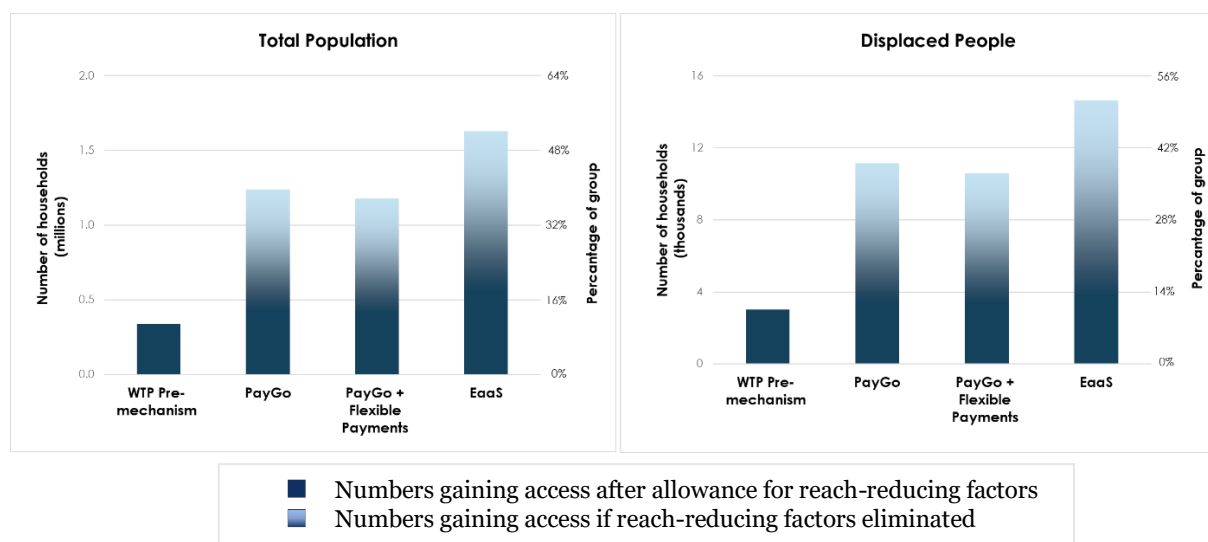


Figure 1: The number of households willing to pay for a Tier 1 Solar Home System as a result of different business models (compared to the number willing to pay the upfront cost)

Figure 1 indicates that each of the business models assessed – PAYGo, PAYGo combined with flexible payments and Energy as a Service – can substantially increase the number of households willing to pay for a Tier 1 SHS among the total population and displaced people.

¹ Potential impact relative to the number of households willing to pay upfront without financial support.

² The analysis presented here builds on an earlier study conducted for the Transforming Energy Access platform. Details of this, including the econometric modelling used in this brief, are available on [Practical Action’s website](#).

However, factors which reduce people’s ability to engage with business models, particularly seasonal or unreliable incomes, low experience and hesitancy in taking on financial commitments (especially where income sources and services are unavailable in refugee camps) and physical remoteness, could mean that far fewer households take up support (and, therefore, gain electricity access) in practice. It is essential that factors are addressed either in the design of business models themselves or through supporting interventions.

For the total and displaced populations, PAYGo combined with flexible payments has a lower impact than PAYGo alone. In the scenario considered, postponing payments resulted in higher total finance costs and so reduced households willing to pay. In practice, impact will depend on context and other forms of flexibility may have a different impact. EaaS has greater impact than either PAYGo or PAYGo combined with flexible payments, with the potential to increase the number of households within the total population willing to pay by up to 1.3 million. For displaced people, the increase was up to roughly 12,000 households.

No households living in extreme poverty were willing to pay the upfront cost used in the model and the modelled payment terms failed to increase the number of households willing to pay. This indicates that more generous payment terms and other forms of financial support are needed to enable uptake for this group.

Increasing access through market interventions alone

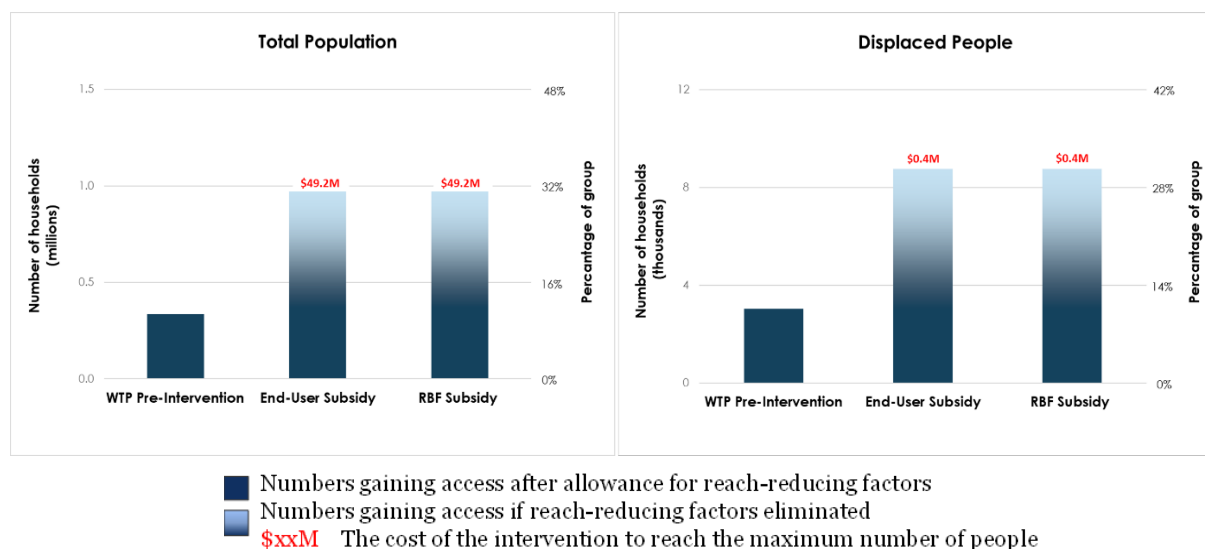


Figure 2: The number of households willing to pay for a Tier 1 Solar Home System as a result of different external interventions (compared to the number willing to pay upfront).

Figure 2 indicates that either a 50% end-user subsidy or a 50% results-based finance sales subsidy would increase the number of households willing to pay for a Tier 1 SHS among the total population and displaced people. Within the total population, each has the potential to enable an additional 640,000 households to access electricity, lower than PAYGo over 12 months (900,000) and EaaS with a 5-year product life. For displaced households, the increase is up to around 5,700 households. As with business models, **a 50% subsidy did not result in any households living in poverty being willing to pay indicating that greater subsidies will be needed to enable affordability.**

The two subsidy types are predicted to have the same impact because they are assumed to reduce the cost to the customer by the same amount. In practice, impacts may be different, for example, if a company does not use the subsidy entirely for this purpose or if poor targeting results in fewer intended households benefitting. Again, factors which hinder

people’s ability to engage with market mechanisms are likely to reduce a subsidy’s reach in practice. This potentially includes lack of registration in national databases or proof of residence which will hinder targeting and inclusion for certain groups. Displaced people are regularly excluded from subsidy programmes which benefit host communities and, therefore, require more targeted financial support.

Combining business models and market interventions

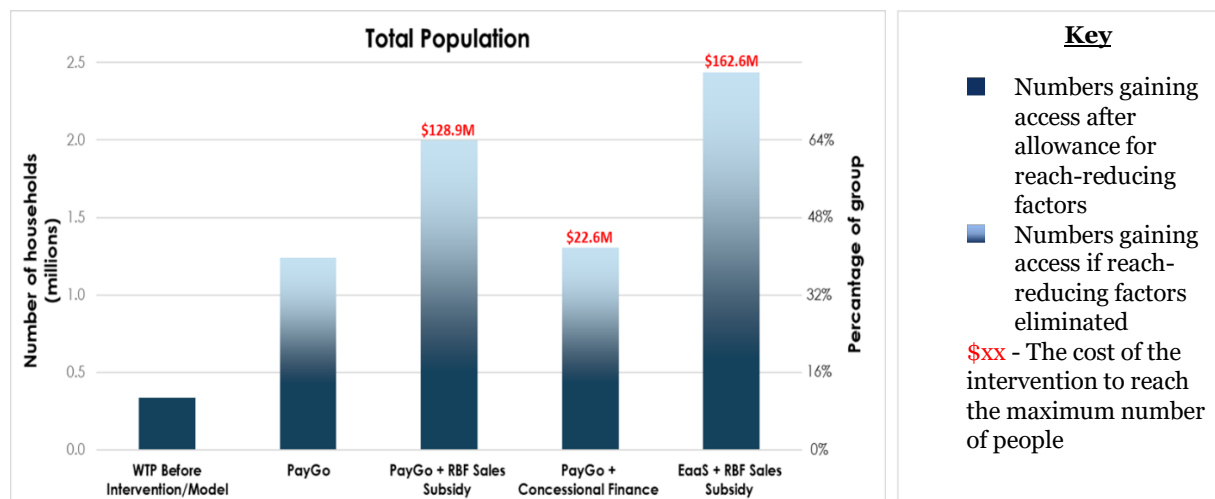


Figure 3: The number of households willing to pay for a Tier 1 Solar Home System as a result of different combinations of business models and external interventions (compared to the number willing to pay upfront).

Combining business models with market interventions produces a higher potential impact across all groups than any one mechanism on its own (although not as much as the sum of the impacts of the individual mechanisms applied separately). However, reach-reducing factors also combine which may substantially reduce the impact of combining mechanisms.

Figure 3 indicates that combining PAYGo with concessional finance has the potential to increase the number of households within the total population willing to pay by up to 970,000, slightly more than the number achieved through PAYGo alone. Combining PAYGo with a 50% sales subsidy has a higher potential impact at roughly 1.7 million households (although the cost of reaching these additional households is much greater at \$128.9 million compared to \$22.6 million for concessional finance). However, of the mechanisms assessed, **EaaS combined with a 50% subsidy has the greatest overall potential, increasing the number of households willing to pay by an additional 2.1 million.** Again, because more households are reached, the cost is also higher at \$162.6 million.

For displaced people, combining PAYGo with concessional finance also has a slightly greater impact than PAYGo alone (8,700 households compared to 8,100). Combining PAYGo with an RBF sales subsidy increases the number of households willing to pay by roughly 15,000 but, again, the greatest impact is achieved when EaaS is combined with a RBF sales subsidy, increasing the number of households willing to pay by roughly 19,000.

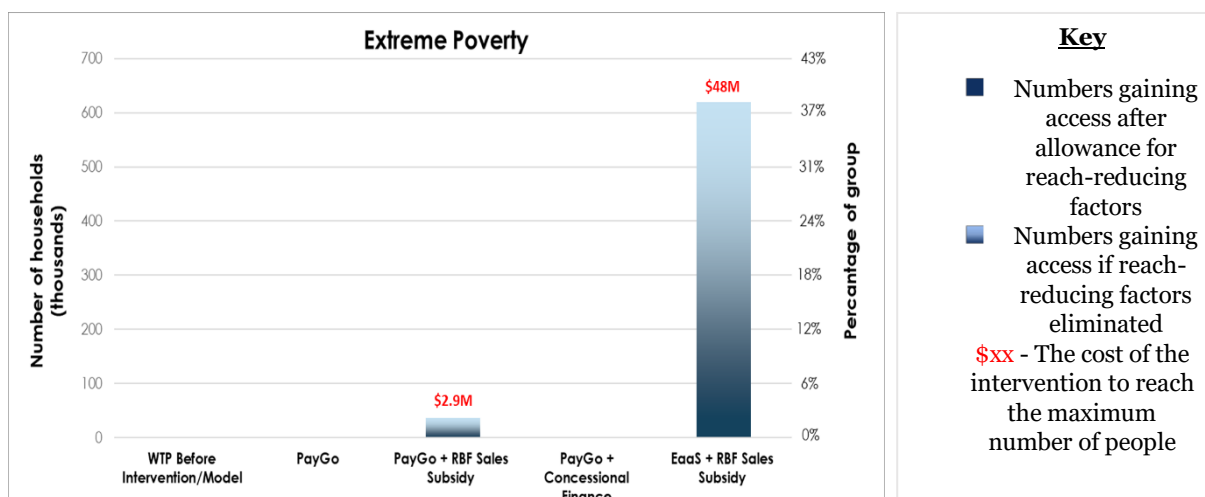


Figure 4: The number of households living in extreme poverty willing to pay for a Tier 1 Solar Home System as a result of different combinations of business models and external interventions (compared to the number willing to pay upfront).

Figure 4 indicates that **combining PAYGo or EaaS with a 50% RBF sales subsidy has the potential to increase the number of households living in extreme poverty willing to pay for a SHS** (where business models and interventions on their own were unable to). Combining a 50% RBF sales subsidy with PAYGo increases the number of households willing to pay from zero to roughly 37,000, while combining this level of subsidy with EaaS results in an even greater increase of 620,000. This indicates that, alongside more generous payment terms and increased subsidisation, combining mechanisms is potentially necessary to enable energy access for those living on the lowest incomes.

Conclusion

Business models and market interventions have the potential to substantially increase the number of households willing to pay for off-grid electricity in Rwanda. Of those explored in this analysis, EaaS alone and either PAYGo or EaaS combined with a significant (e.g. 50%) subsidy had especially high potential impact. However, neither business models nor a 50% sales or end-user subsidy alone increased the number of households living in extreme poverty who were willing to pay. This suggests that either more generous payment terms and increased subsidisation or a combination of mechanisms will be necessary to enable energy access for those on the lowest incomes.

Crucially, the results presented here reflect the level of impact that can be achieved if factors hindering people's ability to take up market mechanisms are addressed; something that is not guaranteed in practice. To achieve their full potential, different business models and market interventions need to be carefully designed and implemented to overcome such factors - ranging from low and irregular incomes to the exclusion of people in poverty from public databases used to target subsidies.