

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

- Energy as a Service (EaaS) has the potential to increase the number of households willing to pay for Tier 1 Solar Home Systems by 3.6 million households.
- Combining PAYGo or EaaS with subsidies further increases impact. EaaS combined with a 50% subsidy can potentially increase access by up to 3.9 million households.
- Factors that hinder people’s ability to engage with market mechanisms must be addressed for potential impact to be achieved in practice.

As of 2021, 10% of Nepal’s population, around 710,000 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 230,000 households living in extreme poverty (less than \$2.15 a day), of whom roughly 29% (67,000) lack access, are not left behind. Within this group, female-headed households have significantly lower access to Solar Home Systems than male-headed households and are more likely to rely on solar lanterns. This brief explores the ability of different 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, female-headed households (total population) and households living in extreme poverty.^{1,2}

Increasing access through business models alone

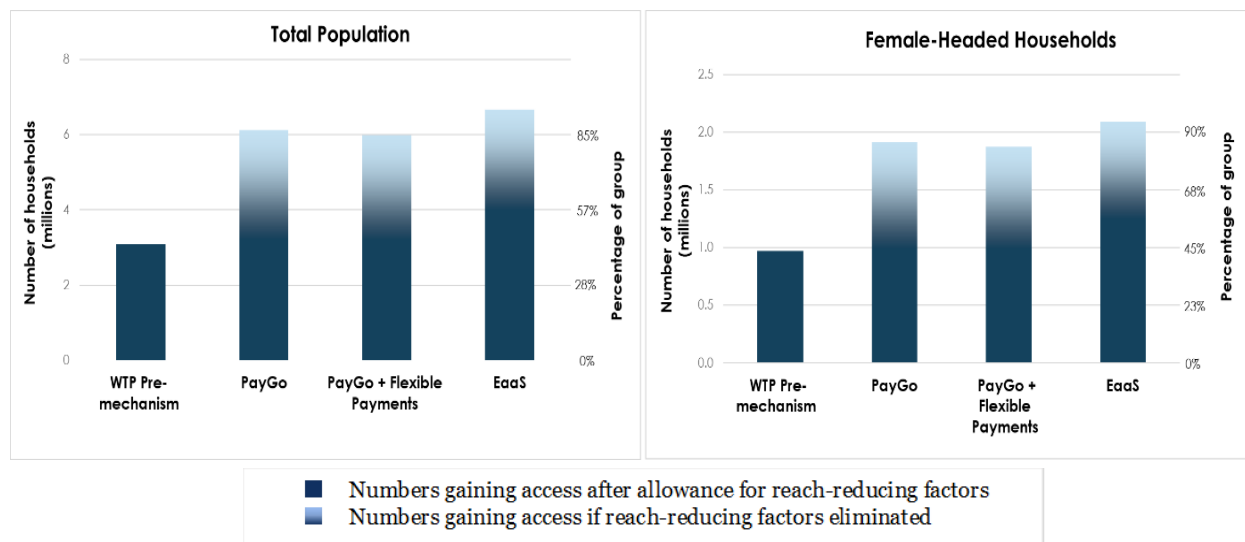


Figure 1: The number of households willing to pay for a Tier 1 Solar Home System as a result of different business models (relative to the number willing to pay the upfront cost)

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

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](#).

households willing to pay for a Tier 1 SHS among the total population and for female-headed households. 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 and physical remoteness, could mean that far fewer households take up support (and, therefore, gain electricity access) in practice. Female-headed households may be hindered by unequal access to education, limiting literacy and financial literacy, and the double burden of work and family care (where male partners have died or migrated). Such factors must be addressed through business model design or supporting interventions.

For the total population and for female-head households, PAYGo combined with flexible payments has a slightly lower impact than PAYGo alone. In the scenario considered, postponing payments resulted in higher total finance costs and so lowered the number of 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 3.6 million. For female-head households, the increase was up to 1.1 million.

No households living in extreme poverty were willing to pay the upfront cost of a SHS. Furthermore, 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

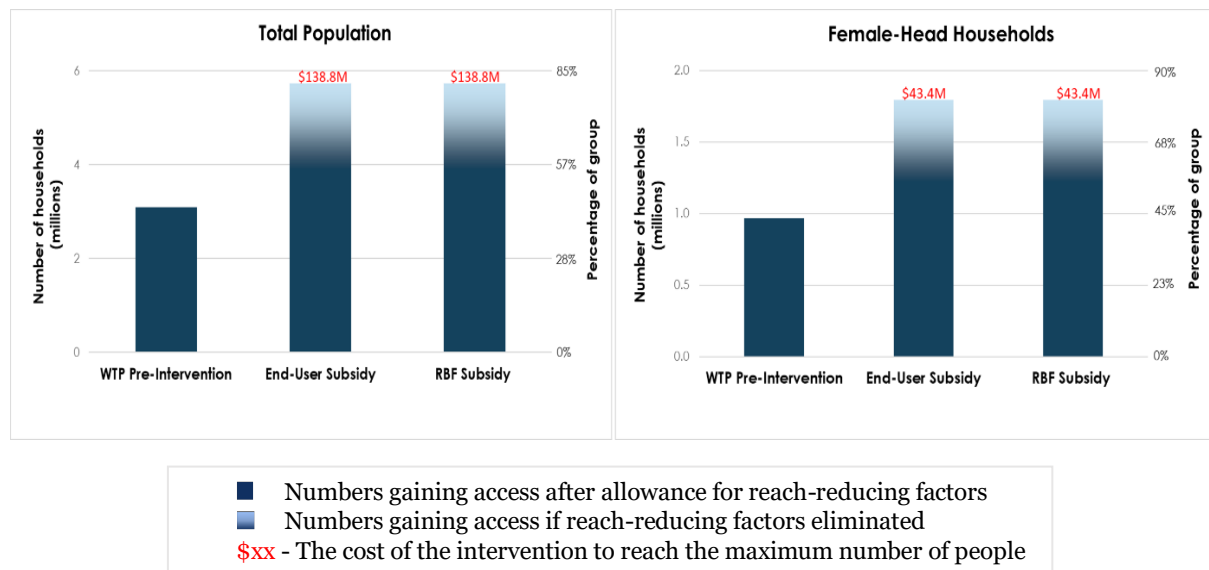


Figure 2: The number of households willing to pay for a Tier 1 Solar Home System as a result of different external interventions models (compared to the number willing to pay upfront).

Figure 2 shows that both a 50% end-user subsidy and a 50% results-based finance sales subsidy would increase the number of households willing to pay for a Tier 1 SHS within the total population and for female-headed households. Within the total population, each has the potential to enable an additional 2.6 million households to access electricity, slightly below PAYGo over 12 months (3 million) and much lower than EaaS with a 5-year product life. For female-headed households the increase is roughly 830,000. As with business models, **a 50% subsidy did not increase the number of households living in extreme poverty willing to pay indicating that greater subsidies will be needed.**

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 subsidy's reach in practice. This is likely to include lack of registration in national databases (affecting many women who work in Nepal's informal agricultural sector) or proof of residence which will hinder targeting and inclusion for certain groups.

Combining business models and market interventions

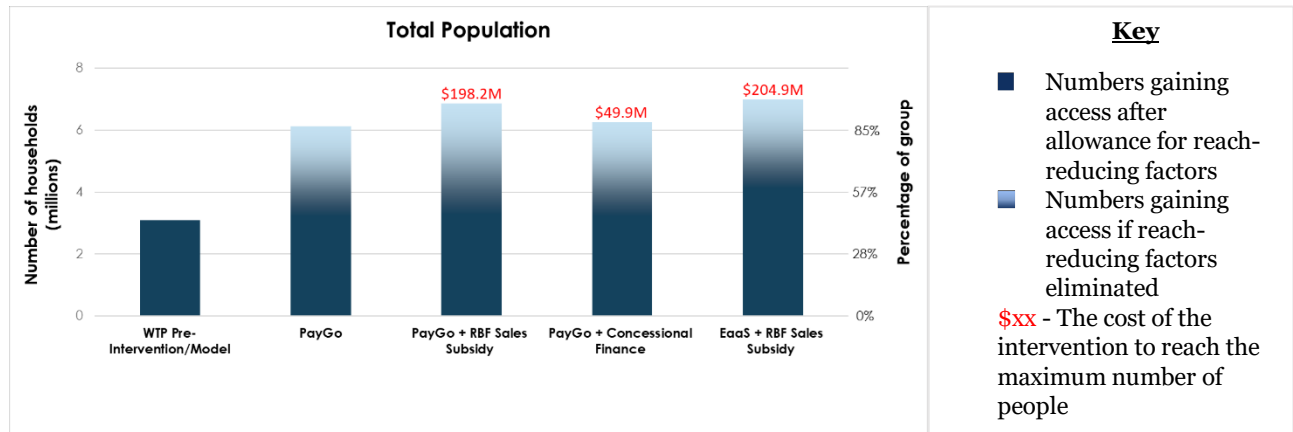


Figure 3: The number of households willing to pay for a Tier 1 Solar Home System as a result of different combinations of business models and external interventions (compared to the number willing to pay upfront).

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 shows 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 3.2 million, slightly more than the number achieved through PAYGo alone. Combining PAYGo with a 50% subsidy has a higher potential impact at 3.8 million households (although the cost of reaching these additional households, at \$198.2 million, is greater than the cost of combining PAYGo with concessional finance, \$49.9 million). 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 3.9 million.** Again, because more households are reached, the cost is also higher at \$204.9 million.

For female-headed households, combining PAYGo with concessional finance also has a slightly greater impact than PAYGo alone (990,000 households compared to 950,000). Combining PAYGo with an RBF sales subsidy increases the number of households willing to pay by roughly 1.18 million but, again, the greatest impact is achieved when EaaS is combined with an RBF sales subsidy, increasing the number of households willing to pay by up to roughly 1.22 million.

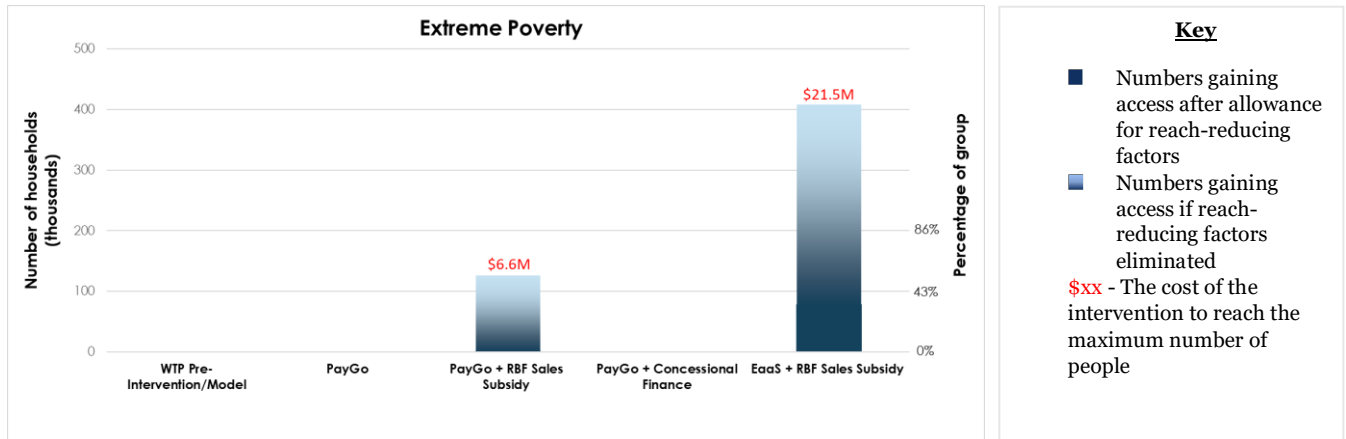


Figure 4: The number of households living in extreme poverty willing to pay for a Tier 1 Solar Home System as a result of different combinations of business models and external interventions (compared to the number willing to pay upfront).

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 126,000, while combining this level of subsidy with EaaS results in an even greater increase of 409,000 - exceeding the number of households estimated to be living in extreme poverty (230,000 as of 2023). 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.