

POWER FOR ALL FACT SHEET

Appliance financing stimulates mini-grid demand and boosts revenue

**POWER
FOR
ALL**



CROSSBOUNDARY
ADVISORY

18%

POTENTIAL INCREASED
MINI-GRID REVENUE THROUGH
APPLIANCE FINANCING

16%

POTENTIAL COST-SAVING
FROM LOAD PROFILE
MANAGEMENT

\$1.3 billion

APPLIANCE FINANCE NEEDED
BY 2030

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One of the key success factors for mini-grids' commercial viability is high asset utilization and demand profiles that fits their cost structures. This factsheet summarizes the latest data and insights on demand stimulation for mini-grid consumers, drawing information from recent studies conducted by CrossBoundary's Mini-Grid Innovation Lab,¹ E.ON Off Grid Solutions,² Rocky Mountain Institute,^{3,4} Smart Power India,⁵ and World Bank.⁶

Low consumption drives up cost of service and an under-managed load profile drives up storage costs. Demand stimulation and load profile management are key to mini-grid financial viability and can reduce the cost of service by 13%.

- » Poor utilization rate drives up mini-grids' cost per unit of electricity sold. Excess power that is generated but not used or stored means loss of revenue. This can account for as much as 17% of operating costs. (E3, p.16,20)
- » For PV-based mini-grids, there is a need to manage the demand load profile because heavy night-time consumption drives up storage costs. Furthermore, if unmet by storage capacity, night-time consumption can require diesel back-up generation, which can account for half of the mini-grid operating cost. (E3, p.20,26; E1, p.15)
- » Research finds managing load profile can reduce the cost of mini-grid electricity from \$0.60/kWh to \$0.52/kWh, a 13% drop, and demand stimulation through productive use can further cut costs by \$0.08/kWh. (E3, p.26; E4, p.22)

Residential electricity consumption is limited by ability to pay. Commercial and agricultural applications have high demand growth potential and can help balance load profile.

- » Rural household electricity consumption averages 39.3kWh/month in India, half of the national average residential consumption. Household consumption level is less driven by needs but rather by ability to pay and thus, the growth of mini-grid developers relies on economic empowerment of consumers as a strategy. (E5, p.34; E2, p.7)
- » Commercial use of diesel averages 131kWh/month. Onboarding commercial customers by the proposition of replacing diesel is an opportunity for mini-grid demand stimulation. (E5, p.37)
- » Agricultural applications, such as water pumping, consume an average of 1711 kWh per year per user in India, and are mostly used during day-time when electricity generation is cheap. This is another mini-grid demand stimulation opportunity (E5, p.66; E4, p.21)

Barriers to higher consumption include sensitivity to price, access to electrical appliances and affordable financing options for end-users.

- » Rural consumers ability to pay is key to higher demand as their consumption is greatly affected by price changes. A typical household customer is generally unwilling to spend more than 6% of its income on electricity bills. (E4, p.17; E2, p.2)
- » 44% of rural electricity consumers find appliance availability as a barrier to energy use. A study found that when access to appliances is not a challenge, 51% of surveyed customers connected new appliances while 80% indicated an intention to purchase or lease additional appliances in the future.⁷
- » End-users in remote locations lack access to efficient and high-quality appliances that meet consumer needs in terms of cost, efficiency and durability because appliance suppliers have difficulty in identifying appliances that meet both mini-grid and grid requirements. (E4, p.17)

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By the Numbers:

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» Access to financing that meets end-user needs is rare in rural sub-Saharan Africa. Study shows that low-income customers were unwilling to take out loans for non-emergency purchases due to high rates and short repayment periods. (E4, p.16)

Appliance financing with a 12-month loan term is a proven measure for demand stimulation that increases mini-grid revenue by 18%. Water pumping and milling can shift demand load profiles and cut mini-grid cost of service by as high as 16%.

» One study finds that offering productive use appliances to customers on 12-month payment terms has nearly doubled consumption and increased total mini-grid revenues by 18% after 11 months. (E1, p.5,7,8)

» The World Bank has identified 30 income-generating appliances such as flour mills and irrigation pumps that have a payback time of less than 12 months for rural end-users. With a longer loan term that breaks down capital requirements, appliance financing program can create high impact. (E6, p.7)

» In East Africa, TVs had a high uptake rate of 9% among rural mini-grid customers, followed by speakers, adopted by 8% of mini-grid customers. These appliances, however, do not shift demand load profile significantly. (E1, p.16,18)

» To shift demand load profiles to day-time consumption, agricultural activities such as irrigation and milling prove to be most effective. Soft-start motors are needed to mitigate instantaneous peak, which may damage electrical systems. (E4, p.20–22)

» The World Bank finds estimates US\$1.3 billion in microfinance for 1.1 million appliances is needed by 2030 for the 220,000 new mini-grids projected to come online, assuming five productive use appliances per mini-grid at US\$1200 average appliance cost. (E6, p.7)

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Share the Message

» Losses and fuel costs caused by poor utilization can account for 17% and 51% of mini-grid operating costs respectively. Demand stimulation and load profile management can boost revenue and cut costs.

» Appliance financing could increase mini-grid revenues by 18%. Irrigation and milling can shift load profiles to day-time consumption and save costs by as much as 16%.

» Affordability and access to finance for electrical appliances is the main challenge for demand stimulation. US\$1.3 billion in microfinance for 1.1 million appliances are needed by 2030 for the newly connected population.

Sources:

1. "Six ways to reduce mini-grid costs by 60% for rural electrification". Rocky Mountain Institute, 2018. **Herein as E1.**
2. "Determinants of electricity consumption in rural Tanzania". E.ON Off Grid Solutions, 2017. **Herein as E2.**
3. "Minigrids in the money: Six ways to reduce minigrd costs by 60% for rural electrification." Rocky Mountain Institute, 2018. **Herein as E3.**
4. "Closing the circuit: Stimulating end-use demand for rural electrification." Rocky Mountain Institute, 2018. **Herein as E4.**
5. "Rural electrification in india: Customer behavior and demand". Smart Power India, 2019. **Herein as E5.**
6. "Mini Grids for Half a Billion People". The World Bank, 2019. **Herein as E6.**
7. "Social Impacts of Mini-grids: Towards an Evaluation Methodology." Eales et al., 2018. p.4