

POWER FOR ALL FACT SHEET

Global off-grid appliance market shows strong potential as decentralized energy markets expand



Off-grid appliances are appliances that can operate in resource-constrained settings or that are designed to operate in off-grid energy systems such as low-voltage DC solar home systems or on AC/DC mini-grids. In this fact sheet, the most up-to-date data on off-grid appliances - their demand, markets, impacts and consumer behaviors - is presented, drawing primarily from three new reports.^{1,2,3}

Global demand for productive use (or 'income-generating') appliances is on the rise - global market trends point at a shift toward larger appliances.

- » A drastic shift is observed in consumer preference from lighting and mobile charging towards water pumping and refrigeration for income generation purposes. This trend suggests that the global off-grid sector may be shifting its focus to large productive use appliances. (E1, 22-23)⁴
- » Solar water pumps and cold storage (both large agricultural units and small commercial units) are the highest demanded appliances among off-grid consumers and also have the highest perceived impact. (E1, 22)
- » Actual sales for some appliances such as refrigerators and milk chilling units are lower than reported demand, indicating an untapped market potential for DRE sector. (E1,7)

3x

GLOBAL OFF-GRID TV MARKET SIZE, IF EFFICIENCY IS IMPROVED

500 million USD

GLOBAL OFF-GRID FANS MARKET SIZE IN 2020

1.1 billion USD

GLOBAL OFF-GRID REFRIGERATOR MARKET SIZE IN 2020

Globally, LED lighting remains the household appliance in highest demand 3 years in a row - geography and gender contribute to variations in consumers' demand for appliances.

- » In the global off-grid household appliance market LED lighting is still in highest demand, followed by televisions and mobile phones. Refrigerators and fans have been steadily moving up the rank since 2014 and ranks 4th and 5th in appliance demand respectively for 2018. (E1, 13)
- » The household demand for products is not necessarily correlated with the socio-economic impact of that appliance. (E1, 22-23)
- » Web routers and internet connectivity appliances, although not yet in high demand, show a strong impact potential where used. (E1, 13)
- » Geographic and climatic factors contribute to variations in demand for certain off-grid appliances such as fans and air conditioning units. (E1, 17-18)
- » 37% of respondents in an off-grid appliance market survey acknowledged differences between male and female consumers' demand for certain appliances.
- » Clothes washers and cookers, for example, are in much higher demand among women. (E1, 15)

The efficiency of off-grid appliances is improving while price is decreasing. Higher prices do not always guarantee higher quality or better performance.

- » Energy efficiency is an important competitive advantage for off-grid television suppliers, enabling broader market penetration. For example, global off-grid television markets could more than triple with efficiency improvements. (E2, 8)
- » In addition to efficiency, an important consideration for rural consumers, when choosing a refrigerator, is 'autonomy performance' -- the length of time that a sealed refrigerator is kept cool without input of power. (E2, 20)
- » The off-grid fan market is trending toward more DC products on the market, following the most common DC appliance product -- solar lights. (E2, 23)
- » Off-grid refrigerator market in India is also seeing growing demand for digital

Join the conversation:

powerforall.org
twitter.com/power4all2025
facebook.com/pwr4all

POWER FOR ALL FACT SHEET

Global off-grid appliance market shows strong potential as decentralized energy markets expand

By the Numbers:

3x

GLOBAL OFF-GRID TV MARKET SIZE, IF EFFICIENCY IS IMPROVED

500 million USD

GLOBAL OFF-GRID FANS MARKET SIZE IN 2020

1.1 billion USD

GLOBAL OFF-GRID REFRIGERATOR MARKET SIZE IN 2020

inverters that make the appliance more efficient and compatible with home solar systems. (E2, 23)

The main barriers to market growth for off-grid appliances include consumer ability to pay, awareness of existing technologies and accessibility of appliances in rural areas.

- » Despite high demand, market penetration of off-grid appliances remains low. For example, Bangladesh, the world's biggest off-grid energy market, has a market penetration rate of only 6% for off-grid refrigeration. (E2, 17)
- » Consumer financing and limited ability to pay remains the main barrier for adoption of larger appliances, such as refrigerators. (E2, 17)
- » Many consumers lack awareness of the difference between AC and DC technologies, and often end up purchasing inverters to power AC appliances on solar home systems, incurring higher costs. (E2, 23)
- » Accessibility of appliances in off-grid areas can be a challenge because of the high costs associated with import tariffs and last-mile distribution. (E2, 12)

More accessible market information is needed, especially in the case of productive use appliances for mini-grids.

- » In the absence of quality-assured appliance catalogues, practitioners and operators are bearing high costs to conduct on-the-ground testing and run risks of assets damages. Up-to-date specifications on efficiency and performance ratings, will reduce the uncertainty associated with off-grid appliances from manufacturers and consumers. (E3, 1)
- » Funded field test and case study methodologies would provide further guidance and certainty to current and future owners of productive energy use appliances. (E3, 2)
- » More research and information on the off-grid market would create lower-risk investments opportunities for off-grid appliance companies. (E1, 4) ⁵

Share the Message

Communities with low energy access are an untapped market for off-grid appliances as decentralized renewable energy service providers expand operations.

- » Off-grid appliance demand trends indicate a shift in the energy access sector toward larger productive use appliances.
- » Energy efficiency improvements present an important opportunity for off-grid appliance suppliers to differentiate their products. (E2, 8)
- » Off-grid appliance market penetration is low, despite high demand. Barriers to last-mile access to appliances include consumer financing, regulatory risks, and remoteness. (E2, 12&17)
- » Off-grid market players such as appliance suppliers, distributors or energy products and service providers need high-quality appliance market data to direct research and development resources toward and to reduce operational costs. (E1, 5; E3, 1).

Sources:

1. Off-Grid Appliance Market Survey: Perceived Demand and Impact Potential of Household, Productive Use and Healthcare Technologies. Efficiency for Access Coalition. September 2018. **Herein (E1)**. 2. Appliance Data Trends: Insights on Energy Efficiency, Quality, and Pricing for Off-Grid Appropriate TVs, Fans, and Refrigerators. Efficiency for Access Coalition. September 2018. **Herein (E2)**. 3. Gurr, Brian, and Archambault, Allison. Viable Productive Uses of Electricity Programs Remain Elusive: A Practitioner's Field-Based Recommendations for Overcoming Challenges. EarthSpark International. **Herein (E3)**. 4. Sources are provided in parentheses using this format: (report shorthand reference, page reference). 5. Notable initiatives on off-grid appliance market intelligence include: [the PRODUSE manual](#), [the Low Energy Inclusive Appliances Program](#) and [the Off-Grid Appliance Data Platform](#)