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■ AQ FEATURE

Sustainable Energy Access for the Poor

BY [Sam Mendelson](#)

The energy dimension of the poverty trap.

For decades, lending to the poor meant microcredit, and energy related projects rarely fit into that model. The few attempts at intersecting energy and microfinance faltered for various reasons, ranging from the poor energy technologies available at the time to an aversion among microfinance institutions (MFIs) to move to a broader energy-lending program. Even in cases where microcredit clients could use funds to buy clean energy technology, few did. Instead, many continued to use traditional, inefficient and often dangerous means— kerosene, candles, animal dung, or diesel—to light their homes and cook their food.

Now, however, a renewed effort is under way to increase access to energy finance. New technologies—in particular small, portable solar products—have now become viable and available. Just as important has been the emergence of new distribution channels and consumer financing mechanisms such as remittances, mobile banking and microleasing. Together, these developments are bringing renewable microenergy to the off-grid and under-electrified poor.

Success in these efforts could have a positive impact on development goals, such as improving health, education and security, and encouraging entrepreneurship— as well as on the broader goal of mitigating climate change.

But the obstacles are also considerable.

First, energy access is highly unequal—both globally and locally. In global supply chains, high-value resources such as oil, gas and biofuels are sourced from less-developed countries for the benefit of wealthier populations. Within the countries, this has been compounded by the priority given by national governments to link wealthy and middle-class communities to the electrical grid over poor or rural communities.

Second, there are 1.7 billion people without electricity and 2.4 billion people who rely on traditional biomass for cooking and heating, producing millions of tons of CO₂. An additional billion are “under-electrified”—meaning they have nominal grid access, but suffer regular blackouts, particularly in the prime hours when children are doing homework and families are preparing food. India alone has 300 million individuals who fall into this group, many of whom receive only a few hours of electricity a day.

Reliance on traditional power sources can also prove dangerous. According to the World Health Organization (WHO), 50 percent of global households and 90 percent of rural households use solid fuels for cooking or heating. Worldwide, more than 95 percent of deaths from fire and household burns occur in the developing world. In South Africa, 200,000 people of all ages are injured or lose property each year due to kerosene-related fires. In southern India, burns are the number two source of childhood injuries or mortalities, with about half due to kerosene lamps. In Uganda, one study found 70 percent of house fires are due to kerosene lanterns.

Poor indoor air quality causes 2 million deaths and 1.4 billion illnesses each year—largely attributable to burning wood or kerosene for cooking and lighting. Kerosene is made of poisonous formaldehyde, NO_x, CO, PAH, and SO_x. One study has found that women are nine times more likely to develop tuberculosis when using kerosene lamps. Respiratory problems are prevalent in slums and villages throughout the developing world.

Lack of access to quality energy affects women in a particularly cruel way. In most societies, women and girls cook and spend time near the fire. In developing countries, they are typically exposed to very high levels of indoor air pollution, many for three to seven hours a day over many years. Women in rural

households typically devote 25 percent or more of total domestic labor to collecting wood, according to a 2007 World Health Organization-sponsored multi-author study. Their daughters normally help collect water, wood, diesel, kerosene or biomass, keeping them from school and study, and from business and educational opportunities— further decreasing the opportunities for women to advance socially and economically.

Finally, kerosene lantern light levels are often only 1/100th of those recommended in industrialized countries, leading to near-sightedness, night-blindness and cataracts.



Sunshine for everyone: A house in a Berber village in the Atlas mountains of Morocco gets electrified. Photo: Ashley Cooper/Corbis



The challenges and opportunities go beyond just households. Absence of power also means that schools cannot use the computer technologies central to modern education. This in turn creates a vicious cycle where the best teachers—denied the tools to succeed in their work—avoid schools without electricity, further exacerbating the lack of access to education among the poor. Children in communities lacking access to energy underperform in schools, drop out and

ultimately remain unemployed. And division between schools without energy and those with further expands the digital divide.

This is the energy dimension of the “poverty trap.”

Avoiding the Energy Poverty Trap

Clean, safe energy sources can help the poor break out of the trap and reduce inequalities within communities. For example, the availability of renewable energy technologies (rets) liberates women from the drudgery of survival activities such as gathering fuel wood, fetching water, cooking inefficiently, processing crops, and performing manual farming work. It opens up the time and space to pursue

opportunities for education and enterprise development.

But the challenge has always been access to finance.

Increasingly, the trend is to use MFIs and remittances as a means to extend access to energy finance for the poor. Microfinance clients are now demanding loan products or energy services to meet business-related energy needs and enhance quality of life for their families. Rural financial institutions are currently experimenting with a broader set of “credit-plus” product offerings, with some MFIs piggybacking energy onto other loan products related to education, housing or agrifinance. Energy companies are also developing products and services tailored to the needs of lower income families.

There are macro trends driving this as well. Fluctuating global energy prices have squeezed low-income consumers the hardest. In the past, the common arguments against energy microfinance have been that loan sizes for small energy products are too insignificant to justify the transaction costs of administering them; or that loan terms for larger energy applications (such as solar home systems) are too long-term for MFIs to risk considering. But as energy prices and volatility increase, the incentives for MFIs to finance alternative energy ownership change. A loan portfolio that provides greater energy security for clients will increase client savings (and therefore repayment) rates, while reducing susceptibility to energy shocks, thus decreasing the risk of defaulting on loans.

In the more immediate term, offering credit for popular energy products, such as solar charging devices, can help MFIs distinguish themselves in highly competitive markets by satisfying an unmet client need—especially important since the 2010 microfinance crisis.

Making it Work

Energy poverty has two components: deprivation and burden. Deprivation describes a dependence on low-quality fuels, leading to low productivity. Burden concerns the economic, health and environmental consequences of energy poverty.

Arc Finance, where I am in charge of monitoring and evaluation, is a U.S.-based NGO that links MFIs with energy companies to solve supply chain and distribution issues for the poor. Our expertise is in providing the tools, technical services, investment, and linkages that allow these diverse groups to find common opportunity and achieve mutual benefits.

While funded from various sources, a U.S. Agency for International Development funded multi-year initiative called the Renewable Energy Microfinance and Microenterprise Program is currently piloting several delivery models using various partners in different countries to provide fair and scalable access to energy finance for the poor.

The model recognizes that providing access to clean energy is not only about consumption (although being able to power lights or a fan is important), or solely about enterprise development (although cheap, clean energy has many microenterprise benefits too)—but about “livelihood development.” When consumption and entrepreneurship are addressed together, it improves the quality of life of the client and her family, and provides more light for schoolwork, more disposable income, and cleaner air— among many other benefits.

The microenergy industry now offers various products targeted at livelihood development, provided by a burgeoning number of companies. A number of international startups have developed solar portable lighting (SPL) offerings. They include Indian company nest (Noble Energy Solar Technologies); U.S.-originated

but now India-headquartered Greenlight Planet (GLP) and d.light design; and Australia-originated Barefoot Power. Multinationals like Philips, Sanyo, Schneider Electric, and Total, and emerging market conglomerates such as India's Moser Baer and TataBPSolar, are also developing value propositions for low-income consumer segments.

These types of SPL include products ranging from small led lanterns that provide several hours of light from a single charge and use the latest lithium phosphate ferrous batteries, to Solar Home Systems (SHSs), which can power lights, fans and televisions in a household. Some SHSs can also charge mobile phones.

SolarNow in Uganda is an example of an energy company providing modular SHSs through contracts with installment plans. A family can begin with a basic 40-watt system and add to it, with a view to owning the equipment within a year and expanding to a system with a power “inverter”—which converts direct current (DC) into alternating current (AC). This, rather than the DC power that comes from a battery, is sufficient to light a household, power appliances and run a business.

Solar power products such as d.light's Kiran or GLP's Sun King have an upfront cost of around \$10 to \$30 and a negligible running cost. This compares to a \$3 upfront cost for a kerosene lantern and at least a \$21 annual running cost. So these solutions can pay for themselves in four to six months and generate at least \$18 annually in financial savings alone per unit after the first year—not a negligible amount for a poor family.

DCBS, a small, rural microfinance institution in South Parganas in the Indian state of West Bengal, is an Arc Finance partner within the Renewable Energy Microfinance & Microenterprise Program. This pilot project involves top-up loans for existing clients to purchase SPLs and creates separate self-help groups to provide the capital for solar home systems.

Animesh Naiya, director of DCBS, explains that their clients are extremely poor with almost no access to grid power. In areas where there is a grid, he says, there are power outages throughout the evening. Besides suffering from poor health and spending money on kerosene and diesel, their businesses are also affected. Many are embroiderers and tailors, and kerosene drops carbon soot onto the cloth, leading to waste.

An additional problem he describes is that free or highly subsidized products from the government have a negative effect on consumers, since some expect these products for free. While the cost of solar technology products (about \$30) seems high, they save clients money in the long run—especially taking into consideration the amount of time spent traveling to charge their mobile phones.

On a different scale from solar lanterns and home systems, solar microgrids provide energy not as a product but as a service—allowing dozens of households to connect to a private grid and pay a monthly fee that is usually less than the cost of mainstream grid access and without the rolling blackouts.

The emergence of quality products, though, is necessary but not sufficient. For SPL and SHSs to genuinely scale, there must be a good understanding of the product value chain.

This requires a focus on energy product development; distribution and logistics (particularly complex in rural areas); marketing and consumer education (especially on the health consequences of existing sources); sales; end-user finance (designing loans or microleasing for the needs and capabilities of the customer); and after-sales service. The latter is particularly important, since many clients are apprehensive about what will happen if the panels or battery fail.

Creating microgrids is a different service value chain. It includes project finance; community

engagement/planning; system design and construction; operations and maintenance; and payment collection from the end users, who must either pay their bill for energy already used or—under a growing and innovative model—prepay for their energy using a meter system, such as that produced by India’s SIMPA Systems, another Arc Finance partner.

To do all this, microfinance has emerged as a key player in expanding renewable energy for the poor. MFIs have distribution networks, knowledge of the needs and aspirations of their customers, and perhaps most importantly, trusting relationships with clients.

The importance of MFIs goes beyond product-specific loans. MFIs can support energy loans for income-generating activity; develop credit lines to improve energy efficiency; partner with energy enterprises that provide sustainable products; provide credit to dealers and/or franchises to sell to clients on an installment basis; and develop remittance-related energy projects.

It’s this final area, remittances, that may be the most exciting model for providing access to renewable energy technologies.

Arc Finance has recently completed the second stage of a pilot program supported by the Inter-American Development Bank’s Multilateral Investment Fund (MIF) called Using Remittances to Finance Sustainable Energy in Haiti. Members of the Haitian diaspora who remit to their families back home were able to send a range of solar lanterns, leveraging the trust and distribution networks already in place. This was complemented by a remittances agent network, which marketed and sold lanterns on the street and in the remittance company’s branches.

The preliminary results have been exciting, exceeding the target of 5,000 clients and 30,000 beneficiaries of five product types over a several-month period for the pilot rollout. With the strong buy-in by stakeholders and early customer satisfaction, there is a potential for scale—both within the several hundred-billion-dollar international remittances market, and within national remittance systems, too.

Greg Watson, team leader for environment and clean energy and formerly remittance specialist at the MIF, says the results have been instructive. “We already knew what proportion of remittances was going to different purposes, so it was clear that some was going to diesel, candles or kerosene,” he reports. “So we knew that if we wanted to deploy in these countries, we could leverage the remittance networks to solve the distribution problems.”

A continent away, in Uganda, SolarNow uses an entirely different model, involving microleasing hire purchase for solar home systems. CEO Willem Nolens says that “one of the major challenges facing the off-grid solar energy sector is the limited availability of capital for households and small businesses to finance a solar home system. But there are now an increasing number of companies successfully serving this huge market by selling high-quality solar systems in combination with a credit facility.”

Providing greater access to energy finance in the developing world poses considerable challenges. This includes finding the best distribution channels that can further decrease the cost of energy products and obtaining seed loan funds to take the proof of concept to the private sector—and to scale, with government support where necessary.

There are also past perceptions to overcome. These include a generation of inferior products that failed to live up to expectations and efforts by NGOs and governments to distribute products for free that ended up distorting the market. There also remains a lingering perception within some MFIs that clean energy products are consumption goods rather than income-generating opportunities.

The continued success of energy access initiatives is not just about raw numbers, but about improved health, education and livelihoods. Stakeholders must also seek to understand the sociocultural context, and recognize that pro-poor interventions may not be manageable by the private sector alone, at least initially. Nontraditional businesses such as governments, NGOs, enterprise associations, social enterprises, and communities themselves must be involved. Partnership is key.

And there is a strong need for more systematic analysis of delivery models. Investors, governments and donors need evidence of real impact, financial sustainability and potential return on investment.

The work to do all of this has just begun. Figures from a 2008 International Finance Corporation and World Resources Institute paper, “The Next Four Billion,” describes a market gap of \$195 billion and 1.7 billion people at the bottom of the pyramid without electricity—a number that has probably increased due to birth rates among target populations. Of approximately 200 million global microfinance clients, only about half a million have received loans for energy access. In short, we’ve barely scratched the surface.

An approach to leveraging microfinance to provide clean energy must be holistic, encompassing energy loans for income-generating activity, energy loans to improve household quality of life, loans to promote improved energy efficiency (usually tied to housing improvement loans), targeted savings products and remittance products, and microleasing for larger home and enterprise clean energy products.

The challenges are considerable, but the potential is enormous, too. On the horizon sits improved quality of life for a billion at the bottom of the pyramid, and a cleaner world as massive developing economies industrialize. It is a journey worth taking.

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