Ending energy poverty

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Power to the powerless. The key is persuading customers to pay

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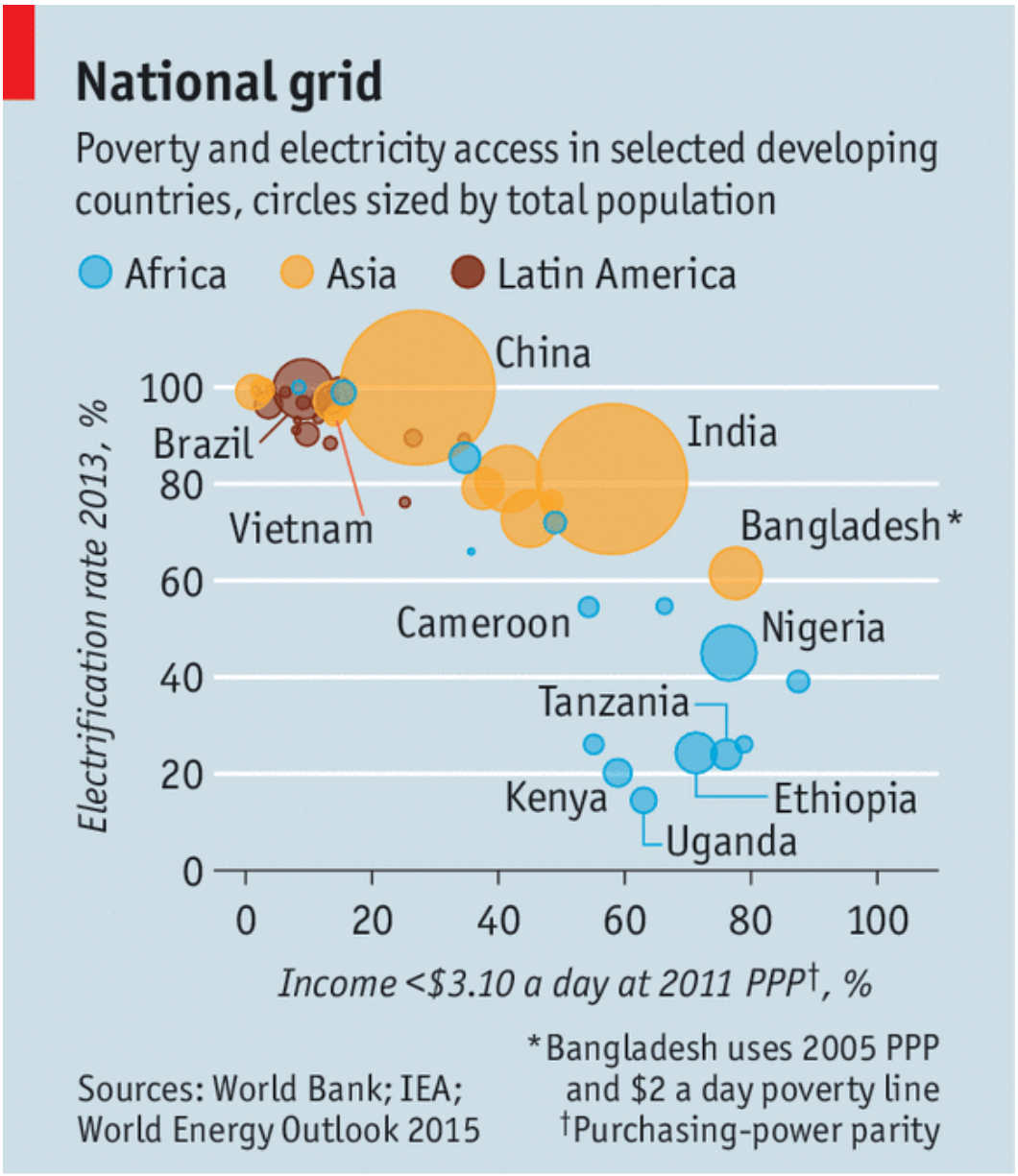
IMAGINE a country the size of India without power. No electric lights, mobile phones, radios crackling with cricket or televisions blaring Bollywood hits. Its economy would be medieval: tailors without electric sewing machines; metalworkers without power lathes; farmers without water pumps. Everyone would rush to finish work by sundown. Nights would be lit only by the moon, cooking fires, candles and kerosene lamps.

This is reality for 1.1 billion people globally—not far short of the population of India. The biggest numbers are in rural southern Asia and sub-Saharan Africa (see chart). According to the UN, 220m people gained electricity between 2010 and 2012. But most of them were in urban areas, particularly in India. In sub-Saharan Africa, a region that, excluding South Africa, uses less electricity than New York state, electrification barely kept pace with population growth. Some 600m of its people are without electricity; demography means that by 2030 the number could be even higher. What would it take to bring all these people into the modern world?



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Much as mobile telephony has helped the poor leapfrog landlines and bricks-and-mortar banking services, a handful of tech-savvy entrepreneurs are seeking to provide widespread access to clean, cheap energy with local systems, metered and paid for by mobile phone. They hope to vault electricity grids, harvesting solar energy beamed down onto rooftops rather than using fossil fuels, and connecting it to batteries to store the energy until nightfall.

Their offerings are likely to be best-suited to private customers in rural areas, whose energy needs are low and who are expensive to connect to grids. But their evolving business models, and innovative marketing and payment methods, also hold lessons for grid firms seeking to provide power to businesses and urban households.

Beyond the pylons

Governments and utilities in poor countries are often too cash-strapped to extend their grids. Part of the problem is widespread reluctance among users to pay for electricity. Customers who do not pay their mobile-phone bills can have their connection taken away remotely; electricity is harder to cut off, and easier to steal. This creates a vicious circle in which utilities lose money, reducing the funds available for improving and expanding supply, and further sapping users' willingness to pay. "The real threat to energy access is that energy is not treated as a private good, but as a right," says Michael Greenstone, an energy specialist at the University of Chicago. "And the problem with a right is that no one wants to pay for it."

Across the world efforts are under way to change such attitudes, using technology and attempts to tweak social norms. In parts of Delhi, a utility has encouraged women to persuade neighbours to pay their bills in order to secure better service for all. Mr Greenstone is part of a project, funded by the International Growth Centre, a global research network with headquarters in London, that is looking for ways to encourage people to pay for electricity in Bihar, where 64m people are without power—the highest share, at 64%, of any Indian state.

Bihar has plenty of generating capacity, Mr Greenstone says, but gets paid for little more than half the power it provides. The rest is pilfered, unmetered or unbilled. The state power company has promised to provide electricity to "feeder" areas of 2,000-3,000 households that pay at least 60% of their bills. In a few randomly selected areas, it will increase the supply of electricity in proportion to the share of bills that are paid. The aim is to make people more aware of the value of their electricity supply and to encourage payment.

Mr Greenstone thinks that the results of the trial, due later this year, will underscore the need for pre-paid electricity meters for households. These are similar to coin-fed meters in low-income housing in the developed world, but can be topped up by mobile phone, rather than cash. Uganda, where only 15% of the population is connected to the grid, is an early adopter. Selestino Babungi, the head of Umeme, the sole grid operator, says that half its 800,000 customers use pre-paid meters. Before 2005, when it won the distribution contract, theft was ubiquitous. About 38% of electricity was "lost" because of illegal hook-ups or non-payment; some big businesses went as far as flying in Indian engineers to rig their meters. By making payments easier for clients and installing an automated system that detects when a meter is tampered with, the firm has brought that share down to 18.5%.

Higher revenues will help the company reach its goal of tripling the size of its distribution network to absorb additional power soon to be generated in Uganda. Most will go to industry and agribusiness, says Mr Babungi, creating jobs that bring more people to the income level where they can afford to connect to the grid and buy household appliances that consume more power. Customers in such areas are likely to be better payers.

The power of progress

Though Uganda's government promises that eventually electricity will be rolled out to everyone, starting with regions where jobs are likely to be created is an idea with a good pedigree. Vietnam launched its post-war electrification in the

rice-growing regions of the Red river and Mekong river deltas, helping the country to become one of Asia's biggest rice exporters. Then it moved on to less immediately profitable areas. Access, which was under 50% in the late 1980s, is now almost universal. Thailand and Costa Rica, which also quickly electrified rural regions, both prioritised areas where the potential for commercial development was higher.

Such rapid electrification, often using fossil fuels, may look like the cheapest way to bring power to everyone. And replacing fires and wood stoves improves air quality. But overall the environmental damage is severe, in terms both of adding smog to cities and accelerating climate change. Even the poorest countries are increasingly aware of the risks of pollution, says Anita Marangoly George of the World Bank. "Why lock them into choices that will turn Lagos and Nairobi into Delhi and Beijing?" she asks.

Hence donors prefer to fund power projects that are green as well as profitable. Some worry that this could saddle poor countries with pricey, intermittent energy. For instance a $24m utility-scale solar-energy project in Rwanda generates electricity at 24 cents per kilowatt hour. Industry executives say they could produce it at half the cost using natural gas.

Others fret that solar energy is still not reliable enough to power economic development. On February 22nd Bill Gates, co-founder of Microsoft and now a philanthropist, published an open letter with his wife, Melinda, drawing attention to poor people's lack of energy around the world, and poor women's lack of time (in part because they lack powered labour-saving devices). He says that with current technology, solar power and batteries are insufficient to satisfy Africa's energy needs. The good news, he adds, is that Africa has several other possible sources of fairly clean and reliable energy: geothermal in east Africa, hydro in Ethiopia and central Africa, and natural gas in several countries, including Mozambique and Tanzania. Unlike wind and solar power, these can be used for "baseload" power that operates constantly. "If you want to attract manufacturing jobs you can't have intermittent energy," says Mr Gates. "If you want energy at less than 10 cents per kilowatt hour that's not some battery connected up to intermittent forces."

Regional transmission networks are an important part of the solution, says MsMarangoly George, since they allow countries and regions to share power, thus making green energy more dependable. And she notes that in recent wholesale power auctions in South Africa, wind and solar power have been as cheap as other sources of energy. Soon auctions in Zambia and Senegal will show whether the cost of green technologies has fallen as fast in poorer countries.

Potentially the most promising approach to bringing light to the 1.1 billion divides the task between traditional utilities and smaller, more entrepreneurial firms. The former focus on cities and businesses, and the latter supply "off-grid" power to poorer households in rural areas, individually or via neighbourhood "mini-grids".

M-KOPA, which operates in Kenya, Uganda and Tanzania, and Off-Grid Electric, in Tanzania and Rwanda, offer packages of appliances, such as a few LED lights, a mobile-phone charger and a radio, all powered by a solar panel and a battery. Payments are made via mobile phone. An upfront cost of $150-500 would be

prohibitive to most of their customers. So the firms charge in instalments, which are spread out enough to bring the monthly cost below that of buying kerosene for lamps. Default rates are negligible; if payments stop, the service is disconnected remotely by disabling the box that links the panel to the appliances. Once the loan is paid off, there are no further payments, until a customer invests in a bigger system with more appliances, such as a flat-screen TV. M-KOPA says it is introducing new customers to electricity at the rate of 500 a day.

The trick, executives say, is to convince clients that they are buying appliances rather than electricity—and to make the gadgets ever more sleek and efficient so that they can operate on the low voltage generated by rooftop solar panels. The next step is to provide low-energy fridges that could help customers open small restaurants or grocery stores. (Off-Grid Electric says it already powers hairdressers and sports bars.) Meanwhile they seek to convince conventional power providers that they are not in competition. “The main conversation we have with utilities is telling them: ‘We target your non-profitable customers,’” says Xavier Helgesen, the boss of Off-Grid Electric.

Lighting the way

Neither of these firms is anywhere near the millions of new subscribers a year needed to make a dent in the 1.1 billion. But they show that if payments are sliced small enough and made via mobile phone—and an army of sales staff is deployed to educate potential customers about the social and economic benefits—poor people will pay for small but life-changing amounts of power. These lessons could make grid-based electricity more accessible, too.