Africa Goes off the Grid to Bring Power to Rural Villages

Half of Africa's population lacks access to electricity, but microgrids powered by solar energy are lighting the way to energy independence.

A man uses a solar energy panel to charge electric devices in Diebly, an Ivory Coast village without electricity. (Photo: Sia Kambou/AFP/Getty Images)

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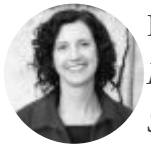

Erica Gies' work has appeared in *The New York Times*, *The Guardian*, *Scientific American*, *The Economist*, and other outlets.

Bio

The NASA satellite map of the world at night shows blazing networks of light across North America and Europe. But Africa remains the dark continent. Despite the United Nations' Millennium Development Goal of universal access to electricity by 2030, half of Africans are without power, most living in remote villages that are unlikely to be connected to the grid in the foreseeable future. But now, thanks to falling prices for solar panels and increasing efficiency of LED lights and small appliances, rural Africans are obtaining electricity off the grid.

Off-grid electricity typically means a stand-alone solar home system or a microgrid (generally up to 100 kilowatts) built in the center of a community with distribution lines radiating out to houses, hospitals, and stores. Microgrids are usually solar powered but are sometimes also fueled with diesel, micro-hydropower, wind, or biomass. They often store electricity in batteries for later use.

"A real revolution is happening," said Michael Franz, manager of the Africa-EU Renewable Energy Cooperation Programme in Brussels. Africa, whose 54 countries encompass an area more than three times that of the United States, is beginning to embrace a hybrid future, "promoting and utilizing both on-grid and off-grid solutions to address the electricity

challenges on the continent," said Elham Ibrahim, the African Union's commissioner for infrastructure and energy.

Developed countries such as the United States are seeing the benefits of this approach too, as hospitals, universities, and private homeowners opt for minigrids (up to 100,000 kilowatts) or solar-battery home systems to lower their electricity costs and keep the lights on during extreme storms and other natural disasters.

Electricity's Dividends

Access to clean electricity improves people's health and reduces greenhouse gas emissions. That's because people without electricity, including the 600 million in Africa, typically use kerosene lanterns and open fires fueled with wood, animal dung, or crop waste to light their homes and cook their food. These fuels contribute to asthma, allergies, cataracts, burns, and poisonings, killing an estimated 4 million people a year worldwide, according to the World Health Organization. Globally, fuel-based lighting produces the equivalent of 240 million tons of carbon dioxide emissions annually.

Katrina Pielli has seen the difference electricity can bring to people's lives. Based in Johannesburg, she is the senior energy adviser for Beyond the Grid, part of the U.S.-led program Power Africa that is working to double access to electricity in sub-Saharan Africa by attracting private investment.

In rural Kenya's Masai Mara territory, Pielli met Teresa Mpetti, a single mother of five. Mpetti, who sells drinks from a kiosk, improved her quality of life when PowerGen Renewable Energy built a microgrid in her village. Previously she had to close her kiosk at dark for safety. Now, thanks to the microgrid, she can light her operation and stay open later. Recently she bought an off-grid refrigerator, allowing her to sell cold drinks. With the increased profits she started a second business, a beauty salon.

"It's this great story of the link between power and economic empowerment and quality of life," said Pielli.

Power Africa, founded by the Obama administration in 2013, has a dozen development partners and more than 120 private sector partners, a reflection of the wide range of international governments, development banks, nongovernmental organizations, and increasingly, private companies seizing the challenge and opportunity of electrifying Africa. "Before, these projects were charity, driven by NGOs," said Aaron Leopold, global energy representative for Practical Action, a United Kingdom–based charity that works to provide sustainable energy to people. "Now there's a clear business case. You're seeing start-ups growing at 400 percent a year."

That's good news because development aid isn't going to cut it, said Pielli. Some countries in sub-Saharan Africa receive only about one-tenth the funding they need to achieve universal access to electricity, according to a 2015 World Bank report. "The numbers are just staggering," she said.

Eastern Africa is the epicenter of the off-grid solar movement, led by companies such as M-Kopa, Off-Grid Electric, and Mobisol. In Kenya, more than 30 percent of people living off the grid have a solar product at home, according to a *Bloomberg* report that also estimates that off-grid households worldwide will reach that benchmark by 2020.

The Power of Mobile Money

Still, many people living in rural Africa do not have the approximately $200 needed for an entry-level solar home system, nor do they have bank accounts, so banks have been unwilling to extend them credit. Enter mobile money.

Off-grid solar companies are taking off in East Africa in part because of earlier development projects for micro-lending that

used mobile money systems for repayment. People can deposit cash with an agent in exchange for e-money, which they can use to pay bills via texting—no internet access required. Mobile money also allows people to create a credit history that can be used to build small businesses.

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M-Kopa, headquartered in Nairobi, Kenya, sells an eight-watt system that comes with a solar panel, a control box with a lithium ion battery, two LED lights, a phone charger, a flashlight, and a radio. To buy it people must put $35 down and then pay approximately 50 cents a day for a year. Larger systems have fans or small televisions as well, and in the future, the company plans to offer refrigerators.

Companies had traditionally avoided serving electricity and water to poor rural people because they thought that they could not pay. While the $35 deposit is still a barrier for some people, the daily payments are typically within reach. "The reality is that they already pay a lot for energy," said Leopold, referring to money spent on kerosene. "On average, it's like $20 per kilowatt-hour. "In the U.S., we pay four to 10 cents per kilowatt-hour."

Customers can prepay for multiple days if they come into money. The control box tracks payments, and customers can see how many days of credit they have at any given time. If they go into default, cellular technology allows M-Kopa to switch off the power remotely until they pay. That capability makes the repayment rate high, north of 90 percent, said Pauline Githugu, director of legal and external affairs for M-Kopa in Nairobi. "Once you get used to having that light, for most people, they find it difficult to go back to kerosene," she said.

Githugu had been working for a local

microfinance bank in her native Kenya when M-Kopa recruited her. She resisted until she realized that M-Kopa had 15 times as many customers as the bank. “This solution seems to be something people really want,” she said.

So far M-Kopa has powered 400,000 homes in Kenya, Uganda, and Tanzania and employs more than 1,000 people.

Not Just a Rural Solution

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Despite the booming off-grid market, many African governments still think of solar as prohibitively expensive or unreliable, said Leopold. But even when an African country decides to build a power plant to serve people close to cities, it still takes an average of nine years for households to get electricity, according to a 2014 World Bank report. “By focusing primarily on the grid, you’re making a choice for people that you have to wait,” he said. “You have to wait nine years to get an electrified health clinic. You have to wait nine years for your kids to use a computer at school. You have to wait nine years for whatever job you’re doing manually right now to get an electrified variant up and running.”

While grid-tied electricity can meet industrial demands, rural villagers who have no power don't need that right now, said Leopold. "Does a small village in the Kenyan countryside need to run an arc welder, a clothes dryer, and a sawmill simultaneously? No, they don't. What they need is something to improve their lives."

Even for industry, microgrids can often do the trick, supplying heating and cooling and driving small machinery such as grain mills and pumps for irrigation.

Off-grid can be the most affordable solution for people living near cities too. As African cities boom, new buildings, including slums, are springing up on the urban periphery. People in these areas are frequently opting for community minigrids or solar home systems. "If you do not have an air conditioner, a dishwasher, or electric cooking, you don't need grid-connected electricity," said Franz, who lived in Nairobi for several years. "You can get along with 130- or 200-watt peak on your roof. You can have a small fridge, your mobile charging, light in every room, and a TV running off of that."

Grid electricity in many African countries remains unreliable. People with means have traditionally relied on diesel generators as backup. Increasingly, these folks are opting for solar systems, said Pielli.

In many places in Africa, off-grid solar is changing lives on a daily basis. It means being able to blow out kerosene lamps that have long harmed children's lungs and eyes as they try to study, said Githugu. "To transform a person's well-being, a child's future,...I find just the possibility of that extremely fulfilling," she said.

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Africa has to force this down the throats of Trump and Congress. In fact, put the renewable energy in their faces so that they are starting right at it. If these countries and continents can do this so can we in the United States. Our shameful election of climate deniers and unedcucated people on climate change is really something that is pretty bad. Al has to Gore Trump with this one and hopefully Invanka can help with the plots.

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