

RESEARCH PAPER BY
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Part of the Climate South Initiative

PANEL OVERVIEW

POWER TO THE MASSES: AFFORDABLE ACCESS FOR ALL

We need power please!

The growth in the African middle class has led to a rise in demand for energy; but the expansion of power grids across the continent lags too far behind demand. Africa needs a new energy model (including distribution channels) to bring power to the masses.

But how do you persuade the population to try something new – especially in rural areas where there is a lack of access to information? Is the solution to Africa’s immediate power requirements the growth of the “pay as you go” energy model, or radically different financing and payment options like microloans?

Africa’s Energy Poverty

Although in Northern Africa, more than 99% of the population has access to electricity, the International Energy Agency reports that in 2014 only 32% of the Sub-Saharan population had power. It is the “only region in the world where the number of people living without electricity is increasing, as rapid population growth is outpacing many positive efforts to provide access” reports the IEA (*IEA, Africa Energy Outlook 2014*). Providing universally affordable, reliable quality electricity is one of the continent’s biggest challenges. Energy poverty stems from a variety of causes including lack of access to electricity grids, poor infrastructure, behavioral barriers, market failures and demand exceeding supply (*IEA, Africa Energy Outlook 2014*). Electricity access varies geographically; approximately 80% of the population without electricity lives in rural areas, and UNEP forecasts that transforming grid access to meet the demand of Africans in both rural and urban areas would require \$4,000 per electrified household, a sum out of reach for the average citizen (*UNEP, 2015*). Regulatory barriers, current lack of capital and infrastructure, and extensive maintenance make scaling of grid access an inadequate sustainable solution for rural electrification.

Despite Africa’s plentiful oil and coal supplies, electricity prices are typically higher than other regions because of poor governance, shortage of infrastructure and corruption (*IEA, Africa*

Energy Outlook 2014). These issues create further obstacles for private companies to invest in the continent's power supply.

This is which is why many advisors, NGOs and multilateral organizations urge African governments to invest in renewables and a combination of grid and off-grid systems. In rural areas, mini-grid and off-grid systems currently account for 70% of electricity, making this type of system the most viable option for investment for affordability and sustainability. In its Africa Energy Outlook, IEA predicts that by 2040, two thirds of mini-grid and off-grid systems will be powered by renewables, most notably solar photovoltaic, wind or hydropower. However, the question remains how to tap into the continent's potential for renewables in an affordable and reliable way, by convincing utility companies and governments to change their models and consumers to alter their behaviors.

The Challenges of Reliable and Affordable Electricity

IEA forecasts that \$450 billion in power sector investment is needed to boost the economy and achieve universal electricity for Africa by 2040 (*IEA, World Energy Outlook Africa, 2014*). Low private sector investment, government corruption and bureaucracy may hinder this goal without a systematic overhaul of Africa's current power system. The biggest challenges in Africa are delivering power that is affordable, accessible and at levels that are sufficient in quantity and quality. African electricity demand and consumption varies regionally so that energy demand per capita is much higher in wealthier African countries.

Electricity consumption in South Africa with a GDP per capita of US\$7592, for example was 4,405 kWh per capita in 2012, only 331 kWh per capita less than Portugal. In contrast, electricity consumption per capita in the Democratic Republic of the Congo, with a GDP per capita of US\$418, and Tanzania with a GDP per capita of \$836.5, consumed only 112 kWh per capita and 101 kWh per capita respectively ([World Bank data, 2012](#)).

Reasons for high prices

Overall, Africans have a much lower electricity consumption per capita than any other world region, yet pay extraordinarily higher prices. The IEA notes that transmission and distribution losses, government corruption and electricity power stations with low energy efficiencies contribute to high electricity prices. Because of an underdeveloped infrastructure, transportation and distribution costs can add \$50-80 per MWh to the average cost to the consumer (*IEA, Africa World Energy Outlook 2014*). Old, poorly maintained fossil fuel plants with low efficiencies, favored because of their lower upfront capital costs, make Africa's current grid capacity grossly underutilized. McKinsey estimates that \$800 billion in capital is needed to overhaul the current grid system including costs for new generation capacity and transmission and distribution (*McKinsey, 2015*).

Changing utility company behavior/models

Market limitations and behavioral barriers prevent African utility companies from switching to more efficient technologies. The 14th PWC Global Power Utilities Survey identified five trends that will influence improvements in the power sector's performance, including climate change, resource scarcity, demographic and social change, a shift in global economic power and rapid urbanization. Climate change, resource scarcity and technological breakthroughs, however, topped the list of reasons power companies would be propelled to use new energy models. Moreover, utility and power companies felt that despite the importance of these trends, they struggled to shift away from centralized grid models to distributed and decentralized generation (PWC, 2015).

Renewables as a solution to off-grid systems

Traditional electricity energy mixes in Africa come from fossil fuels and renewables in the form of hydro and biomass. Sub-Saharan Africa is only beginning to tap into its vast renewable resources including potential for hydro, solar and wind. According to the IEA, only 10% of Africa's hydropower potential has been realized. As of now, Africa's hydro production accounts for only 3% of the world's share, which makes it grossly under capacity (BP Statistical Review of World Energy, 2014). Despite its vast potential for renewables, Africa consumes only 0.6% of the world's share of renewable energy compared with Europe at 41.3% and Asia Pacific at 28% (BP Statistical Review of World Energy, 2014). Using renewables like solar would be advantageous because they can be deployed faster in a decentralized manner (IEA).

Renewable energy is the most viable solution for rural electrification. First, photovoltaic systems can easily be converted to small-scale distributed generation models. Second, solar, in particular is well suited for Africa because the resource is plentiful - Africa has insolation levels of ranging from 5-7 kWh/m² year round (UN Economic Commission for Africa, 2015). Third, solar will become more affordable. As experience curves drive the cost of technology down, PV panels will eventually hit parity with other fuels (Bradford, Travis, The Energy System, 2014). Nevertheless, financial, technological and cultural obstacles remain in encouraging wide-scale adoption of solar technologies, including unsupportive policy and regulation, resistant consumer and producer behavior, competition, production service model and distribution channels (PWC, 2015). High tax and tariff burdens, poor government transparency and difficult access to capital also hinder investment in new technology (UNEP, 2015).

Disruption of the status quo will require greater investment in renewables. Based on its Utilities and Power Survey, PWC forecasts that Africa will have increased its disruption by 50% in the next five years. Distributed generation, for example, is a viable and attractive solution in Africa, as it bypasses infrastructure problems, can target rural populations and offer new financing models. Moreover, renewables will eventually reach parity with other types of fuels making low energy costs market-driven rather than policy-driven (PWC, 2015).

The State University New York College of Environmental Science and Forestry (SUNY ESF) also attributes market problems to local businesses' lack of access to capital, investment uncertainty and lack of user-end financing mechanisms. Current finance mechanisms exist including pay-as-you-go, fee-for service and subsidies from NGOs. Pay-as-you-go models, which use mobile payments, are advantageous because they allow consumers to split bills into smaller, more affordable installments. The only upfront large cost is installment, which can be amortized (*Sustainable Rural Electrification, SYR, 2015*). The second option, fee-for service, is another common payment mechanism, in which the customer leases PV equipment from a utility company, which provides maintenance and service. However, the upfront costs are beyond the budget of most households. Some countries have opted to subsidize the financing of solar PV equipment in rural areas or have encouraged microloans (*Sustainable Rural Electrification, SYR, 2015*).

Recommendations from the SUNY ESF, UNEP, AELF, IEA and McKinsey

- NGOS can facilitate public private partnerships and work to provide PV solar services to rural communities by serving as liaisons between PV solar manufacturers and distributors and donors. They can also offer guidance to communities about the benefits of solar, which can induce behavioral changes (*SUNY ESF 2015*)
- Governments should create a conducive environment for private sector investment in innovative technologies by providing tax exemptions on solar products, creating renewable targets or reducing import taxes (*SUNY ESF 2015*)
- The African Energy Leaders Group and IEA advocate for improved energy infrastructure on a regional level, which will eventually facilitate large, competitive markets. Additional regional cooperation could be through cross-border grids or regional power pools. (*AELF and IEA, 2014*)
- The AELG advocates for better national energy policies, cross-border energy trade and joint infrastructure and encouraging banks to support investments.
- African nations with large gas reserves can boost economic development by reducing flaring, which accounts for 1 trillion cubic meters of wasted energy per year, by ensuring that gas regulation; prices and infrastructure are in place (*World Energy Outlook, 2014*)
- Improvements in governance and greater transparency will lead to better management of resources and revenues
- Governments should engage all stakeholders and encourage the private sector to invest in utilities and new technologies by increasing transparency of energy policies and strategies, and introduce tax exemptions for companies investing in renewables and eliminating import tariffs (*UNEP, 2015*)
- Governments should facilitate partnerships between financial institutions and suppliers to increase the supply of capital and encourage investment (*UNEP, 2015*)

- PWC suggests government reforms to make the market more inclusive and open to private sector opportunities. One way to lower costs would be for a transformation to occur away from centralized grids to decentralized, distributed generation.
- Engaging customers is another way to transform the market, and the power sector could do this through smart grids, micro-grids, and local storage. PWC forecasts that for distribution to be affordable, it will eventually need to bypass power and utility companies so that retailing moves to digital platforms, energy automation and own generation.
- UNEP advocates more research centers and funding to promote renewables and regional cooperation and integration of energy resources and transport.
- Regional integration including power pools and active promotion of renewables will save the region money, which will trickled down to African consumers (*McKinsey, 2014*)
- Governments should both demonstrate political will and create an environment that will attract private sector investment (*McKinsey, 2014*)

Figure 1 BP Statistical Review of World Energy 2014

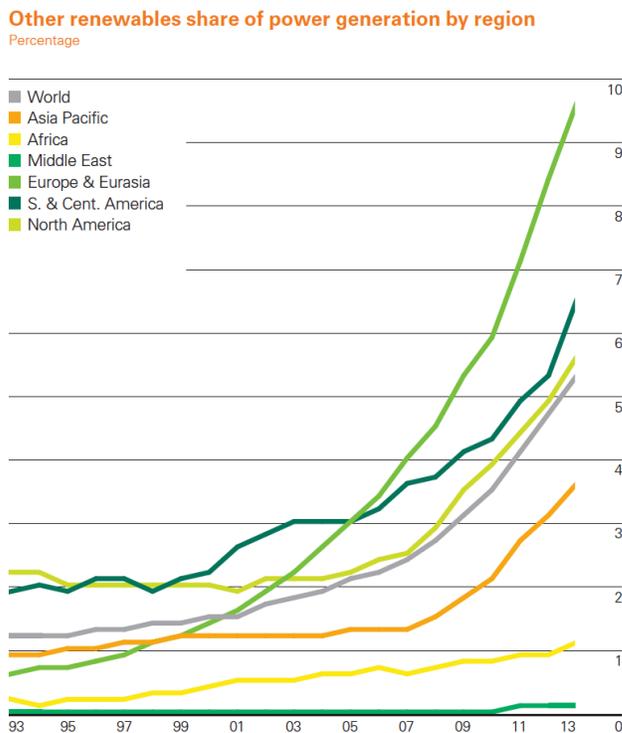


Figure 1.6 ▷ Number and share of people without access to electricity by country, 2012

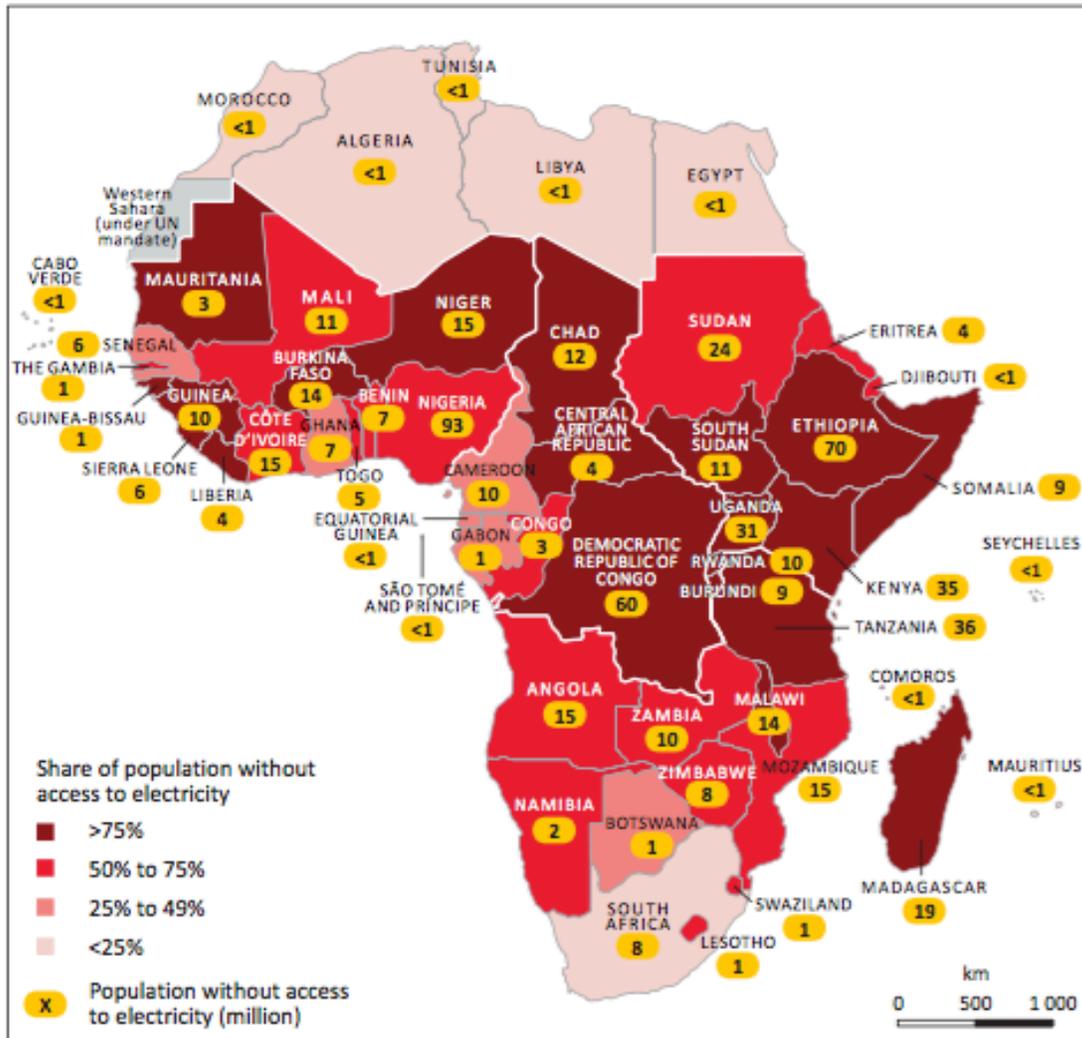


Figure 2 IEA, World Energy Outlook- Energy in Africa

Issues for debate:

- How do you persuade the population to try something new – especially in rural areas where there is a lack of access to information?
- Is the solution to Africa’s immediate power requirements the growth of the “pay as you go” energy model, or radically different financing and payment options like microloans?

Forum Flashback:

NYFA 14: Speaker Cyrille Costes, President and CEO of Lynx Energy Partners, Switzerland argued that regional cooperation between governments and the public and private sectors would boost Africa's ability to meet its energy demands. Etienne Ngoubou, Minister of Oil, Energy and Water Resources, Republic of Gabon noted that positive government policies were a catalyst for the Gabonese's increased access to electricity.

Further reading:

The Economist notes new investments in renewables can improve access to electricity for Africans - <http://econ.st/1QJCX46>

The Guardian looks at how Tesla's home-storage batteries might accelerate Africa's transition to renewables. <http://gu.com/p/49h5h/stw>

Investors explain why financing solar projects in Africa is important <http://qz.com/429427>. "By 2020, solar is projected to be cheaper than the grid in 85% of Africa."

Power cuts in Africa's largest economies may stunt economic growth (from *The New York Times*). <http://nyti.ms/1HKjCAP>. "Most companies don't have four hours of power a day from the national grid," said Akpan H. Ekpo, the director general of the West African Institute for Financial and Economic Management in Lagos.

The path to a better power grid in Africa?

<http://www.forbes.com/sites/billtucker/2015/07/16/the-road-to-africa-the-path-to-a-better-power-grid/>

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