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# Powering Africa

**Antonio Castellano, Adam Kendall, Mikhail Nikomarov, and Tarryn Swemmer**

There is a direct correlation between economic growth and electricity supply. If sub-Saharan Africa is to fulfill its promise, it needs power—and lots of it.

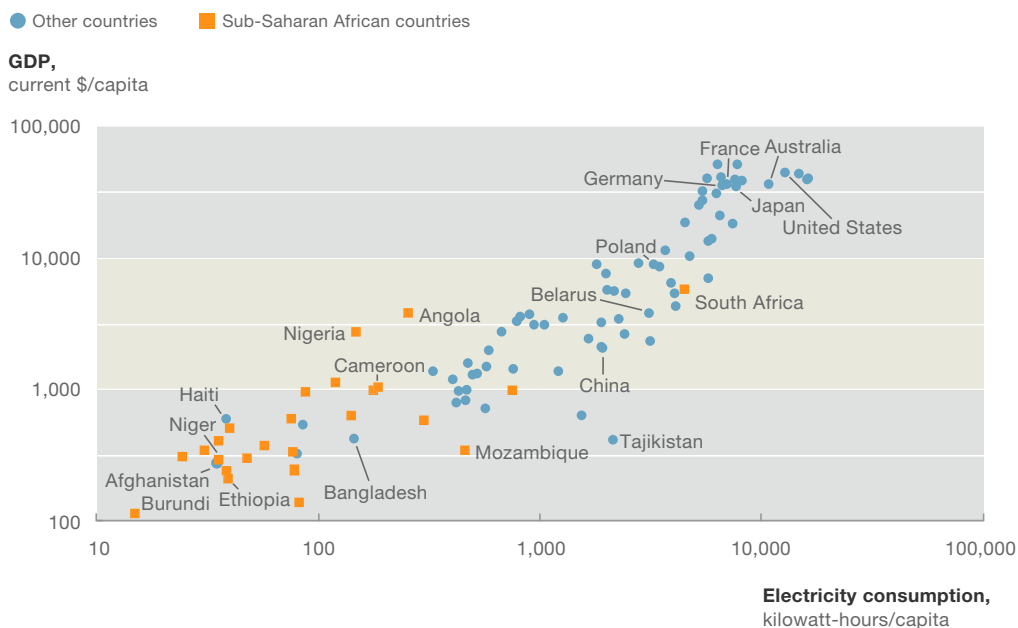
**Sub-Saharan Africa is starved for electricity.** The region's power sector is significantly underdeveloped, whether we look at energy access, installed capacity, or overall consumption. The fact that sub-Saharan Africa's residential and industrial sectors suffer electricity shortages means that countries struggle to sustain GDP growth. The stakes are enormous. Indeed, fulfilling the economic and social promise of the region, and Africa in general, depends on the ability of government and investors to develop the continent's huge electricity capacity.

Countries with electrification rates of less than 80 percent of the population consistently suffer from reduced GDP per capita (Exhibit 1). The only countries that have electrification rates of less than 80 percent with GDP per capita greater than \$3,500 are those with significant wealth in natural resources, such as Angola, Botswana, and Gabon. But even they fall well short of economic prosperity. Whether people can obtain electricity (access), and if so, how much they are able to consume (consumption) are the two most important metrics that can indicate the degree to which the power sector is supporting national development.

From an electricity-access point of view, sub-Saharan Africa's situation is the world's worst. It has 13 percent of the world's population, but 48 percent of the share of the global population without access to electricity. The only other region with a similar imbalance is South Asia, with 23 percent of the world's population and 34 percent of the people without access to electricity. This means that almost 600 million people in sub-Saharan Africa lack access to electricity. Only seven countries—Cameroon, Côte d'Ivoire, Gabon, Ghana, Namibia, Senegal and South Africa—have electricity access rates exceeding 50 percent. The rest of the region has an average grid access rate of just 20 percent. Moreover, even when there is access to electricity, there may not be enough to go around.

## Exhibit 1 Africa won't grow without power.

### Relationship between electricity consumption and GDP,<sup>1</sup> 2011



<sup>1</sup>Base 10 logarithmic scale.

Source: IHS Economics; International Energy Statistics, US Energy Information Administration, 2013, eia.gov

Regarding consumption, Africa's rates are far below other emerging markets. Average electricity consumption in sub-Saharan Africa, excluding South Africa, is only about 150 kilowatt-hours per capita. This is a fraction of consumption rates in Brazil, India, and South Africa.

Our new report, *Brighter Africa: The growth potential of the sub-Saharan electricity sector*, explores how power demand will evolve in the region, along with the associated supply requirements; how much it will cost to supply the needed power, plus the options available to manage the expense; and what is required to ensure that the new capacity gets built. In brief, sub-Saharan Africa has an extraordinary opportunity but will have to do a lot of work to take advantage of it.

### Meeting a four-fold increase in demand

We took a demand-driven approach to better understand the likely evolution of the sub-Saharan African power sector and the resulting opportunity for the players who will help propel it. We project that sub-Saharan Africa will consume nearly 1,600 terawatt hours by 2040, four times

what was used in 2010. That forecast is based on a number of important factors, including a fivefold increase in GDP, a doubling of population, electricity-access levels reaching more than 70 percent by 2040, and increased urbanization. By 2040, sub-Saharan Africa will consume as much electricity as India and Latin America combined did in 2010 (Exhibit 2).

**Exhibit 2** Electricity consumption in sub-Saharan Africa will by 2040 exceed today's levels of major developed economies.

	Electricity consumption 2010, terawatt-hours p.a.	Consumption/capita, kilowatt-hours
United States	3,962	13,395
China	3,557	2,944
European Union	3,035	6,264
<b>Sub-Saharan Africa 2040</b>	<b>1,570</b>	<b>989</b>
Japan	996	8,394
Latin America	841	1,961
India	760	626
Canada	522	15,137
Brazil	426	2,381
<b>Sub-Saharan Africa</b>	<b>423</b>	<b>514</b>

Source: Key World Energy Statistics, Organisation for Economic Co-operation and Development and the International Energy Agency, 2013, [iea.org](http://iea.org); World Development Indicators, World Bank Group, [worldbank.org](http://worldbank.org)

Nevertheless, we forecast that electrification levels will only reach 70 to 80 percent by 2040 given the challenges associated with getting the power to where it needs to go. It takes on average 25 years to progress from a 20 percent electrification rate to 80 percent electrification rate, our research found.

We know there will be demand. What about supply? Sub-Saharan Africa is incredibly rich in potential power-generation capacity. Excluding solar, we estimate there is 1.2 terawatts of capacity; including solar, there is a staggering 10 terawatts of potential capacity or more. There is potential for about 400 gigawatts of gas-generated power, with Mozambique, Nigeria, and Tanzania alone representing 60 percent of the total capacity; about 350 gigawatts of hydro, with the Democratic Republic of the Congo (DRC) accounting for 50 percent; about 300 gigawatts of coal capacity, with Botswana, Mozambique, and South Africa representing 95 percent of this; and

109 gigawatts of wind capacity, although it is relatively expensive compared with other sources. The proven geothermal resource potential is only 15 gigawatts, but this is an important technology for Ethiopia and Kenya, which hold 80 percent of it.

Gas would account for more than 40 percent of the electricity generated from 2020 onward, with hydro remaining a very important technology. Solar would take off significantly after 2030, representing 8 percent of the generation mix by 2040 and more than 30 percent of capacity additions between 2030 and 2040. Even in the absence of active incentives, more than 25 percent of total energy in 2040 would come from clean sources—geothermal, hydro, solar, and wind—compared with 21 percent today, almost all of which is from hydroelectric sources. Southern Africa will continue to build coal capacity, but its overall importance in the continent's fuel mix will diminish from 51 to 23 percent. We found that the average levelized cost of energy generated would be about \$70 per megawatt-hour with relative emissions of 0.48 tons<sup>1</sup> of CO<sub>2</sub> per megawatt-hour in 2030, dropping to 0.43 tons of CO<sub>2</sub> per megawatt-hour in 2040.

If every country builds what it needs, we estimate that the region would require about \$490 billion of capital for new generating capacity, plus another \$345 billion for transmission and distribution.

Also, we studied ways to facilitate the development of the sector and the trade-offs they entail. Regional integration, such as power pools, and promotion of renewable generation are game changers that could shape the energy landscape in sub-Saharan Africa over the next 25 years. We found that significantly increasing regional integration could save more than \$40 billion in capital spending, and save the African consumer nearly \$10 billion per year by 2040, as the levelized cost of energy falls from \$70 per megawatt-hour to \$64 per megawatt-hour. Higher levels of integration would result in larger regional gas options being favored over some of the smaller in-country solar and wind additions, leading to an increase in carbon emissions.

If sub-Saharan Africa aggressively promotes renewables, it could obtain a 27 percent reduction in CO<sub>2</sub> emissions; this would result in a 35 percent higher installed capacity base and 31 percent higher capital spending (or an additional \$153 billion).

There are also a series of shocks that could fundamentally change the sector in Africa. For one, the massive Grand Inga Dam hydroelectric project could help save \$32 billion in capital spending as well as 63 megatons in carbon emissions annually. In addition, Africa is significantly underexplored from a gas perspective, so there is the real possibility of further gas discoveries on the east or west coasts. Tapping such sources could result in a much cheaper levelized cost of energy.

To move ahead on development of the sector, national governments should take the initiative in a number of areas. For one, they could focus on ensuring the financial viability of the power sector. Four points matter here: electricity tariffs should reflect the true cost of electricity, costs should be transparent, the country should make the most of what it already has in the sector, and officials should pursue least cost options in investments.

A second imperative involves creating an environment that will attract a broad range of funding mechanisms. Private-sector involvement is critical and central to effectively delivering new capacity. To attract the private sector, it is necessary to provide clear, consistent regulations; allocate risks to the parties best suited to carry them; ensure that a credible buyer (off-taker) exists; and seek support from external institutions to guarantee the risks.

Last, it is important for governments to demonstrate political will. To do this, they can prioritize efforts, keep an eye on the long term, and focus on the regulations and capabilities needed for the sector to thrive, not just on the plants and associated infrastructure.



While the sub-Saharan African power sector faces many challenges, there is real momentum for change. For example, the UN program on Sustainable Energy for All is sparking private-sector activity in many different parts of the value chain. The region has the ability to take development of the sector to the next level. Success will propel economic growth of the continent and greatly enhance the lives of hundreds of millions of people, as well as potentially create a thriving electricity-supply industry and an associated 2.5 million temporary and permanent jobs across the continent.

This is excerpted from the report *Brighter Africa: The growth potential of the sub-Saharan electricity sector*. [□](#)

**Antonio Castellano** is a senior expert in McKinsey's Milan office, **Adam Kendall** is a principal in the Casablanca office, and **Mikhail Nikomarov** is a consultant in the Johannesburg office, where **Tarryn Swemmer** is a specialist.