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Whitepaper
A focus on sub-Saharan Africa

Renewable energy in sub-Saharan Africa

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The second-largest economy in the region, South Africa[1], had a challenging year. Economic growth of 1.7% in 2015 is expected to have fallen to around 0.5% in 2016

Sub-Saharan African economies expected to improve on a poor 2016

A number of developments made 2016 difficult for sub-Saharan Africa. Firstly, prices of commodities exports, now a large source of foreign exchange earnings, were still depressed compared to long-run average levels. This affects inward investment in the over-supplied market and therefore foreign direct investment (FDI) in general. Secondly, the strength of the US economy and the Federal Reserve's plan to lift rates upwards put pressure on emerging market currencies. Credit conditions also become tighter as liquidity follows higher returns in advanced markets. Drought also affected the area, hitting agrarian economies like Tanzania, Mozambique and Zimbabwe particularly hard.

The second-largest economy in the region, South Africa[1], had a challenging year. Economic growth of 1.7% in 2015 is expected to have fallen to around 0.5% in 2016. Political scandal and allegations of cronyism have shaken the government, with the fallout reducing the value of the rand. In order to protect the currency, the base interest rate remains high at 7%, making it hard to reduce elevated unemployment (26.7% in the Q3 2016 statistics). The government is also pursuing fiscal consolidation to bring down a deficit of around 3% of GDP.

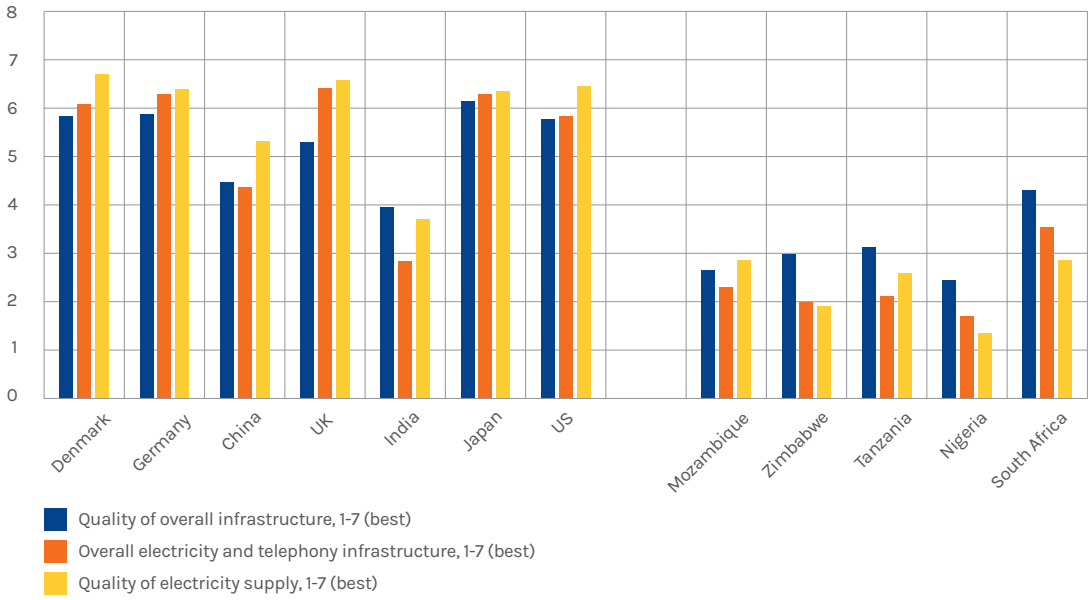
Poor infrastructure, including electricity, was a significant constraint during 2016. Productivity growth was weak, which is bad news for near-term economic prospects, and lacklustre investment (set to average 1.6% per year growth between 2014 and 2017) means that growth in this area may continue to trend down. A new minimum wage may help the consumer side of the economy, but it has been set at a deliberately low level to minimise job losses. Over the next year the tightening of credit conditions will continue. With commodity prices still rising from 2015's lows, export earnings should increase as they do. We expect to see subdued growth in 2017 of around 1.5%. The following sections look at how infrastructure, particularly energy, is a bright spot which may improve the economy's future potential.

[1] Due to currency fluctuations, Nigeria was recently overtaken by South Africa in GDP at market exchange rates. It remains larger on the most widely used measure, purchasing power parity (GDP at PPP).

South Africa's infrastructure is of marginally higher quality than the worst-performing international comparator in Figure 1, India

1. Infrastructure holding back overall performance

Figure 1: Quality of overall infrastructure, electricity infrastructure and electricity supply, five sub-Saharan African economies and international comparators, 2015-2016



Overall, infrastructure quality is generally low in sub-Saharan Africa. South Africa's infrastructure is of marginally higher quality than the worst-performing international comparator in Figure 1, India, although per-capita incomes in South Africa are over four times those in the subcontinent. Poor quality infrastructure hinders growth wherever it is, but especially in low-income countries. With young, fast-growing populations and opportunity to converge with richer parts of the world, countries such as India and South Africa could otherwise achieve much faster increases in their living standards with better quality infrastructure.

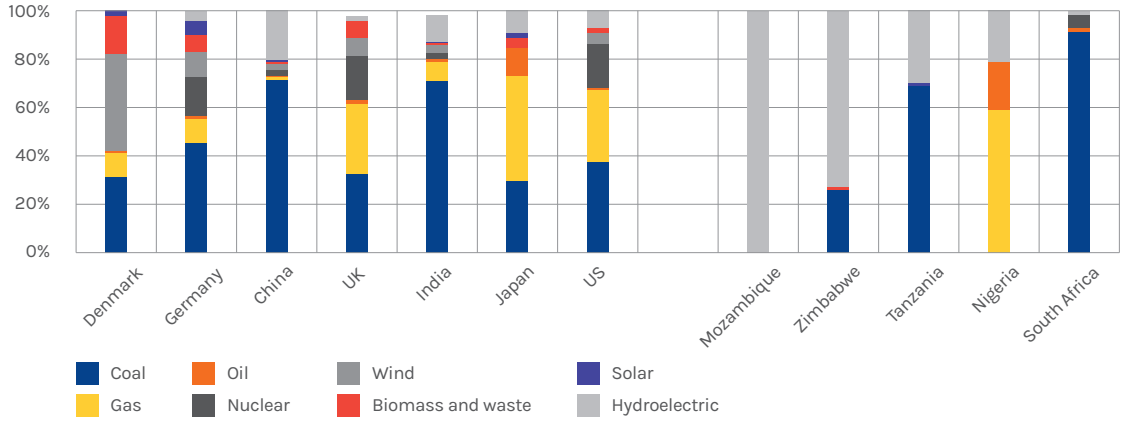
In terms of electricity supply, all the African economies rate some distance below those in the rest of the world in Figure 1. This will be a challenge as future energy demand rises rapidly. We will go on to examine South Africa's plans to address this, which are already relatively well developed.

2. Renewable generation in South Africa rising apace

Denmark and Germany lead the international comparators in renewable generation in Figure 2. Sub-Saharan African performance in renewable energy is hugely variable. The five main sub-Saharan African economies use very little wind or solar power – much less than India, which has per-capita incomes in a similar range. India is something of a pioneer in renewables, particularly considering the modest means at its disposal: it was the first country in the world to set up a Ministry of Non-Conventional Energy Sources in 1980, and by 2011 was producing more renewable power than Austria's total installed capacity from all sources.[2] It has redoubled efforts at expanding renewable capacity since 2011.

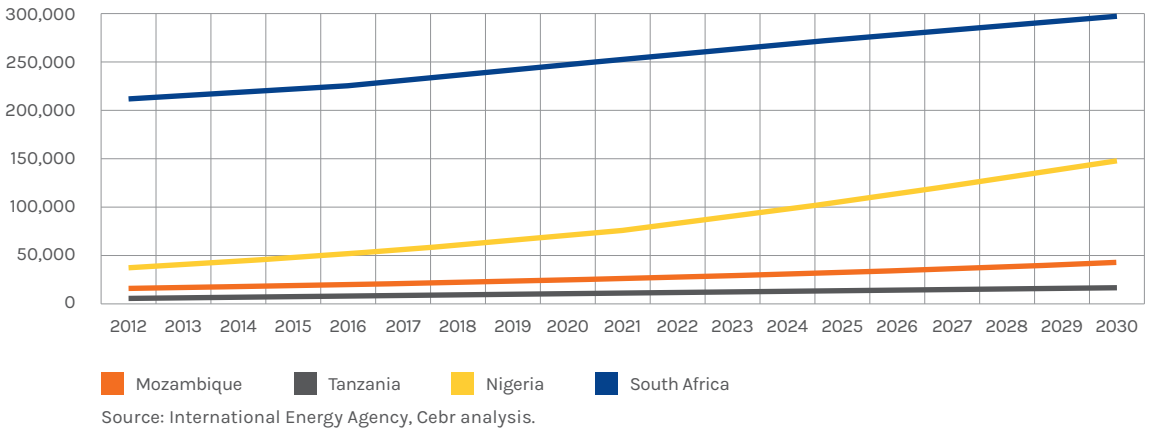
Over time, energy demand is a function mainly of per-capita incomes and population. Essentially this makes it a function of GDP, which itself is dependent on population. At higher incomes, growth in per-capita energy use slows down. This is factored into the forecasts in Figure 3.

Figure 2: Power generation by type in five sub-Saharan African economies and international comparators, 2014



Source: Energy Information Authority. Note: India and US also generate small amounts from geothermal sources.

Figure 3: Forecasts for total energy demand in five sub-Saharan African economies, 2012-2030, MWh



Source: International Energy Agency, Cebr analysis.

[2] Khare, Nema and Baredar, Status of solar wind renewable energy in India, 2011.

Nigeria is expected to see far higher demand growth... At 40% over the timeframe, population growth is the main driver

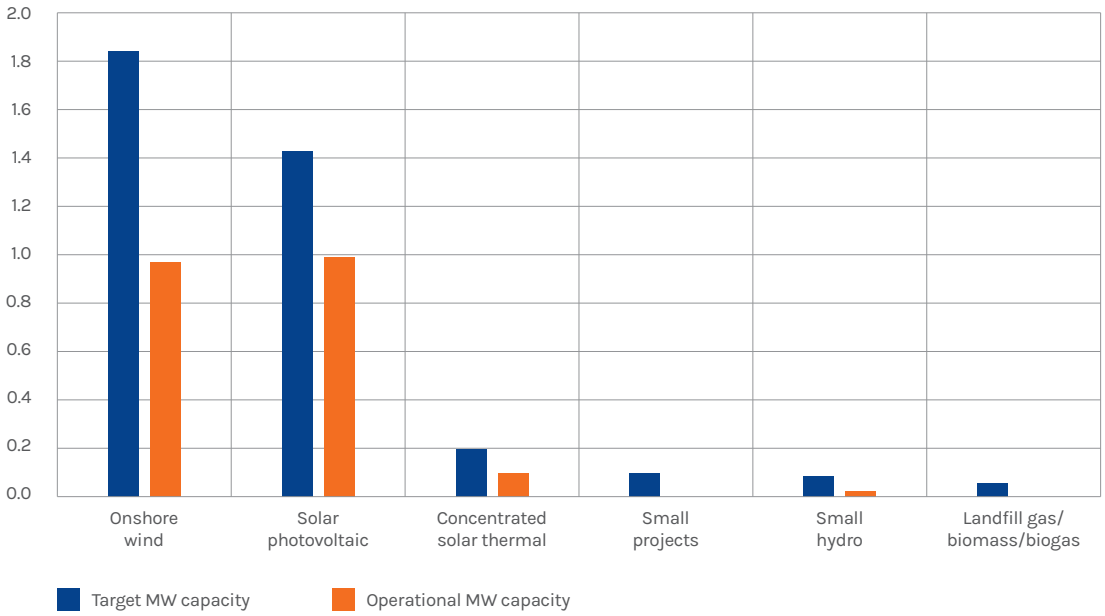
With energy demand forecast to increase by almost fourfold, Nigeria is expected to see far higher demand growth than the other three African economies, in both absolute and relative terms. At 40% over the timeframe, population growth is the main driver of this.

South Africa, currently the most developed economy of the group, has a demand of 226GWh per year but will only generate 32% more energy in 2030 than it does at present. Its population increase, at 9%, is more manageable, while per-capita incomes are much higher already.

The slowdown in GDP growth at present also creates a temporary slowing in energy use growth.

South Africa has set targets for capacity creation (capacity being the amount of electricity the country's grid can generate at one time), shown in Figure 4. Generation is harder to set precise targets for than capacity, because it depends on variable weather conditions as well as patterns of demand. However, a country that increases capacity should see a fairly reliable increase in its generation of energy of that type.

Figure 4: 2020 targets and 2015 installed capacity for renewable energy by type from South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), GW



Source: Department of Energy, The Energy Blog. Note: no data on small projects or landfill gas/biomass/biogas.

The programme has been successful in drawing investment into the sector

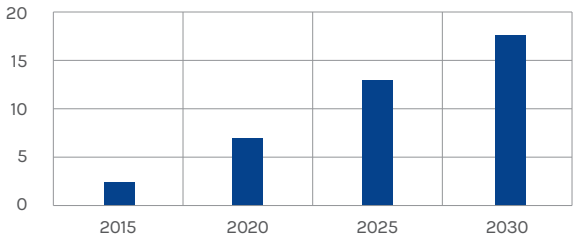
South Africa planned to install 3.7GW of renewable energy by 2020, including 1.8GW of wind power under its Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), and it is already over halfway there. Solar power is also doing very well. The programme has been successful in drawing investment into the sector, having attracted R193bn ($13.7bn) of private money so far.[3] The total put South Africa in the top 10 countries for renewables investment in 2014. It has also been helped by the plunging prices of renewable energy over the same time. Both wind and solar can now sell energy to the grid at prices below that of coal power, gradually changing the coal-intense mix in Figure 2. The 2020 target is therefore being revised up. It stands at 7GW now and is set to move higher when a new Integrated Energy Plan is published. However, the new targets have not yet been finalised.

South Africa has some way to go to reach its old 2030 target of 17.8GW[4] which is estimated to account for 20% of its capacity in 2030. Following exponential recent growth in renewable capacity, the new 2030 target is expected to be significantly more ambitious. New 2050 capacity is envisioned at around 50GW for solar, 25GW for wind and 1GW for biomass, out of a total of around 140GW (depending on the scenario used).

One drawback of renewables is that they can become a victim of their own success. On windy and sunny days, these utilities produce large amounts of power, meaning the price per GW drops steeply. This is sometimes the case in European countries, where renewables have the strongest presence. The only solution at present is to charge negative prices at occasional times, which reduces the yield on renewable power investments.

As battery technology and energy storage capabilities improve, the problem will be alleviated. Innovations such as Tesla Powerwall allow homes and businesses to store their own energy, making the grid's task of balancing supply and demand at all times significantly easier. However, negative prices are a risk to bear in mind at present.

Figure 5: South Africa capacity targets from the REIPPPP, GW



Source: Department of Energy, The Energy Blog. Note: 2015 figure is actual, not a target.

[3] South African Treasury figures cited in The Energy Blog.
[4] It is in the process of establishing new targets, with a draft Department of Energy paper out.

Water power alone can supply the majority of the needs of a low-income country with an agrarian economy – such as Mozambique or Zimbabwe

3. Hydro an important source across much of sub-Saharan Africa, but not in South Africa

Figure 2 shows that the main power source in many sub-Saharan Africa economies is hydropower, although that is not the case in South Africa. While Denmark and Germany lead in solar and wind, the northern Europeans' renewable resources supply less as a proportion of total generation than Mozambique and Zimbabwe can gain from hydro. Water power alone can supply the majority of the needs of a low-income country with an agrarian economy – such as Mozambique or Zimbabwe. But generation capacity is always limited by the number of suitable natural sites to use for dams.

Unless local resources are plentiful, the rapid growth in energy requirements that accompanies economic expansion necessitates other forms of electricity generation. For example, Mozambique has twice as much hydropower generation capacity as the UK and it accounts for 99.9% of all electricity generated, while in the UK it accounts for just 1.9%. South Africa is more similar to the UK than Mozambique in this respect, with its hydropower resources playing a relatively small role (0.5%) in energy requirements.

4. Inflation-linked green infrastructure investments can reduce exposure to macro risks

As mentioned above, renewable energy in South Africa has attracted considerable funding. The 2014 total amounted to 86% of the total FDI into South Africa in that year.[5] We look here at the factors that have contributed to this success.

South Africa has both an economy with rapid growth potential and a clear plan, with targets, for renewable energy generation. Its foreign investment regime is also a relatively open one. A further draw of renewable investments in particular, is the divestment trend that many investment institutions have followed of late. For example, coal power is often targeted as a high-polluting industry, meaning companies interested in South Africa would be wiser to look at the greener energy sector.

Inflation-linked debt funding is a relatively new instrument being used increasingly for infrastructure funding in South Africa. For example, Ashburton Investments announced a green debt initiative under the South African REIPPPP last year. The attraction for many large investors, such as pension funds, is that they have liabilities that are relatively regular in frequency and amount. This matches the income streams from infrastructure projects, which have a similar profile thanks to guaranteed and often inflation-linked revenues from users.

Another advantage is that infrastructure investments are illiquid: there are relatively few active players in the market for them. This reduces their attractiveness to speculators and thus removes the price premium associated with liquid investments, which suits institutions that do not need this feature. The investments also allow disintermediation: banks need not be involved, which can cut out a source of transaction fees and improve the yield to investors.

Inflation has been relatively high of late in South Africa: over 6% on average in 2016. We expect an average figure of 6.2% in 2017. Inflation in South Africa is also more volatile, historically, than inflation in many OECD economies. The South African economy faces various upward pressures to inflation:

1. The new minimum wage will feed through into consumer prices.

2. The weakening of the rand, with more to come from:
   a. Upcoming rises in US interest rates;
   b. Potential political uncertainty in South Africa if the issues surrounding Jacob Zuma are exacerbated (the recent downgrade of South African sovereign debt by Fitch, to one notch above junk status, underlined this).

3. Higher oil prices.

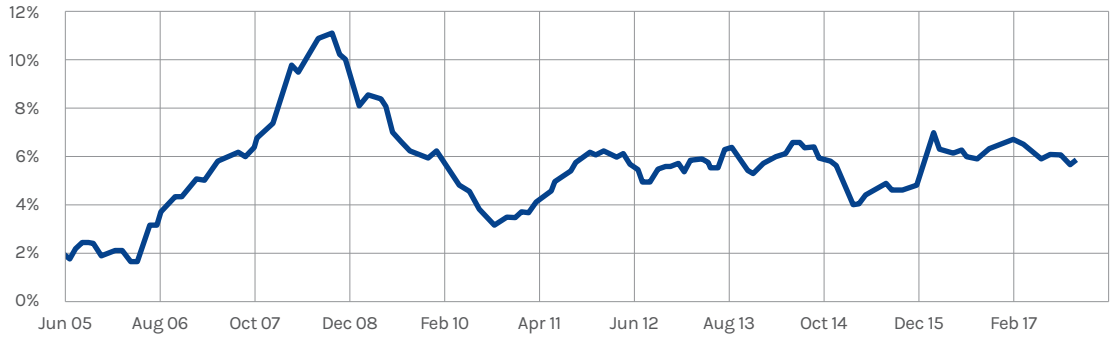
Despite these reasons we are not expecting a rise in South African interest rates, as this would be detrimental to economic growth. The central bank argues that inflation is set to fall: food prices contributed much of the recent rise, and the drought that caused this is now over. We therefore see the outlook as one where inflation remains, as at present, elevated above the 3%–6% target range, gradually falling for the next year.

However, this is subject to several risks, which can be avoided by choosing an inflation-linked asset. If one of the ratings agencies does lower the South African debt rating, interest rates and inflation would both rise and the rand would fall. The principal risk they cite is that of the debt-to-

[5] The Energy Blog, 'Reaping reward - South Africa's REIPPPP'.

GDP ratio (currently at 44%) rising, intensified by political uncertainty. The minimum wage increase, as it will raise disposable incomes, should be broadly helpful for growth. A fiscal plan from the government that intends to cut the deficit over the next four years should also alleviate fears over the ratio growing.

Figure 6: Consumer price inflation projection for 2017



Source: Macrobond, Cebr analysis.

A sharp shift to renewables means that investment opportunities in the sector are attractive despite some risks to the economic outlook

5. Conclusions

Infrastructure is an important facilitator of growth in developing countries. South Africa's economy is suffering from poor quality infrastructure in general, with various other one-off factors complicating the task of achieving steady expansion in GDP over 2016. However, thanks to government targets and an attractive investment regime, the outlook in South Africa for energy generation is bright.

A growing population and rising GDP per capita are set to sustain an upward trajectory for South African energy demand. A sharp shift to renewables means that investment opportunities in the sector are attractive despite some risks to the economic outlook. Innovative ways of funding investments allow these risks to be managed, meaning that investors can take advantage of the growth in the sector without being unduly exposed to risk.

About this white paper

This whitepaper was written in partnership with Cebr.

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