IRENA
International Renewable Energy Agency

PROSPECTS FOR THE AFRICAN POWER SECTOR

- an IRENA Working Paper

Africa has vast untapped renewable energy resources that can provide electricity for all at an affordable cost. While the deployment of renewables already shows both established and emerging areas of success, there are barriers to implementation, many of them project-specific, which African energy ministers can address.

These are the broad conclusions of the *Prospects for the African Power Sector* – a recently published working paper in IRENA's Scenarios and Strategies series. It notes that Africa faces a unique opportunity today as nearly two-thirds of the additional capacity needed by 2030 has yet to be built. The continent can benefit from the recent global progress and cost reductions in renewable power generation technologies, to leapfrog the development path taken by industrialised countries and move directly to a renewable-based system.

The paper makes a series of recommendations including the development of clear and stable policy frameworks that enable the private sector to invest with confidence; use of local manufacturing to reduce costs and create employment; and the inclusion of renewables in economic development strategies. Other measures that can help scale up investment include assessment of Africa's specific technology needs; enhancing the mapping of renewable energy potentials; and cooperating in the development of a continental electricity grid, which can connect and manage remote and variable renewable resources, and improve security of supply.

Power demand in Africa

Africa will need to add around 250 GW of capacity by 2030 to meet demand growth. The working paper considers two future routes for the continent – a Reference Scenario, based on a continuation of existing trends and policies; and a Renewable Scenario, which examines the impact of policies that actively promote transition to a renewable-based electricity system, which boosts economic development, and achieves electricity access for all by 2030.

Under the Renewable Scenario the share of renewables in power generation could increase to 50% in 2030, and to 73% by 2050. This scenario suggests that if the right policies are in place, renewable energy could be the path for least-cost development, particularly for bringing electricity access to millions of Africans currently lacking access to the grid.

Prospects for the African Power Sector considers all the renewable energy options open to Africa today and concludes that large hydropower is the least-cost solution, followed by onshore wind, biomass and geothermal. Although solar is currently more expensive, it has a huge potential and costs are rapidly falling.

The Renewable Scenario estimates an *increase* in the electricity system costs (investment and fuel) between 2008 and 2030 of around USD 700 billion, compared to the Reference Scenario. This increase includes the cost of achieving universal electricity access. However, in the long term the Renewable Scenario's undiscounted electricity system costs are USD 1 trillion *lower* than the Reference Scenario. These investment figures mask significant *additional macro-economic benefits*. If the local content of renewables projects can be raised, it will result in lower absolute costs per kW and improved balance of payments positions, as well as higher economic activity and sizeable job creation.

Prospects for renewables

Although hydropower has dominated renewable power investment across the continent, it only generates 10% to 20% of the total economically feasible potential. The working paper describes the Grand Inga and Ethiopian hydropower projects as

important new large resources, but notes that other countries in West and Central Africa also have great potential for large and small hydropower.

Solar has by far the largest renewable resource potential in Africa, with high-quality solar resources available everywhere, other than in equatorial rainforest areas. The working paper states that one key factor that has been holding back the development of solar in Africa has been its price. However, rapid cost reductions are being achieved and as a result, annual capacity additions have been growing rapidly.

African wind potential is virtually untapped, says the paper, noting that the full use of Africa's wind potential would require significant investment in the transmission system to connect resources to demand centres. It adds that although high-quality geothermal resources are an excellent source of low-cost, baseload electricity these resources are limited in Africa relative to those of wind and solar. Even though bioenergy is currently widely used in Africa for cooking and industrial purposes, it is not used for power generation. The use of bagasse residues for power generation could be expanded.

Prospects for the African Power Sector notes that many countries are lagging behind in the introduction of biomass, geothermal, solar and wind for power generation. However, the paper also shows both established and emerging areas of success. Solar resources in northern Africa are being developed, and a number of countries have started to harness their wind resources, including Egypt, Morocco, Kenya and South Africa. Kenya has also started an ambitious programme to develop its geothermal resources.

Africa needs to urgently raise the level of investment in its power sector. The continent will need to add around 250 GW of capacity between now and 2030 to meet demand growth. This will require capacity additions to double to around 7 GW a year in the short-term and to quadruple by 2030. Due to the magnitude of investment required building additional capacity these will have to include private-public partnerships. While access rates are improving in some African countries business environments and policy frameworks are not yet sufficiently robust to attract the required levels of investment.

Fast Facts

- Current installed capacity: 147 GW (a level comparable to the capacity China installs in a year).
- Average per capita electricity consumption in sub-Saharan Africa (excluding South Africa): 153 kWh/year (one-fourth of the consumption in India and just 6% of the global average.)
- Nearly 600 million people in Africa lack access to electricity.
- Electricity blackouts and reliance on expensive diesel power generation costs some African economies between 1% and 5% of GDP annually.

Africa is endowed with vast untapped renewable energy resources that can provide affordable electricity for all. Solar has by far the largest renewable resource potential in Africa, with high-quality solar resources available almost everywhere. Africa's onshore wind resources are in the order of 1750 GW, far more than total African demand for the foreseeable future.