Energising Africa with renewables

By Adnan Amin,
Director-General, International Renewable Energy Agency (IRENA)

To meet its growing demand, Africa has an urgent need to raise the level of investment in its power sector. The region currently has 147 GW of installed capacity, a level comparable to the capacity China installs in two years. Capacity is concentrated in the North and South of the continent. In sub-Saharan Africa, average per capita electricity consumption is 153 kWh/year equivalent to just 6 per cent of the global average. Nearly 600 million African citizens lack access to electricity. Electricity blackouts occur on a daily basis in many African countries, in many cases causing people and enterprises to rely on expensive diesel power generation to meet their electricity needs, costing some African economies between 1 per cent and 5 per cent of GDP annually.

At the same time, Africa's population and economic growth rates are amongst the highest in the world. Out of the ten fastest-growing economies in 2010, six are in sub-Saharan Africa. As a result, the continent will need to add around 250 GW of capacity between now and 2030 to meet demand growth.

Africa faces a unique opportunity as nearly two-thirds of this additional capacity has yet to be built. The continent can benefit from the recent technology improvements 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.

Governments in Africa now consider renewable energy as a core element of their energy strategy to provide access to millions of citizens whilst contributing to energy security and climate change mitigation (IRENA, 2011). This is part of a global trend. Renewable power generation is now the fastest growing sector of the energy mix and accounts for almost a fifth of all electricity produced worldwide.

A key feature of many renewable power supply options is their capability to operate economically at small scale. This is a very attractive feature in situations, such as are found in most parts of Africa, where there is no established grid. Furthermore, the costs of renewable energy technologies have come down significantly in the past decade, to the point where they can often compete with fossil fuels without subsidies. An analysis by the European Commission suggests that an optimal mix to meet Africa's demand growth would consist of approximately one third grid expansion, one third mini-grids and one third off-grid systems.

Africa is endowed with vast untapped renewable energy resources that can provide electricity for all at an affordable cost. The potential for hydropower is estimated around 150 GW, spread over the major river basins. Wind power potential in the north east, north west, south and certain elevated spots in the Sahara and Sahel areas is among the best in the world. Solar resources are excellent everywhere except in the rainforest zone, where biomass resources offer an attractive alternative option. The East African rift valley offers interesting opportunities for geothermal energy. However, there is no "one size fits all" solution for Africa's needs and the optimum mix varies by power pool, by country and even on a smaller spatial scale (Figure 1).

Opinion is divided on Africa's potential for energy crops, which will depend on the future increase of agricultural productivity, population growth, changing food consumption patterns, and on net lifecycle greenhouse gas (GHG) emission reductions. There is general agreement that significant quantities of agricultural waste residues are available that can be used. Countries such as Mozambique have significant unused land suitable for bioenergy production. Achieving the necessary economies of scale and overcoming the logistical challenges while meeting sustainability criteria such as lifecycle GHG reductions, including land use change as well as social standards, will be critical for a successful deployment of biofuels in Africa (IEA, 2010).

Although Africa's potential for renewables is relatively well known, precise assessments are needed to provide the basis for bankable generation projects. Accurate data are not currently available for many project locations. Improving the resource dataset is therefore a priority. IRENA has been working on new datasets for wind, solar and biomass for all African countries and bankable wind data for Namibia. The Agency is also coordinating global efforts to develop a Global Solar and Wind Atlas, through the Clean Energy Ministerial (CEM) process and the UN Sustainable Energy for All Initiative (SE4ALL).

Access to technology is another key issue affecting Africa's uptake of renewable energy. The importation of equipment is often hampered by taxation and the lack of a sizeable market, which drives up cost. IRENA analysis shows that project costs in Africa are higher than in other parts of the world. Projects often need to encompass enabling infrastructure because equipment is imported. Financing costs are high because of perceived risk and the opportunity cost of capital. Moreover, international development projects tend to incur substantial transaction costs. Although local production of equipment is currently

limited in many African countries, IRENA analysis suggests that the local content in projects could rise to 45-80 per cent, depending on the technology, which should help reduce costs (IRENA, 2012). One of the key benefits of an industrialisation strategy through renewable energy is its potential to create jobs and benefit many sectors of society, in contrast to fossil fuels exports, which risk crowding out other economic activity.

Renewables can therefore bring new income sources to African nations. In North Africa, the Desertec Industrial Initiative aims to install 100 GW capacity by 2050 to export electricity to the European market. Morocco, so far the only African country with a powerline connection with Europe, has been chosen as the first location to develop a 500 MW Concentrated Solar Plant as part of the Desertec Initiative.

The magnitude of the investments required is such that governments will need public-private partnerships in order to scale up investment in generation capacity. While access rates are improving in some countries, the business environment and policy framework are still not sufficiently robust to attract the level of private investment required to install the additional 250 GW by 2030. In many countries electricity is subsidised and sold at prices below production cost. The result is that utilities lack capital that is sorely needed for investments.

The development of clear and stable policy frameworks is essential to enable the private sector to invest with confidence. IRENA has recently instigated a new country-driven process – the Renewables Readiness Assessment (RRA) – which assesses national policy frameworks and gives a measure of a country's readiness to adopt renewables with recommendations for policy adjustments. To date Mozambique and Senegal have been assessed under the RRA process and a regional roll-out in the ECOWAS region will follow during 2012 (IRENA, 2012).

Adoption of renewable energy offers Africa other advantages for end-use sectors, such as cooking, transportation and industry, which can enjoy similar or even higher benefits. Traditional solid biomass in rural areas and charcoal use in cities currently dominates energy end-use in sub-Saharan Africa. Traditional biomass presents a number of challenges such as its health impacts, increasing scarcity, and inconvenience of use. A mix of LPG, efficient cooking stoves, biogas and advanced liquid biofuels is emerging as a viable solution. Governments should give priority to providing economically viable alternatives, while at the same time encouraging a more sustainable use of traditional biomass. Cities should be a priority, where costly charcoal use dominates and alternatives can be economically viable today.

In conclusion, Africa stands at a crossroads with the opportunity to build a modern renewable energy-based economy across the continent. While upfront investment costs may be higher, renewable energy use will generate significant benefits that outweigh costs in the medium to long term. The critical challenge for African governments is the establishment of robust policy frameworks that will make this energy revolution possible. ❑

Figure 1: Electricity production mix in the Renewable Scenario by country and fuel in the ECOWAS power pool, 2030