Connecting the continent: creating a pathway to low-carbon growth for Africa

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With the greater than ever prospects for energy demand in Africa resulting from the relatively strong economic performance of the past ten years, as well as the projected 5 per cent economic growth trend of the continent for the year 2011, it has become imperative for governments to take definite steps to end energy insecurity and to set the African continent on a path of sustainable energy production and consumption.

In this context, the African Development Bank's (AfDB's) programmes in the energy sector are targeted at scaling up access through increased energy production and cross-border energy trade, while putting Africa on a sustainable path to a low-carbon economy. Therefore, the AfDB's strategy in the energy sector aims at gradually eliminating energy poverty through increased generation and better interconnectivity of the electrical grids across regions, while ensuring a scaling up in the development of renewable energy sources and the mainstreaming of energy efficiency measures and practices. Because of the limited scope of most national transmission and distribution infrastructure, the development of stand-alone renewable energy sources is often the least-cost solution to meeting the particular circumstances of rural areas which need electricity to strive and to develop. In addition, starting from a relatively low base, Africa has the opportunity to pursue a low-carbon intensive development pathway which is in line with the international concerns over climate change.

Despite the fact that Africa has significant natural resources, energy production remains low. With important natural resources including hydro-potential (estimated at around 1,750 terrawatts per hour (TWh)), geothermal (estimated at 9,000 megawatts (MW)), uranium (19 per cent of world potential), solar and most of all, 9.7 per cent, 7.7 per cent and 5.5 per cent of world oil, gas and coal reserves respectively, the energy resources on the African continent are diverse and considerable. But despite these abundant resources, Africa's energy production remains only about 9.5 per cent of the world's total output, including 12.1 per cent of the world's crude oil production; 6.6 per cent of natural gas output; 4.7 per cent of the world's hard coal; and 3.1 per cent of hydro-electric power.

Access to energy is closely linked to poverty reduction, both in a national and regional perspective. Insufficient energy is a central aspect of practically all core conditions of poverty, such as poor health, insufficient access to water, poor sanitation and inadequate education. In addition, connectivity also fosters growth in a regional perspective. The African Development Bank's Research indicates that there are positive effects of electricity consumption by a country on other countries' economic productivity. The results of AfDB's analysis show positive outcomes of the *regional* electricity consumption on an *individual* country's GDP per capita, implying a need for regional cooperation with respect to electricity generation, connection, and consumption. To the extent that projects promote regional integration by increasing capacity to generate power and extend connectivity, they help each country benefit from positive economic spill-overs. Results from empirical analyses of the effect of electricity generation, and connectivity, indicate that increased access to energy increased economic productivity.

Africa has the opportunity to pursue a low-carbon intensive development pathway

Increasing Clean Power and its trade in East Africa

The East African region has large renewable energy potential, especially for hydro, wind, and geothermal electricity, yet its potential remains unexploited due to a lack of transmission infrastructure and investment. East Africa is marked by high system losses due to overloaded transmission lines, and suppressed demand due to inaccessibility to and high tariffs of electricity. Despite the large excess of production over consumption in East Africa, apart from Burundi, Rwanda, and Uganda, trading of electricity among countries remain minimal, largely due to lack of interconnection of grids. For instance, currently less than 10 per cent of hydroelectricity potential in Ethiopia, Sudan, and Uganda has been exploited. The Bank's activity in the East Africa region focuses on expanding East Africa's clean power capacity generation. For instance, the Bank's Bujagali hydroelectric power project in Uganda includes a 250-MW run-of-the-river power plant and the construction of around 100 km-long transmission lines, upgrades to an existing line, a switchyard at the project site, a new substation to the north of Kampala, and an improvement to the existing substation southwest of Kampala. The total project cost is estimated at about US$ 735.5 million. The project is expected to be commissioned in 2011. The Bujagali project does not regulate the outflows from Lake Victoria, making it all the more feasible as it will not impinge on the current lake levels. The power generation project will benefit both existing and new electricity consumers, who will receive sufficient, least-cost and reliable power supply. Private industry will benefit from more cost-effective electricity supply and reduced load shedding. Fewer blackouts and brownouts will reduce the need for expensive and air-polluting back-up generators. The government will be able to direct fiscal revenues generated as a result of the proposed project to meet poverty alleviation and other social needs. As connectivity is a main precondition for trading clean energy, the Bank has an interest in helping countries in the region install substations and grid lines on both a national and a regional level. Bank-financed projects are intended to increase the capacity and maintain the reliability of the power transmission system to allow the efficient evacuation of power from new and cheaper generation plants. For instance, in Tanzania the Bank supports the Iringa-Shinyanga Backbone Transmission Line Project, which will interconnect four substations at the Iringa, Dodoma, Singida and Shinyanga towns with a 670 km line of 400 kV, a project expected to be completed by the end of 2013 and at an estimated cost of US$476.82 million.

As pooling energy resources through regional power trade promises to reduce power costs, the Bank also supports multinational interconnectivity projects. The East African Power Pool, created mainly to support power trade efforts, includes the Interconnection of the electric grids of 5 Nile Equatorial Lakes countries – Kenya, Uganda, Rwanda, Burundi, and the Democratic Republic of Congo (DRC). The Bank provides US$151.5 million to finance these projects. The benefits of interconnection projects include fuel cost savings; both associated with the replacement of expensive supply sources as well as related loss reduction in generation and transmission as a result of the interconnection. In addition, there are environmental benefits associated with the replacing of thermal energy with hydro energy.

Yet, access to energy in Africa remains scarce. Recent studies estimate that 80 per cent of the world's 1.5 billion people without electricity live in mostly rural areas of Sub-Saharan Africa. Chronic power shortages plague 30 African countries. Only one in four Africans has access to electricity. The entire installed generation capacity of 48 Sub-Saharan African countries is 68 gigawatts, no more than Spain's. Outside of South Africa, power consumption is barely one per cent of the level in high-income countries.

As a result of low access to energy, Africa currently only contributes about 4 per cent of global greenhouse gases. However, if industrial and economic development continues along a 'business as usual' course, Africa's emissions can increase significantly; concrete actions are therefore needed now to chart a low-carbon development pathway. Africa has the opportunity to grow a low-carbon economy and avoid being locked into the high-carbon growth path experienced by developed nations.

As a consequence, the African Development Bank Group strives to be the lead financier for increasing access to energy for Africans, in ways that support low-carbon development on the continent. The Bank directly contributes

Inga - The Hope of Africa

The Inga hydropower site in the DRC alone accounts for the largest hydropower potential of the continent, nearly 45,000 MW. Inga currently has an installed capacity of 1,774 MW consisting of two power plants (Inga I and Inga II), the first having a capacity of 351 MW and the second with a capacity of 1,424 MW. Yet, these two installed plants represent only 4 per cent of the potential of this site. Two more phases are planned for the site: Inga III, with a capacity of 4,300 MW and Grand Inga with around 40,000 MW, or about double the installed capacity of what is today the largest hydroelectric facility in the world (the Three Gorges station in China).

Inga represents a unique potential for renewable energy which could be sufficient to meet the current demand for electricity of the entire continent. The major advantage of the site lies in the relatively low production cost of electricity (US$76.16/kW/year) which remains very competitive compared to other production alternatives, even when the costs of implementation of associated transport infrastructure are taken into account. Ultimately, the proposed development potential of Inga would also constitute an interconnected grid, and thus allow the development of an effective energy market across the continent.

Since 2008, the Bank has been collaborating with the government in making the hope of Africa a reality. The main objective of the ongoing operations of the ADB in the development of Inga are two-fold: refurbishment of the already existing plants as well as assisting the government to weigh the options at hand for further exploitation of the site. The Bank supports, jointly with other donors, the rehabilitation of the already existing power plant Inga I, that currently can only produce at 60 per cent of its capacity. The Bank has approved an operation on the rehabilitation and strengthening of the Inga hydroelectric power and distribution network in Kinshasa (EDI) to the tune of US$54.2 million.

The Bank is first financing a comprehensive feasibility study that takes into account all aspects of alternative ways of exploiting the site fully. The Bank has granted the government of the DRC, in April 2008, a grant of US$14.4 million to fund the feasibility study, a key element of decision support for selecting the solution to implement. In addition to assessing the technical, environmental and social, economic and financial options for developing the site, the study will establish a platform of analysis and recommendations of a strategic nature, as a basis for multiple decisions that will incorporate a large number of actors. These include governments, primarily the government of the DRC but also those of countries that are potential customers of energy producing countries, and those whose transport infrastructure electricity will pass through. The National Energy Society of the DRC would be the linchpin for the implementation of the project, together with private investors, donors and potential customers.

The Bank's involvement comes at a crucial time, marked by the return of peace in the country and in the Great Lakes region in general, as well as the favourable evolution of the controversy concerning the construction of dams, the creation of power pools in Africa and soaring oil prices.

to the expansion of access to energy in Africa, particularly for the poor. Bank Group projects identified as increasing energy efficiency include grid interconnections, notably in East and Southern Africa. Grid interconnections ensure that electricity reaches users. Also, in ensuring access to energy for all Africans, AfDB's operations show significant results. For instance, the Rural Electrification Project for Ethiopia helped increase Ethiopia's rate of access to electricity from 13 per cent in 2001 to 22 per cent in 2009. In low-income countries alone, AfDB-financed projects completed between 2006 and 2009 installed or rehabilitated 5,811 km of transmission lines, constructed or rehabilitated 658 distribution substations and transformers, installed 42,500 service lines and energy meters and provided energy to almost 17 million Africans.

Working through its public and private sector departments, the Bank Group has substantially increased its investments in renewable energy in Africa. The Bank's private sector operations in the energy sector started in 1998, resulting in ten recently approved projects amounting to approximately US$1 billion to finance energy in various forms and countries. For 2011 to 2012, the pipeline (public and private) for renewable energy has increased even further and amounts to US$1.4 billion. A key role for the Bank is to leverage financing from other sources, providing comfort to investors on the financial viability of

The Lake Turkana Wind Power Project in Kenya

Kenya's electricity sector services only an estimated 14 per cent of the population. The generation of more electricity is necessary for energy to reach more people and support economic growth. The situation is aggravated by Kenya's over-reliance on hydropower (hydropower supplies approximately 50 per cent of the country's energy), which is often unreliable, especially in the dry seasons.

To meet its energy needs, the country will have to import nearly half of its energy by 2020. The Government of Kenya is seeking to reduce its reliance on imported energy and fossil fuels while ensuring a reliable supply of electricity, particularly clean, low-cost energy. The Lake Turkana Wind Power Project will build 365 wind turbines, reinforce 200 km of roads and bridges to transport the turbines from the port of Mombasa to northeastern Kenya, and add an estimated 426 km of transmission lines to supply power to the national electric grid.

The reliable, continuous, clean power thus produced will provide the country with 300 MW of relatively cheap energy and increase Kenya's power by 30 percent. The project is forecast to reduce carbon emissions by 16 million tonnes during its 20-year lifespan. Costs are projected at approximately €459 million. The African Development Bank, which is the lead broker, will facilitate the entire debt tranche through the African Financing Partnership. The AfDB has also committed to a loan of up to €100 million.

projects. The perceived risks in these projects are high, due to the relative long-term maturity of such investments and the sometimes new or expensive technology. Also important is targeted support for improvements in policies and regulations. These improvements are necessary to drive energy efficiency actions and increase the uptake of renewable energy in Africa.

However, expanding access to clean energy requires significant resources. Bridging Africa's gap in energy infrastructure requires more than doubling current investment efforts for the next 20 years. The cost of putting Africa on a low-carbon growth path have been estimated at US$22 to US$31 billion per year between 2010 and 2015

RIsing power: Africa has only begun to realise its energy potential

and between US$52 and US$68 billion per year by 2030. Funding will be a deciding factor in our path to reach the clean energy goals.

Climate finance thus needs to be an imperative for all stakeholders, ensuring access to funding climate-relevant energy projects in Africa. To construct a robust, low-carbon growth pathway for Africa, the continent will need significant additional external financing. The AfDB stands ready to explore several potential funding sources, including the additional resources pledged under the Copenhagen Green Climate Fund. All will be explored to implement actions complementing those for which the Bank is already the preferred partner of choice in Africa, such as the Climate Investment Fund and Global Environment Facility.

Cooperation by the countries, regional communities, and donors at regional level will help make the development of electricity and national economies sustainable all together. Given its enormous endowment of renewable resources, there are significant energy-related business opportunities for Africa, leading to economic and social growth. As an example, Africa has one of the world's highest potentials for solar. Costs of CSP power generation is three times less in North Africa than in Germany. More efforts are needed to fully utilise the Continent's potential for clean power. ❑