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ACTING AGAINST ENERGY POVERTY IN AFRICA

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BANQUE AFRICAINE DE DEVELOPPEMENT
AFRICAN DEVELOPMENT BANK
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Abbreviations:

AfDB	:	African Development Bank
CDM	:	Clean Development Mechanism
CEIF	:	Clean Energy Investment Framework
CRMA	:	Climate Risk Mitigation and Adaptation
CSP	:	Concentrating Solar Power
ECOWAS	:	Economic Community of West African States
EAC	:	East Africa Community
GWH	:	Giga Watt Hour
GDP	:	Gross Domestic Product
IPPF	:	Infrastructure Project Preparation Facility
IPP	:	Independent Power Producers
NBI	:	Nile Basin Initiative
NEPAD	:	New Partnership for Africa's Development
PPP	:	Public-Private Partnership
SSA	:	Sub-Saharan Africa

1. INTRODUCTION

1.1 The installed power generation capacity in SSA is 66 GW which, excluding South Africa reduces to 28GW in total for over 45 countries, and is less than the installed capacity of Poland alone. A significant proportion of this capacity is not in usable condition. Given economic growth rates of close to 5% per year, just to sustain this growth level would require annual expansion in generation capacity of 4GW, whereas at present barely 1GW is being added. Furthermore, hydrology stress in recent years and high costs of fuel have further reduced energy output from existing, usable capacity.

1.2 Approximately 24% of the population of SSA (500 million) had access to electricity in 2005 compared to close to 54% in South Asia and close to 90% in East Asia, the Middle East and Latin America. At current rates of electrification and given the rate of population growth, household access to electricity is not increasing appreciably unless the investment is scaled up towards creating additional capacities to generate, transmit and distribute electricity in SSA.

1.3 Traditional, centralized energy supply, such as grid electricity, only reaches a small fragment of the African population, and will not do much better in many years to come. The technologies for decentralized renewable energy production are well developed and are becoming more reliable and profitable with fluctuating fossil fuel prices. Given the significant renewable energy potential in the region, there exist opportunities for exploiting renewable energy technologies such as hydropower, wind energy, solar thermal power, bagasse-based cogeneration, solar water heaters, and geothermal combined heat/power plants. Most small businesses and communities in rural Africa are willing to pay for energy services if these are available at affordable prices and closer to international standards. In the face of low power generation capacity, low access rates, poor system reliability and high electricity prices for much of the African continent, the need for increasing investments, institutional efficiency and innovation is underscored. To gauge the depth of the problem, the base line energy situation is described below.

2. BASE LINE ENERGY SITUATION

2.1 Continental Overview. Africa's energy production is about 9.5% of the world's total output, including 12.1% of the world's crude oil production; 6.6% of natural gas output; 4.7% of the world's hard coal; and 3.1% of hydro-electric power. The continent holds 9.7% of the world's proven oil reserves, including a large portion of new discoveries. Africa is a significant net exporter of energy resources (475 million tones of oil equivalent per year) equivalent to 40-45% of the continent's production. Yet the continent's 930 million inhabitants consume the least amount of energy per capita. Africa hosts just 3.6% of global refining capacity; generates only 3.1% of the world's electricity; and consumes only 9% of its total oil production, exporting the rest. Its share of world energy consumption is only 3% compared to its 14-percent share of the world's population.

Endemic low per-capita consumption of energy is both a cause and consequence of Africa's prolonged poor socio-economic performance since the first oil shock in the early 1970s, particularly in oil-importing Sub-Sahara African countries.

2.2 Northern Africa: This sub-region of 5 middle-income countries (Algeria, Egypt, Libya, Tunisia, and Morocco) has a combined population of 158 million, projected to grow at an average rate of 1.4% per annum over the next 25 years to reach 220 million in 2030. The energy mix of the five countries is dominated by oil and gas. This sub-region is one of the world's net energy exporters.

2.3 Universal access to electricity (generated mostly by oil or gas thermal plants) is close to being attained. Electricity contributes just over 15% of total final energy consumption. Currently, there is adequate installed generating capacity. The five countries are directing their efforts towards two main objectives: (i). improving rural access to modern energy services; and (ii) strengthening interconnection of the five countries' power grids and building capability for efficient power trading.

2.4. South Africa: This country of almost 47 million, projected to grow at an average rate of 1.2% per annum over the next 25 years to reach 58 million in 2030, is also a substantial net exporter of energy resources. Hard coal is the dominant energy resource, contributing slightly more than one-half of total domestic primary energy supply, including 90-95% of electricity that represents 26% of total final energy consumption. Recently, South Africa's power sector has been experiencing an unprecedented crisis. A spate of electricity blackouts in January 2008 halted mining production for five days running. The government declared a national emergency and announced steps to deal with the energy crisis, including a 10% mandatory cut in electricity consumption by households, companies and industries until 2010; and a doubling of electricity tariffs over the next five years to help finance ESKOM's expansion plans. The country, however, has sufficient petroleum refinery capacity to cover domestic demand and the needs of countries in its sub-region. Its power transmission and local distribution infrastructure is extensive, serving all major urban centers, and is well integrated with the power supply grids of the member countries of the Southern African Power Pool (SAPP).

2.5 But, at the level of access, South Africa's energy sector faces three major challenges: to raise access to electricity from about 70% today to 100%, by bringing power to homesteads in rural areas; to reduce energy intensity and raise demand-side energy efficiency especially in the industrial and commercial sectors; and to reduce GHG emissions. The Government of South Africa in 2003 decided to mainstream renewable energies into the country's energy economy, with a target of contributing 10,000 GWH by 2013. To promote investment in renewable energy development, the government has announced the Renewable Energy Feed-in Tariffs for land fill gas, small hydropower, wind power and concentrating solar power. The government has also established an appropriate regulatory framework for implementing Feed-in-Tariff mechanism for achieving the government's 10,000 GWH target by 2013 and sustaining growth beyond target date.

2.6 Sub-Sahara Africa: The vast sub-region covering 41 countries, excluding South Africa and the island states, has a combined population of about 710 million projected to grow at an average rate of just under 2% per annum over the next 25 years, reaching 1.1 billion people in 2030. The sub-region as a whole is one of the world's major net exporters of energy resources; but, this masks the fact that only 7 countries are net energy exporters. Biomass provides over 80% of total domestic primary energy supply across the sub-region – even in major petroleum exporting countries. Electricity contributes less than 3% of total final energy consumption. Some 45-50% of the electricity is generated from hydro-power, with an equal amount from oil- and gas-fired thermal power plants. The continuing dominance of biomass – wood fuel, dry shrubs, agricultural residues, and sun-dried animal dung – is due to the limited access to electric power supply. Other fuels – refined petroleum fuels, gas, charcoal, and alkaline batteries – are much more accessible in urban areas than in rural areas.

2.7 Less than 10% of the SSA rural population has access to modern energy services. Just over 20% of the population overall is connected to electric power supply. The situation varies among countries. In 21 countries, less than 10% of the population has electricity at home. Barely 1% of the rural population has access to electric power supplies in most of the countries. The situation is much better in urban areas, where roughly 50% of the population has access to electric power. In a majority of countries, however, clients are subjected to damaging voltage fluctuations and frequent scheduled and impromptu power outages. This is due to many years of under-investment in capacity expansion in many countries, and poor operations and maintenance (O&M) practices. Supplies of petrol, diesel, kerosene and gas also are unpredictable, particularly during periods of price volatility and in remote rural areas.

2.8 Thus, a large segment of the continent's population, especially in SSA lives in conditions of acute 'energy poverty'. As forests are being cleared for agriculture and other purposes, women and children are walking longer distances to collect biomass. Indoor air pollution is responsible for lung diseases and killing more people than Malaria. Moreover, as regards the future of access to energy and electricity, the International Energy Agency predicts that the number of biomass using people will rise from 600 million (2004) to over 700 million in 2030 in Sub-Saharan Africa. The number of people without access to electricity is also going to increase from about 400 Million to 600 million by 2030. This trend will be damaging the environment and forests of the continent.

2.9 Assuring a sustainable and affordable supply of electricity and clean energy is one of the best ways to reduce poverty, inequality and environmental degradation on the continent. Given the current situation and future trends, expanding energy access is a priority for achieving the sustainable development in Africa. However, at current rates of electrification and given the rate of population growth, household access to electricity will not increase remarkably unless the electricity access programs are scaled up and investment in the sector is ramped up.

2.10 Island States: Africa's island states – Cape Verde, Comoros, Equatorial Guinea, Madagascar, Mauritius, São Tomé e Principe, and Seychelles – face unique problems

imposed on them by insularity and isolation. Except for Madagascar, the island states are characteristically minuscule in terms of size of territory, population, and economic output. The island states have a combined population of 22 million, projected to grow at an average rate of about 2% per annum to reach almost 36 million in 2030. Imported oil products contribute over 80% in the island states' energy mix. Electricity is generated predominantly by oil-fired thermal power stations. With regard to access to electric power, the situation varies among the island states. Mauritius and Seychelles have attained universal access. The rest, particularly Madagascar, have rural and urban electrification rates comparable to those in SSA countries and face the same challenges. They have one additional handicap: their geographical isolation rules out regional integration approaches to building electric power supply, leaving them only the option of mini power grids and micro to small-scale generating plants. Similarly, *landlocked countries* and *fragile states* face special challenges.

3. ENERGY SUPPLY IN AFRICA AND KEY DEVELOPMENT CHALLENGES AND OPPORTUNITIES

3.1 Energy Access and Clean Energy Development

3.1.1 Increased energy access is a priority for Africa. A large segment of the continent's population, especially in SSA and in the rural areas of the continent, lives in conditions of acute 'energy poverty'. Foraging for fuel for domestic uses takes up a disproportionate share of productive and leisure time mostly of women and children. And, it is a back-breaking activity. Health impairment and an unacceptable high rate of mortality in the order of 400,000 deaths from respiratory diseases per year are linked to exposure to indoor pollution from 'dirty fuels' in poorly ventilated dwellings. Energy poverty is also associated with deprivation of adequate light to facilitate evening and night-time chores and leisure activities. Thus, for example, children have less time to study at home in the evenings.

3.1.2. Beyond domestic energy supplies, the high cost of transportation services due to scarcity of refined liquid fuels, and 'information poverty' linked to incapacity to communicate with the wider world due to lack of electric power and the high cost of alkaline batteries all limit people's participation in national, regional and global activities, including trade. At the level of production, energy scarcity and insecurity reduces producers' range of possibilities and undermines their competitiveness in national, regional and international trade systems. In short, lack of energy security perpetuates poverty.

3.1.3 The AfDB estimates (*Table 1*- in *Annex2*) that, even with access to electricity provided to more than 90% of rural populations, by 2030, rural demand for electricity will represent only about 10% of total power generation. The rest of total demand will come from urban areas where the energy-intensive industry and service sectors are predominantly located. Taking into account a wider range of energy sources, including biomass, rural populations are expected to exert about 20-25% of total final energy consumption demand by 2030. Thus, rural energy demand is not overwhelming. Nevertheless, AfDB's experience is that conventional approaches to rural electrification

are not the most cost-effective means to attaining the goal of access-for-all to electricity in rural areas. Geographical realities suggest that decentralized, autonomous energy infrastructure development harnessing local resources – most often, renewable – is a more cost-effective approach to increasing rural energy access. On the other hand, integrated national power grids and fuel bulk supply systems interconnected at the regional or multi-country level are the most cost-effective and reliable means to meeting the energy needs of urban populations and economic sectors.

3.1.4. Thus, Africa's policymakers face the challenge of simultaneously having to meet the two types of growing energy demand under a scenario of robust economic growth, transformation, and poverty reduction. One dimension of the challenge is mastering cost-effective technologies for sustainable exploitation of energy resources which include hydropower, wind energy, geothermal, solar energy, etc.

Hydropower

3.1.5 Hydropower is the least cost option for meeting demand, as shown by several hydropower power projects in Ethiopia, Tanzania, DRC and Cameroon. The Congo River in DRC is the most significant renewable energy resource of Africa with potential to contribute to economic renaissance of the continent (Figure 1). It is well recognized that the development of hydropower is very critical to improving access to electricity in Africa, improving the security and reliability of energy supplies, and reduction of environment damages from the use of traditional fuels that has such far-reaching effects on poor people's health and livelihoods. To develop their hydropower potential the countries and the Regional Economic Communities (REC), have prepared power master plans. The regional power master plans are significant from the angle of optimally utilizing the energy resources. Furthermore, since the Water resources and the River Basins of the continent are shared by several countries, the African Development Bank in partnership with the World Bank is assisting the countries to forge co-operation among the riparian countries to develop large hydropower projects on regional basis to export power to those need most (NBI-Eastern Nile Power Trade Program Study).

3.1.6 In this context, the conference of the African Energy and Water Ministers (2006) made the recommendations that instead of single purpose (e.g. hydropower only), multipurpose water resource development should be pursued. Given massive investment needed, joint multi-country ownership should be pursued for water resource development, and regional integration should pursued along side the hydropower development and the costs of mitigating the adverse environmental and social impacts of the hydropower development should be fully internalized.

3.1.7 It seems that the hydropower potential of Africa cannot be developed unless new financial models are explored. The public-private partnership (PPP) is one of them. The private sector is not very much interested in developing hydropower projects as it is in thermal projects. There are several specific issues to be addressed in hydropower development: (i) the projects are very site specific and there is no possibility of standardization (ii) there are high construction risks and the construction period is relatively long (iii) the projects are exposed to hydrological variations and (iv) the

projects are sensitive to environmental and resettlement issues. Moreover, a long-term off-take agreement is required between the developer and the host government which is to underwrite the foreign exchange risk if there is no competitive market in place. Just before the onset of the financial crises, the good news is that the Development Partners have been able to forge a PPP for Bujagali hydropower project (250 MW) which is under implementation in Uganda, which is described below:

Box 3.1 : Uganda Bujagali hydropower project

The project Objective: Improve the quality and reliability of power supply. Increase power generation and facilitate power supply exports to neighboring countries, thereby boosting the country's socioeconomic development.

Expected Outcomes: Increased reliability, continuity of power supply, and increased power supply exports to neighboring countries.

Financiers: EIB (US$ 140.00 million/UA 91.85 million), IFC (US$ 130.0 million/UA 85.29 million), DEG 45.0 million/UA 29.52 million, Proparco/AFD (US$ 75.0 million/49.21 million), FMO (US$ 40.00 million/UA 26.24 million), Commercial Bank/PRG (US$ 48.4 million/31.75 million), and ADB (UA 72.17 million), Total Equity sponsors and government (US$ 147.1/UA 96.51 million).

AfDB and JBIC are co-financing the Bujagali power transmission project.

3.1.8 Furthermore, the African Development Bank has financially supported the development of 9 MW Buseruka mini- hydro in Uganda. Moreover, the Bank is supporting a number of studies to prepare hydropower projects, namely Inga hydropower sites, Mandala and Border Dams, Souapiti, Fomi, etc. The Infrastructure Project Preparation Facility (IPPF) managed by the AfDB is assisting the countries in packaging projects so that they are able to attract the private sector investments.

3.1.9 However, due to the global financial crises the availability of credit is limited for sponsors to invest in infrastructure projects, and therefore it is required to put back on agenda the public sector financing of hydropower projects. Consequently, the lending pipeline of the African Development Bank includes the co-financing of Gibe III (1800 MW), OMVG energy program (250 MW), etc. To effectively exploit the hydropower potential of African countries, the Regional Economic Communities, Multilateral Development Banks and the Infrastructure Consortium for Africa have to play a pivotal role in complementing the efforts of national governments in meeting the challenges of resource mobilization for investment and fostering the emergence of integrated energy markets.

Geothermal Energy

3.1.10 The potential of geothermal energy is stated to be 14,000 MW in East Africa Rift Valley. The geothermal potential for selected African countries is as follow: Kenya 3GW, Ethiopia more than 1GW, Djibouti approximates 850 MW, Uganda 450MW and Tanzania 150MW. To date, only 127 MW has been exploited in Kenya and less than 2 MW in Ethiopia. There are different types of constraints to geothermal development: some of them are generic, while others are specific to individual countries. The generic constraints cover the exploratory risks related to drilling and field development, while the specific constraints are related to financial risks, and country related commercial and

institutional risks. Removal of these risks together with the reduction of implementation costs would promote the adoption of geothermal energy in the region. There is need to develop a regional program to facilitate the exploitation of the geothermal energy in the Rift Valley.

Solar Energy

3.1.11 The solar photovoltaic has been particularly popular in Ghana, Kenya, Namibia, South Africa, Morocco, Tunisia and Senegal but with high income households. The use of solar water heaters in households and institutions is still limited. However, the solar water heaters provide clear opportunities for utilities to reduce system peak demand in most of the countries. Therefore, a utility sponsored and the government supported program to install solar water heaters can make a difference.

3.1.12 Africa's solar energy potential is huge (Figure 2) and equivalent to 100 million tons of oil per annum, according to David Wheeler, Senior Fellow, Center for Global Development. With adequate investment in the Concentrated Solar Power (CSP) technology, the continent can produce enough electricity to meet its own needs and export surplus electricity to Europe. Efforts are being made to exploit solar energy. In Southern Africa, Botswana has prepared a pre-feasibility study of solar power plant and is going to prepare a feasibility of CSP to be developed in 50 MW modules. ESKOM has also prepared a feasibility of a CSP of 100 MW, allowing for 16 hours of energy storage, load factor of 68 - 80%.

3.1.13 Morocco is implementing a CSP project with funding provided by the World Bank, GEF and the African Development Bank. The Union for Mediterranean Countries, will prepare a Mediterranean Solar Plan, envisaging the construction and production of 20 GW of CSP by 2020, with electricity exports to Europe.

Wind Energy

3.1.14 The wind energy potential is greatly located in the coastal areas. Tentatively, it is planned to add about 8500 MW by 2020 (Figure 3). About 150 MW of wind power has been installed in Africa (Egypt, Morocco, Tunisia, South Africa, and Cape Verde). This is a very low penetration rate compared to other markets. The low capacity of installed wind generation is not because the resource does not exist, but for other reasons including a number of countries do not have the appropriate regulatory framework in place to encourage the private investment in the development of wind energy. This constitutes an important barrier impeding the development of wind energy in Africa. The African Development Bank, supported by the Canadian International Development Agency (CIDA), has prepared a Strategic Study of Wind Energy Development in Africa. The Bank has prepared a pipeline of wind energy projects corresponding to about 900 MW. The Bank is also promoting private investment in the wind energy projects.

4. STRATEIGIC APPROACH TO INCREASING ENERGY ACCESS AND INTEGRATING CLIMATE CHANGES

4.1 Energy development can only be addressed rationally and systematically in comprehensive, long-term national development and poverty reduction perspectives. Countries in recent years have scrambled to plug electric power supply gaps by stepping up investment in oil-fired thermal generating plants. This is not the most economical solution in the long term.

4.2 Few African countries have paid attention to devising and implementing pragmatic and sustainable long-term strategies for attaining access-for-all to reliable energy supplies. Power transmission and distribution grids cover only a tiny part of national territory and reach only a small fraction of the population. The supply and distribution of refined petroleum fuels is relatively better, but local markets are volatile and prone to manipulation by hoarders and cross-border smugglers. Governments still control or influence energy prices, in the interests of minimizing social discontent.

4.3 Countries have discovered and realised the importance of access to energy as a factor in sustained socio-economic development and poverty reduction. They have set for themselves the goal of universal access to safe and reliable energy and power supplies for the entire population as soon as it is possible. To cite just two examples, the Economic Community of West African States (ECOWAS) has prepared a White Paper and the East African Community (EAC) has prepared a Strategy on increasing energy access.

4.4 In view of the increasingly tight global energy market situation in recent years, African countries should promote broad-based energy development aimed at **four main objectives**:

- Accelerating the reduction of energy poverty and vulnerability, by increasing access of households and small economic operators to reliable and affordable energy supplies;
- Facilitating sustained high rates of economic growth, by providing operators in the productive sectors with realistically priced electric power and energy supplies;
- Contributing to world-wide energy security, by sustaining significant exports of energy resources to the rest of the world, while increasing African countries' collective self-sufficiency and strengthening regional inter-dependence in energy services and products; and
- Promoting clean development and contributing to global emissions reduction efforts, by steadily raising energy efficiency on the supply side and encouraging a culture of energy saving on the demand side, increasing the contribution of renewable energy sources, and paying close attention to environmental and social externalities of energy production.

4.5 Regional cooperation in energy development offers rich prospects, but must overcome challenges. Beyond the altruistic motive of sharing scarce resources, there are significant scale economies in energy production, as well as the guarantee of viability provided by selling energy services in extended markets, and the increased capacity to generate investment capital. Other benefits include multi-country cooperative procurement of bulk supplies of gas and crude oil, the maintenance of buffer stocks to

assure energy security and obviate price volatility, and petroleum refinery into a range of fuel products. However, such cooperation and economic integration is not easily realized. It requires the pooling of sovereignty, very competent regional institutions, and a high level of collective mutual trust.

4.6 Clean Energy Development: Point of Departure[1]

4.6.1 Energy conversion from hydrocarbon fossil fuels and biomass – whether in electric power plants, internal combustion engines of transport vehicles, industrial processes, or domestic cooking stoves – is responsible for roughly two-thirds of global greenhouse gas emissions. Other sources (agriculture, land-use changes including non-energy forest logging, and waste disposal) account for the remaining one-third.

4.6.2 At the worldwide level, therefore, the challenge is how to increase energy access while significantly reducing total emission of GHGs. African countries, however, contribute just over 4.9% of GHG emissions of all signatory countries of the United Nations Framework Convention on Climate Change (UNFCCC). As developing countries that have not contributed much to the build-up of GHGs, African countries are exempted from binding commitments to CO_2 emissions reductions under the Kyoto Protocol. Africa, however, especially Sub-Sahara Africa is adequately endowed with renewable energy potential that could be harnessed to meet a substantial share of the continent's energy needs. This is especially pertinent in remote rural areas where populations endure increasing energy poverty.

4.6.3 Deforestation for purposes of agriculture and fuel wood harvesting is an important and growing source of emissions. And, five SSA countries – Sudan, Zambia, Nigeria, Tanzania, and Democratic Republic of Congo – are among the ten with the largest rates of forest loss in the world. The flaring of gas during crude oil production is another source of GHG emissions.

4.6.4 In many African countries, chronic under-investment by energy and power utility corporations in upgrading technologies and strengthening operations and maintenance (O&M) of their energy production plant and their transportation and distribution infrastructure has resulted in a low level of technical efficiency. At the production level, outdated less efficient technologies mean less energy output per unit of fuel inputs and more GHG emission per unit energy output. In the transportation and distribution stages, there is a high rate of unaccounted for losses. And, consumers use appliances less efficient than in other regions of the world where performance standards are more effectively enforced. Aggregate supply-side and demand-side energy losses due to lack of efficiency (relative to the world's most efficient economies) are in the range of 25-30% of energy supply reaching consumers.

4.6.5 While they are among the least producers of CO_2 emissions per capita, African countries are likely to be among the most hit by greenhouse gas-induced climate change

[1] Source: The Stern Review; October 2006.

in coming decades. Their low level of economic and institutional development leaves them more vulnerable to climatic variability, extreme weather events, and long-term changes such as floods, droughts, falling precipitation or rising sea level. Thus, even though African countries are not obliged to reduce emissions under the UNFCCC, they should champion a significant reduction in global emissions in order to limit climate change. Their stand will carry added moral weight if the African countries themselves are taking steps to restrain the growth rate of their own emissions, while sustaining economic growth, social transformation, and poverty reduction.

Development of a carbon credit market

4.6.6 Revenue from carbon credit trade through the CDM effectively reduces the cost per unit of energy output from eligible renewable sources, increasing their commercial viability. Increased access to the CDM and more effective marketing of emissions reduction opportunities on international carbon trade exchanges therefore should be the keystone of African countries' strategies for clean energy development.

Carbon economics: Increases in Project Rates of Return as a result of additional revenues from sales of Emissions Reductions ("Carbon") at $4/tCO2e.

Technology	**financial** Delta IRR
Hydro, Wind, Geothermal	0.5-2.5%
Crop/Forest Residues	3-7%
Municipal Solid Waste	5-15+%

In adapting to climate change, however, Africa could benefit from the introduction of cleaner technology, including sustainable energy, and propel the continent onto a low carbon development path. The Bank's has developed and approved the Clean Energy Investment framework and several options and mechanisms have been proposed and will be implemented at the continent level. A market for carbon credits is starting to develop in Sub-Saharan Africa, such as the experience gained from Private Sector transactions to Madagascar, Uganda and Kenya.

5. PROMOTING ENERGY INFRASTRUCTURE IN AFRICA

5.1 Investment Implications

5.1.1 Unlocking the continent's electricity generation potential alone, requires investments of up to 23.8 Billion US$/year (see Table.1 below] annually. Adding on power systems rehabilitation, operations and maintenance increases this figure to about $40 billion annually. It is estimated that demand for power in Africa will increase between 2007 and 2030, in response to sustained annual growth rates of 3-4%, increased population and higher rates of urbanization. To meet this demand increase, cumulative investments to the tune of USD 450 billion in power generation, transmission and distribution would be required.

Table1. Indicative Capital Investment requirements (in year-2005 fixed US$) to attain universal access to reliable electric power by 2030.

	Generating Capacity GW			Total Capital Investment Billion US Dollars (2005)				Indicative Average Investment: Billion $ p.a.
	Net	Replace.	Total	Generation*	Transmission †	Distribution †	Total	
Northern Africa: 5 MICs	60	22	82	82	29	62	173	7.5
South Africa	47	30	77	77	5	10	92	4.0
Sub-Sahara Africa: 41 Countries	82.5	19	102	102	54	119	275	12.0
Island States: 6 Countries	2.5	1.5	4	4	1	2	7	0.3
AFRICA	192	72	265	265	89	194	547	23.8

Notes: * Indicative estimate of the cost of generating capacity is US$ 1 billion per 1.00 GW (in 2005 constant dollars). This is roughly the same as the investment requirement estimate used in IEA: *World Energy Outlook 2006*.
† These estimates are the ones used in the IEA study (page 148).

5.1.2 The Table 1 above, provides an indicative summary of the investments required under a scenario to attain access by 2030 to reliable electric power for at least 90% of the SSA rural population, 100% of the SSA urban population, and 100% of both the rural and urban populations in the Northern African MICs, South Africa and the 6 island states. The first column of the Table presents the net increase in installed generating capacity, i.e., effective peak-load capacity plus stand-by capacity. The second column shows indicative estimates of capacity replacement over the period 2008-2030. The fourth column presents the capital investment requirements (in constant 2005 US dollars) to acquire new generating (net plus replacement) capacity. The nominal price of new generating capacity is set at roughly US$ 1 billion per GW. The next two columns, respectively, show estimates of capital requirements for transmission and distribution infrastructure, including off-grid stand-alone and mini-grid networks. The last two columns show, respectively, total capital investment requirements over the period and indicative annual averages.

5.2 Current responses

5.2.1 Against this backdrop, interventions in the sector have been dynamic. The landscape of financing for the power sector is evolving, from a dominance of state financing through government spending and/or borrowing, to increased private sector participation through public-private partnerships (PPPs) and the involvement of independent power producers (IPPs). The emergence of hybrid markets in which large state-owned utilities co-exist with independent power producers (IPPs) has improved with private sector participation in the power sector on the continent, without full liberalization of the markets.

5.2.2 The response in the area of reforms speaks for greater efficiency of energy institutions, and technological innovations for energy efficiency. Private sector investments have meant energy policy reforms, improved efficiency in governance and management of power utilities, and a move towards competitive pricing. These measures

are contributing to improvements in service delivery and cost recovery for utilities, important in ensuring maintenance and sustainability of capital investments.

5.2.3 Sub Saharan African countries, through their central governments and state-owned utilities, still contribute on average 2.7 percent of GDP to the power sector, equivalent to about US$ 55 billion in 2008. Of this amount, only about a fifth goes to new investments in the sector. Official development assistance has been highly volatile over the past decade, and on average, about 1 percent of countries' contribution.

5.3 Regional Integration and Power Trade

5.3.1 The second area of response is through increased focus on regional power trade. Regional integration is also gaining prominence in the discussions and strategies for greater connectivity in Africa. At a policy level, through the New Economic Partnership for Africa's Development (NEPAD), African states have outlined a strategy for expansion of electricity power systems. Additionally, several regional power pools including the South African Power Pool (SAPP), East African Power Pool (EAPP), West Africa Power Pool (WAPP), and the Central Africa Power Pool (CAPP), have been formed to foster systems harmonization and to promote multi-country investments.

5.3.2 Regional power trade particularly is appealing for two main reasons: (i) regional trade lowers the marginal cost of electricity therefore facilitates greater access rates, and (ii) it enables diversity of each country's power generation mix thus improves systems stability and reliability.

5.3.3 A few ***'success stories'*** exist, for example the long standing power trade arrangements between South Africa, producer of 70% of electricity in SSA, and several SADC countries. The state-owned South African Utility, Eskom, has historically contributed the energy needs for Botswana, and Lesotho. Power supplied by Eskom was both reliable and cheap. This has stabilized electricity prices at an average affordable tariff.

5.3.4 Despite this progress, performance of regional power trade initiatives has so far been lackluster, a result of the usual challenges associated with negotiating and implementing regional projects, for example asymmetry in geographic location of energy sources hence the associated burden of capital investments, and political risk. We know for example, that the southern African interconnected system has of late experienced shortages, a result of under-investment by Eskom and poor maintenance of existing infrastructure. This has led to a reduction in electricity exports from South Africa, and subsequent power shortages in the region.

5.3.5 The problem is the absence of infrastructure and institutions and harmonized policies which obstruct the integration of electricity supply systems. Creating regional electricity markets is a way to reduce risks and transaction costs and to lure investors to develop much needed electricity generation and transmission facilities for increasing electricity access in rural areas. The investment requirements for the Bank's regional operations are given below (see Table 2 below):

Table 2. AfDB - Indicative 2008-2010 Regional Operations

Approved and Pipeline - March 2009 (In Million UA)

Year	ADF Loan	ADF Grant	Required Co-financing	Required Capital investment	Status
2008	**25.00**	**75.00**	**0.00**	**100.00**	Approved
2009	**36.00**	**84.00**	**500.00**	**620.00**	**To be financed**
22010	**4150.00**	**0.00**	**0.00**	**4473.00**	**To be financed**
Grand Total	**4211.00**	**159.00**	**500.00**	**5193.00**	

For further project specification, see Annex.1

5.4.1 Clean energy options

5.4.1 Richness of renewable energy resources such as solar, wind energy and hydropower, is the great wealth of Africa. Within the last decades, solar and wind energy technology has matured mainly in the industrialized countries to provide competitive electricity cost prices compared to fossil fuel electricity generation at many sites. Adjusted to African specific needs this technology can be applied in many countries to cover local electricity demand resulting in job creation and increased standard of living. In developing countries, all renewable energy industry started up with small but reliable units increasing scale with time. To guarantee sustainable development the same process should be carried out in African continent as well. Therefore, well established European technology has to be adapted to regional requirements of African countries. Clearly, hydropower is the important renewable energy resource for Africa and the Bank is supporting the development of hydropower projects on the continent, some of which are listed below:

Table 3- Least cost hydropower projects

Country	Project	Capacity (MW)
Zambia	Itezhi-Tezhi	120
Zambia	Kafue Gorge Lower	600
Zambia	Kariba North Bank Ext.	350
Zimbabwe	Kariba South Bank Ext	300

DRC	Inga III	3500
DRC	Grand Inga	39000
Malawi	Kaphichira phase II	64
Mozambique	HCB North Bank	850
Ethiopia	Gibe III	1800
Multinational	OMVG Energy Program	250

6. THE GROWING OPPORTUNITIES FOR JOB CREATION AND POVERTY REDUCTION

6.1 Access to energy services is a key component of alleviating poverty and an "indispensable element of sustainable human development," according to the International Energy Agency (IEA). "Without access to modern, commercial energy, poor countries can be trapped in a vicious circle of poverty, social instability and underdevelopment.

6.2 Rather than treating the symptoms of poverty, as development assistance too often does, investing in a clean energy future for poor countries gets at the roots of the development challenge. Promotion of Investments in Clean energy solutions can develop long-term economic growth and a built-in capacity for self-reliance. The opportunities for Africa to emerge as a rising star in the growing renewable energy markets are enormous. As stated earlier, Africa has vast, latent potential for geothermal, hydro, wind and solar power generation.

6.3 The provision and access to productive energy in rural population is essential for developing industrialization in Africa. In recent years focus and priorities has been given to connection of rural areas using non productive electricity such as using DC-system that has limited application for industrial operation. Therefore, it has not created sufficient productive employment and decent work for Africa's rapidly growing population. This implication is also due to the high cost of electricity. In other regions, reductions in poverty often followed agricultural reforms, energy supply policy and increases in productivity and labor-intensive industrialization that created millions of jobs. This structural transformation has yet to take place in Africa.

7. THE ROLE OF THE AFRICAN DEVELOPMENT BANK

7.1 Between 1967 and 2008, about 11.40 % of Bank Group approvals amounting to UA 5 billion were allocated to the power sector. At the national level, support was provided to electrification programs in countries including Benin, Burkina, Cameroon, Ethiopia, Guinea, Mali, Mozambique, Senegal and Tunisia. Rural electrification has been the dominant objective under the AfDF window, followed by multi-national grid inter-

connections and renewable energy development. Furthermore, the Bank Group, in collaboration with the World Bank, also has supported energy sector reforms in a number of countries, including Senegal. Under the AfDB window, large-scale power generation projects have tended to dominate, followed by modern fuels (refined petroleum products and gas) and power transmission and distribution, in that order. For the Bank Group as a whole, the top four objectives were large-scale power generation, modern fuels, power transmission and distribution, multi-national grid interconnection, and rural electrification. In contrast, policy and institutional support represented just 5% of AfDF net approvals and slightly over 1% of total approvals.

7.2 Progressing Energy Access. At the regional level, the Bank Group generally has encouraged RMCs to share resource endowments, including natural gas and untapped hydropower potential by connecting national gas and power grids, and developing sub-regional power pools (e.g., SAPP and WAPP). Other examples of regional and multi-country operations include:

- The natural gas pipeline project sponsored by Sasol from Mozambique to South Africa;
- The Algeria-Morocco-Spain power interconnection;
- Studies under the Nile Basin Initiative, including the Rusumo Falls hydropower plant, the interconnection of energy networks of Rwanda, Burundi and Tanzania, and the interconnection of the electricity networks of the Nile Great Lakes countries;
- Studies on the Inga project in the Democratic Republic Congo (in the Bank's pipeline);
- Project preparation support (from the NEPAD-IPPF) for a number of multi-country energy projects – including the Kenya-Uganda oil pipeline, the Benin-Togo-Ghana interconnection project, and the Zambia-Tanzania-Kenya inter-connection;
- Financing for the Ethiopia- Djibouti interconnection project; and
- Interconnection studies in the ECCAS and OMVS sub-regions.
- Gibe III and Ethiopia-Kenya power interconnection project

7.3 In addition, the Bank's Private Sector Department, with support from the Danish Renewable Energy Technical Assistance, has compiled a project pipeline comprising small- to large-scale wind-power projects expected to generate a total of 921 MW of electricity; mini, small and large hydro-power projects to generate a total of 283 MW; cogeneration power projects to produce a total of 410 MW of electric power; geothermal power projects to generate 480 MW. In addition, the private Sector of the Bank is assessing the proposals for clean-energy focused funds.

7.4 Presented below is part of the Bank Group's pipeline of clean energy operations (Annex 4), some of which have been appraised / are expected to be appraised during the five-year period 2009-2012.

- A solar thermal power plant in Morocco;
- Hydro-power projects in Sierra Leone and Uganda;
- Micro-hydro and wind energy in Madagascar;
- Feasibility studies for mini and micro hydro-power plants in Gabon;

• Development of the cogeneration utilizing bagasse from sugar factories as a fuel;
• Development of small size hydro for tea factories;
• Rural electrification in Tanzania with solar and hydro components;
• Renewable energy project in Gambia;
• Community forestry management projects (in Benin, Burkina, Ghana);
- Gibe III (Ethiopia)
- Ithezi-Thezi (Zambia)

8. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

8.1 Energy development over the coming 20 years must provide Africa with the possibility and thus the foundation - the technological, skills and production base - for rapid deployment of the sustainable options. Even if the climate change impacts considered most probable by the vast majority of scientists, with their implications for national security, do not materialize, the pursuit of the Millennium Development Goals require a transformation of the energy sector.

8.2 A just transition to sustainable energy in Africa is a real possibility if it is initiated in the short term. Reduction of our dependence on conventional energy is inevitable over the long term, but will be at far greater cost and with little prospect of a just distribution of costs and benefits if Africa does not plan for it. The opportunities and resources are within our reach. Application of the 'polluter pays' principle and accountability of corporate and international financing institutions are necessary conditions. What is needed most is political commitment and make use of the Carbon that is bought by the “polluter pays”.

Recommendations

8.3 The Bank Group’s policy, namely the Clean Energy Investment Framework (CEIF) for Africa, sets a comprehensive agenda for dealing with the challenges of increasing energy access, while at the same time making maximum use of clean energy options in Africa. To finance the energy access and clean energy development operations, the Bank Group will draw on its own resources and partner with other institutions as well as with private sector. However, the financing needs for clean energy and energy access exceed substantially the available resources. To meet additional financing requirements of clean energy access and mitigation, CEIF (Clean Energy Investment Framework for Africa) proposed creation of Clean Energy Access and Climate Adaptation fund for Africa (CECAFA) to (a) promote energy access by mainstreaming clean energy options and promoting energy efficiency; (b) enable RMCs to utilize carbon credit markets to finance clean energy projects; and (c) assist RMCs in responding to the risks and threats posed by climate change by mainstreaming climate risk management and adaptation into development planning and investment decisions.

8.4 The Bank's Climate Risk Management and Adaptation (CRMA) Strategy would require the Bank to serve two distinct goals: (i) to assist African countries to strengthen their capacities to respond effectively to the risks, threats and opportunities (if any) posed by climate change; and (ii) to ensure that Bank Group operational investments in RMCs attain their intended development results and yield benefits over their normal economic lifespan, in the face of the destructive impacts of climate change. CRMA strategy explains the need for additional resources required for capacity building and financing of adaptation activities, and proposes to use CECAFA as an important instrument to fund some of the immediate technical assistance and investment requirements of climate risk management and adaptation, as well as knowledge sharing and capacity building within the Bank Group and RMCs.

8.5 The Bank Group's Clean Energy Investment Framework (CEIF) for Africa proposes Bank support in four priority areas: (i) developing hydropower resources, power interconnections and regional power pools;(ii)promoting investment in energy access and cleaner energies including mini to small hydro, solar and wind power, tapping biogas and landfill gas, sustainable forestry management, strengthening energy efficiency in homes and enterprises, etc; (iii) improving energy efficiency of the transport sector by rationalizing urban and national spatial planning and development, optimizing transport planning, strengthening automobile regulation, etc; and (iv) playing a catalytic role in resource mobilization for Africa's clean energy development and increased access especially for the poor. To address these priority areas, CEIF proposes a number of activities that could be implemented in different countries, including:

i. Rural Electrification (off-grid as well as grid-connected). Bank's experience indicates that conventional approaches to rural electrification are not always the most cost-effective ways of providing access to electricity in rural areas. Geographical realities suggest that decentralized, autonomous energy infrastructure development harnessing local resources – often renewable – could be a more cost-effective approach to increasing rural energy access.

ii. Decentralized Energy Development. Communities need to be provided adequate assistance to develop local energy resources to meet their energy requirements. Possible solutions include: stand-alone power supplies and mini-grid distribution systems powered by mini and small scale hydro, geothermal, or wind power; community managed forests; community biogas generation and distribution etc.

iii. Reversing Deforestation. African countries should work towards arresting and reversing deforestation– by restoring equilibrium between the rate of forest harvesting for fuel and timber and the rate of forest regeneration. On the demand side, the growth rate of wood fuel should be restrained by substitution of higher calorific value fuels and by switching to more efficient stoves. On the supply side, forest regeneration should be restored by highly effective reforestation and afforestation practices of sustainable forest management.

iv. Developing Sustainable Bio-fuels. Development of biofuels should be taken in a calculated and cautious manner. Where appropriate legislative and sustainability

frameworks exist, RMCs should promote biofuels production – provided this does not adversely affect food security and the environment.

v. Switching to Renewable Energy and Low Carbon Sources of Energy. African countries should increase the contribution of hydro, geothermal, solar, and wind to total final energy consumption. Furthermore, communities could be encouraged to switch from high-carbon fuels (e.g., wood fuel or oil) to lower-carbon combustibles such as natural gas and biogas.

vi. Upgrading to Cleaner technologies. In the North African countries and South Africa, with limited hydro and geothermal endowments, the hope for increasing electricity generation while restraining GHG emissions is conditional on upgrading to progressively cleaner power-plant technologies as they become financially feasible.

vii. Improving Energy Efficiency. In all the 53 RMCs, there is considerable scope for increasing energy efficiency on the supply side and tightening energy consumption on the demand side without reducing economic output, lowering the standard of living, or diminishing the quantity or quality of social services rendered by departments of central government, local administrations and municipalities.

viii. Improving Efficiency of the Transport Sector. Motorized transportation accounts for a significant share of oil consumption, congestion, local pollution, and GHG emissions. Improving efficiency of the transport sector can bring multiple benefits in all African countries. RMCs need to institute a strategic perspective in planning the transport infrastructure, and an effective incentive system to encourage public transportation and other methods of improving efficiency.

Figure 1: The Congo River: A Renewable Energy Resource of Africa- with potential to Contributing to Continental Economic Renaissance.

Figure 2: Solar Energy Map of Africa

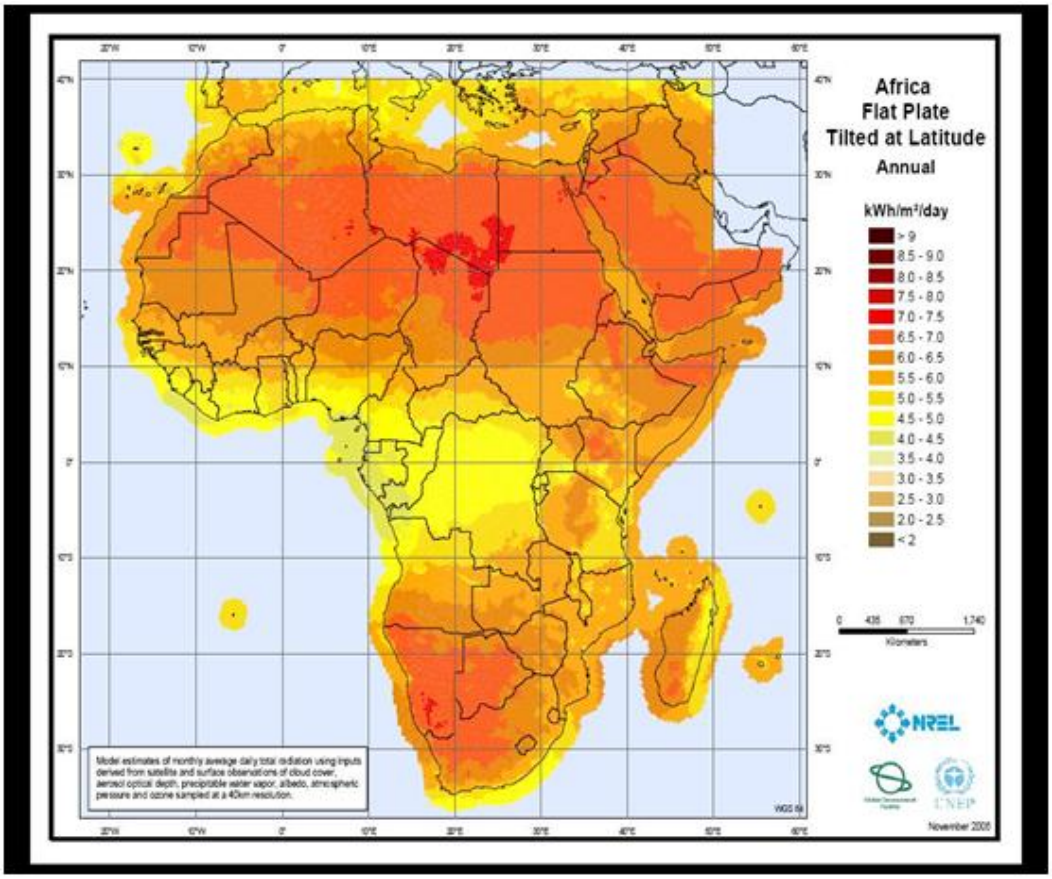
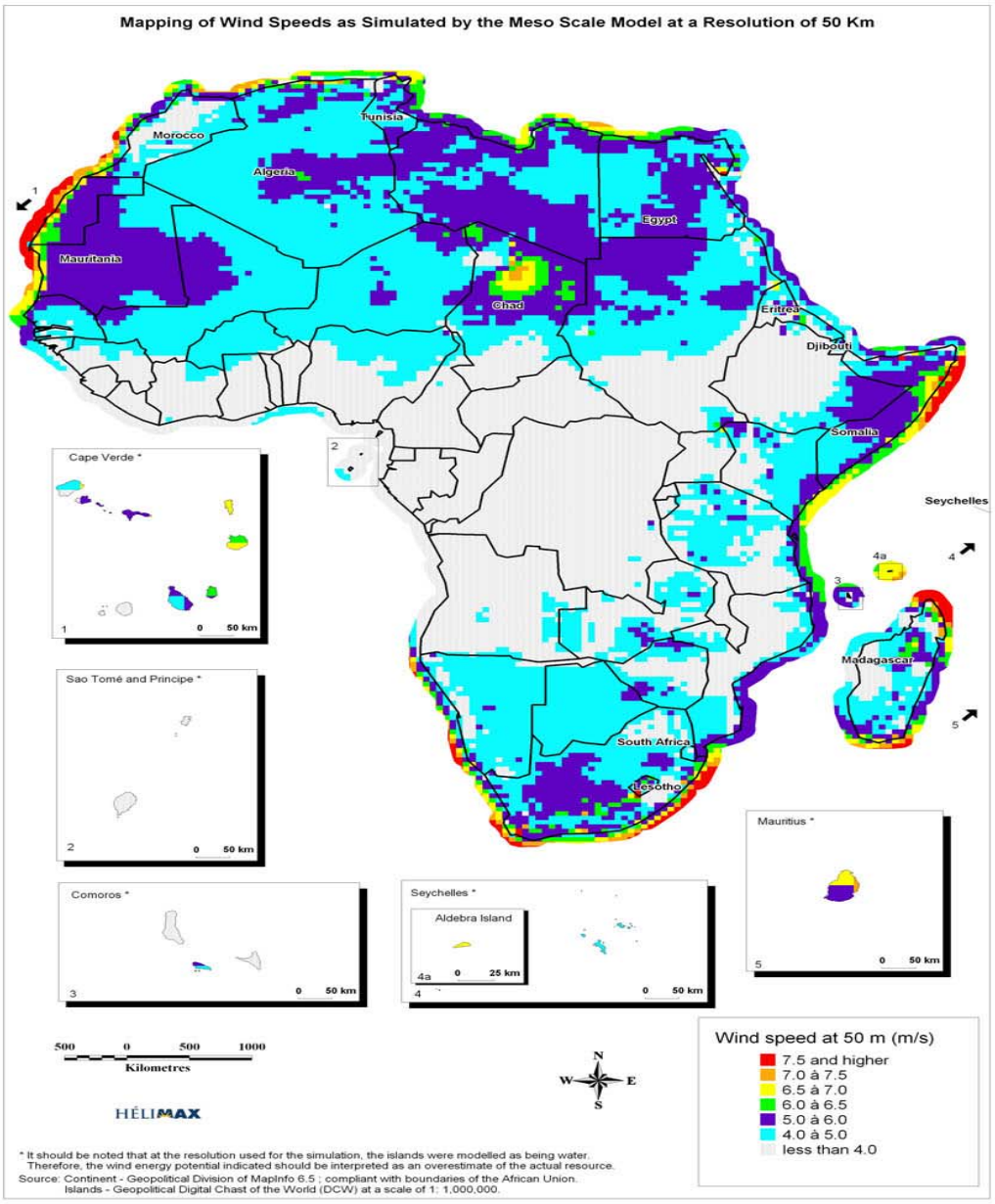


Figure 3-Wind Energy Map of Africa



Annex 1: AfDB Group Energy and Power net Approvals and Project Pipeline 2008 - 20010

Project status And *Indicative 2008-2010 Regional Operations* ***Approved and Pipeline - March 2009***									
STATUS	**Year**	**Project**	**ADF loan**	**ADF Grant**	**RPG cost share exempt**	**Co-financing**	**Total Cost of the Project**	**Participating countries and cost sharing (if not RPG)**	**Comment**
Approved	2008	NELSAP Interconnection Project (Interconnection Project – Grid Connection of Countries : BURUNDI, KENYA, OUGANDA, RD CONGO, RWANDA)	25.00	75.00			**100.00**	Burundi (2008: 5m UA); Rwanda (2008: 10.15m UA); Kenya (2008: 10m UA); DRC (2008: 4m UA); RO Pool (2008: 66.1 m UA)	Board presentation scheduled for 27 Nov 2008.
Subtotal 2008			**25.00**	**75.00**	**0.00**	**0.00**	**100.00**		
Pipeline	2009	Energy Project OMVG: Construction of the Hydropower plants of Sambangalou and Kaleta, Interconnection Line – Grid connection of OMVG Members countries	**36.00**	**84.00**	**-**	**500**	**620**	Senegal, Gambia, Guinea Bissau	Board presentation scheduled for18 March 2009.
Subtotal 2009			**36.00**	**84.00**	**0.00**	**500.00**	**620.00**		
Pipeline	2010	BOALI 3 power project and interconnection with DRC		23.00			**23.00**	CAR, DRC	Subject to agreement on cost sharing between participating countries. Préparation in 2009 . Not reviewed by OpsCom at concept or project appraisal stage

Pipeline	2010	Interconnection Ivory Coast-Liberia-Senegal-Guinea	300.00				**300.00**	Ivory Coast-Liberia-Senegal-Guinea	Study ongoing. Board presentation planned for 4th quarter 2010.
Pipeline	2010	Interconnection Ghana-Burkina-Mali	350.00				**350.00**	Ghana-Burkina-Mali	Study ongoing. Board presentation planned for 2nd quarter 2010.
Pipeline	2010	Interconnection Ethiopia - Kenya ***	1000.00	***			**1000.00**	Ethiopia - Kenya	Study ongoing. Board presentation planned for 2nd quarter 2010.
Pipeline	2010	Interconnection Zambia-Tanzania - Kenya ***	1000.00	***			**1000.00**	Zambia-Tanzania - Kenya	Study ongoing. Board presentation planned for 3rd quarter 2010.
Pipeline	2010	Interconnection of CEEAC Countries	300.00				**300.00**	CEEAC Countries	Study ongoing. Board presentation planned for 4th quarter 2010.
Pipeline	2010	Souapiti Hydropower Plant ***	1200.00	***			**1200.00**	Guinea - Liberria- Serra Leone	Study ongoing. Board presentation planned for 3rd quarter 2010.
Pipeline	2011	Interconnection Guinea -Mali	300.00				**300.00**	Guinea -Mali	Study ongoing. Board presentation planned for 2nd quarter 2011.
Subtotal 2010			**4150.00**	**0.00**	**0.00**	**0.00**	**4473.00**		
GRAND TOTAL			**4211.00**	**159.00**	**0.00**	**500.00**	**5193.00**		

Annex. 2:

Table.1: projected Electricity Consumption Demand in Africa 2007 – 2050; and required Generating Capacity Development

		2007	Average Growth Rate p.a.	2015	Average Growth Rate p.a.	2030	Average Growth Rate p.a.	2050
North Africa:								
▪ *Consumption Demand*	*(TWh)*	***176***	*4.2%*	***244***	*4.2%*	***453***	*4.5%*	***1 101***
- Rural		16		20		30		70
- Urban		160		224		423		1 031
▪ *Generating Capacity*	*(MW)*	***37 195***	*1 917*	***52 531***	*2 954*	***96 848***	*6 370*	***224 240***
West Africa:								
▪ *Consumption Demand*	*(TWh)*	***38.5***	*6.8%*	***65.4***	*6.7%*	***172***	*5.1%*	***535***
- Rural		0.7		1.7		14		38
- Urban		37.8		63.7		158		497
▪ *Generating Capacity*	*(MW)*	***9 631***	*630*	***14 667***	*1 673*	***39 758***	*4 314*	***126 028***
Central Africa:								
▪ *Consumption Demand*	*(TWh)*	***17.7***	*6.6%*	***29.6***	*7.8%*	***91***	*5.3%*	***254***
- Rural		0.3		0.9		7		14
- Urban		17.4		28.7		84		240
▪ *Generating Capacity*	*(MW)*	***4 088***	*325*	***7 613***	*963*	***25 682***	*1 772*	***52 777***
Eastern Africa:								
▪ *Consumption Demand*	*(TWh)*	***19***	*7.0%*	***33***	*7.7%*	***100***	*7.0%*	***249***
- Rural		0.4		1.5		17		39
- Urban		18.6		31.5		83		210
▪ *Generating Capacity*	*(MW)*	***4 148***	*424*	***7 543***	*1 047*	***23 255***	*1 781*	***58 866***
Southern Africa:								
▪ *Consumption Demand*	*(TWh)*	***260***	*3.3%*	***338***	*3.3%*	***550***	*3.4%*	***1 074***
- Rural		10		19		59		196
- Urban		250		319		491		878
▪ *Generating Capacity*	*(MW)*	***56 286***	*2 149*	***73 477***	*2 945*	***117 650***	*5 064*	***218 937***
Island States:								
▪ *Consumption Demand*	*(TWh)*	***3.3***	*5.2%*	***4.9***	*6%*	***11.8***	*5.2%*	***32.8***
- Rural		0.2		0.4		1.3		6.3
- Urban		3.1		4.5		11.5		26.5
▪ *Generating Capacity*	*(MW)*	***948***	*27*	***1 161***	*158*	***3 527***	*304*	***9 599***
AFRICA:								
▪ *Consumption Demand*	*(TWh)*	***515***	*4.2%*	***716***	*4.5%*	***1 379***	*4.4%*	***3 249***
- Rural		33		50		136		376
- Urban		482		666		1 243		2 873
▪ *Generating Capacity*	*(MW)*	***153 446***	*3 235*	***178 328***	*6 980*	***280 034***	*15 050*	***581 041***
SUB-SAHARA AFRICA:								
▪ *Consumption Demand*	*(TWh)*	***110***	*7.0%*	***188***	*6.7%*	***497***	*5%*	***1 329***
- Rural		5		10		57		110
- Urban		105		178		440		1 219
▪ *Generating Capacity*	*(MW)*	***24 635***	*1 908*	***39 896***	*4 541*	***108 016***	*8 606*	***280 127***

Annex. 3 :

Table.2 A Scenario of Increasing the rate of Access to Electricity in Rural and Urban Areas of Africa, 2007 – 2050

	Rate of Access to Electricity (% of the Population)						
	2007	*Number of Residential Connections per year*	2015	*Number of Residential Connections per year*	2030	*Number of Residential Connections per year*	2050
North Africa:	***90***	***840 529***	***98***	***661 829***	***100***	***715 342***	***100***
- Rural	85	342 176	95	156 471	100	36 765	100
- Urban	95	498 353	100	505 359	100	678 577	100
West Africa:	***29***	***1 187 104***	***44***	***2 619 279***	***98***	***1 485 380***	***99***
- Rural	2	118 470	8	1 054 331	95	46 755	97
- Urban	66	1 068 634	79	1 564 948	100	1 450 224	100
Central Africa:	***9***	***361 184***	***23***	***1 549 889***	***98***	***661 358***	***99***
- Rural	1	118 773	10	727 633	96	614 583	98
- Urban	21	242 411	39	822 256	100	661 358	100
Eastern Africa:	***10***	***838 921***	***20***	***3 636 639***	***88***	***1 954 396***	***100***
- Rural	1	164 375	5	1 872 226	79	426 819	100
- Urban	34	674 546	50	1 794 413	99	1 527 577	100
Southern Africa:	***34***	***958 888***	***57***	***1 238 724***	***97***	***690 983***	***100***
- Rural	10	223 604	25	629 640	93	31 894	100
- Urban	64	735 283	89	609 084	100	659 089	100
Island States:	***9***	***92 080***	***23***	***371 145***	***95***	***175 279***	***100***
- Rural	6	12 086	8	209 186	91	20 532	100
- Urban	15	79 993	52	161 959	99	154 747	100
AFRICA:	***29***	***4 010 915***	***45***	***9 139 428***	***95***	***5 593 184***	***99***
- Rural	14	979 485	21	4 649 486	90	596 361	98
- Urban	54	3 119 123	74	5 205 820	100	4 761 145	100
SUB-SAHARA AFRICA:	***18***	***2 836 859***	***31***	***9 203 952***	***94***	***4 798 623***	***99***
- Rural	1	265 969	7	4 405 244	88	561 168	97
- Urban	47	2 570 890	65	4 798 708	100	4 237 455	100

Annex. 4: Indicative Clean Energy pipeline 2008 - 2012