

Transition From Fossil Fuel to Clean Energy: A Must Achievable Project in Sub-Saharan Africa.

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Abstract

The paper explored the cruciality of transition from fossil fuel to clean energy: a must achievable project in Sub-Saharan Africa. For Sub-Saharan African countries to economically compete globally, there is an urgent need to consider its future energy production. Overdependence on fossil fuel has negative implications, for its inability to meet up the required demand of the continent and the hazards posed on global climate (carbon emission) and the attendant health and environmental problems. These call for optional renewable source of energy (solar energy, wind energy, hydroelectric energy, geothermal energy, biomass energy) clean energy in short. These have capacities of boosting the economy of Africa due to its reliabilities, renewability, potentialities, stabilities, sustainability, amongst others. Findings revealed amongst other that 350GW of hydroelectric energy, 110 GW of wind energy, 15GW of geothermal energy and 1,000 GW of solar energy are untapped. If these are well harnessed, its outcome will drive the economy of the country and continent at large.

Keywords: fossil fuel, clean energy, transition, power plants, project, continent.

1 Introduction

The sector of energy in Africa is very germane to her economy. According to African Energy Review (2021), annual demand for energy increases by 30% annually but its supply reduces geometrically.

According to International Energy Agency (2020), African energy generation, is predominantly from fossil fuel (38.7% from oil, 29.7% from natural gas, 22.1% from coal). This consistent exploitation of fossil fuel reserves has made countries to overlook

the advantages of other forms of energy with infinitesimal contributions from renewable energy (0.6% from solar, 0.6% from nuclear, 6.8% from hydropower energy, 0.4% from bio-energy and 1.0% from wind energy) which make African countries highest untapped potential in the world (only 11% are used). Though fossil fuel produces export revenue, job creation (2.1 million jobs in the year 2020, formally 3.7million in 2010 (Guardian Newspaper, 2021) but renewable one has capacity of producing more jobs in energy associated industries.

2.0 Renewable Energy

Renewable energy is the energy, according to Oxford dictionary (2022), that cannot be exhausted when utilized. Reasons for renewable energy include increased electricity demand, instability in price of products of petroleum, needs for the environmental protection of vicinity, human being health, generation of jobs. These factors are pushing the country to key-in to optional source of energy such as solar energy, biomass, geothermal, wind energy, wind energy and nuclear energy.

2.1 Solar Energy

The energy derived from the sun is known as solar energy. Solar power and hydro power are commonest Africa's form of energy of production

with about 5million jobs by 2030. African has also solar power potential which can bring power to local area (South Africa and Egypt are leading). United Kingdom is collaborating with Nigeria in the area of solar energy, the model used in Kenya and Tanzania is what they are going to apply in Nigeria. Reasons for solar energy include a renewable source of energy, inexhaustibility, environmental benefit, less expensive, creation of many jobs, regularizing price of energy, can be used anywhere, are very easy to install, improve public health.

2.2 Hydro-Energy

Hydro-energy refers to energy generated from water(hydro). Africa Energy Portal (2019) reveals that out of the fifteen countries examined (Benin, Burkina Faso, Cape Verde, Ivory Coast, Gambia, Ghana, Gambia, Guinea, Guinea Bissau, Niger, Mali, Liberia, Togo, Sierra Leone, Senega and Nigeria), hydro generation is predominant in four countries.

Historically, according to National Electricity Regulatory Commission (2022), generation of power in Nigeria, according to is traceable to 1886 when the colony of Lagos installed two generating sets. In 1962 and 1972 electricity Corporation Corporation of Nigeria (ECN) and Niger Dams Authority (NDA) was established respectively but

in 1972, the two were merged to form National Electricity Power Authority (NEPA) to generate, transmit and distribute electricity in the country. Later, in 2005 the NEPA was reformed and renamed Power Holding Company of Nigeria which gives private companies opportunity to participate in generating, transmitting and distributing electricity during President Olusegun Obasanjo's administration. Similarly, during this period, the National Electricity Regulation company was established. Presently, according to NERC (2022) Nigeria has six generation companies, namely: Afam power plc, Egnin power, Jebba power plc, Kanji power plc, Ughelli power plc, Sapele power plc and Shiroro power plc. Also, eleven distribution companies such as Yola, Kaduna, Kano, Benin, Ibadan, Eko, Jos, Abuja, Ikeja, Portharcourt and Enugu electricity distribution companies. Despite all these reforms, presently, Nigeria only generates 3.522MW, whereas up to 50,000MW are required to meet up with its need.

2.3 Biomass

Another most significant source of renewable energy, according to International Energy Agency (2021) is biomass. IEA (2021) describes biomass as non-fossil material which are biological in nature. These can be utilized to generate heat or electricity (Malina & Musmara, 2016). Electricity

can be produced through plant-based material known as biomass. Biomass materials are wood residues, energy crops, agricultural residues, industrial domestic and farm wastes. This type of energy generated from these is known as biomass energy. Basically, biomass is categorized into primary biomass (harvested biomass for energy directly and secondary biomass (waste and residue). Though, it is not absolutely clean. It is costly but renewable, less dependence on fossil fuels and its carbon neutrality helps to reduce waste (European Commission, 2018).

Biomass energy is highly vital for Sub Saharan Africa (World bank, 2010). Africa has highest bioenergy potential, if well harnessed can address negative impacts of fossil fuel imports (which devalue our currency), and lack of access to electricity challenges related to poverty (Kemausour, 2022). With all these potentials, up to date, little has been done. Nigeria is the most populous country in the continent of Africa and produces thirty-two million tons of waste in one year. According to Bakare (2021), only thirty percent of wastes are collected while the remainders end up in landfills, bodies of water, sewers and beaches. Why is Africa's production still low in term of energy production? What are the problems and obstacles?

2.4 Geothermal

Geothermal is coined from the Greek words Geo (earth) and thermal (Heat). That is, heat in the earth. This heat is ceaselessly generated in the planet earth which makes it a good source of renewable energy that can be used for heating up building, to bath and for electrical generation. About twenty-six countries are currently generating electrical power from geothermal. Infact, geothermal capacity amount to 15.4 Gigawatt which is only 6.9% of total global potential according to Geothermal Energy Commission (2021) with the United State of America generating 3,676MW, Indonesia producing 2,133MW, Philippines enjoying 1,918MW, Turkey producing 1,52MW, New Zealand generating 944MW, Kenya generating 861MW, Iceland producing 755MW and Japan generating 601MW.

Geothermal energy source is environmentally friendly. Though geothermal is location specific/restricted and costly (\$2 to 7million is needed to construct a plant that can generate 1-megawatt capacity) but its renewability, sustainability, potentiality, stability and requires no fuel that makes it unparallel since it is occurring naturally (Welding Institute, 2022). Therefore, it leads to a rapid revolution in the energy sector. Kenya is the biggest producer of geothermal

energy in Africa, that is, 40% of country's supply of electricity with Nigeria no geothermal energy.

2.4 Wind Energy

Earth is heated by sun and cause the movement of air which is known as wind (Okwedy, 2021) which makes it an indispensable natural resource that can be converted to energy with the aid of turbine known as wind turbine. Historically, Professor James Blythe was the first scientist to build a wind turbine in Scotland. Wind energy has the potential of generating 59 TW whereas only 0.01% is tapped. Oweye (2022) reports that, in harnessing wind energy, both southern and northern parts of Nigeria have high potentials. Describing various wind profile across Nigeria, Nigeria Metrological Agency revealed that southern part of Nigeria has a mean wind profile with a height of 3.0-3.5m/s and the northern having 4.0-7.5m/s wind speed which make the country very resourceful in wind energy. Hafner, et.al (2017) revealed that 110 GW of wind energy are untapped. If it is harnessed, its outcome will drive the economy of the continent (Dutiro, 2020).

2.5 Nuclear Energy

The energy derived from nuclear reaction through either nuclear fusion or fission in the nuclear plant is known as nuclear energy. Historically, the premier nuclear plant was constructed in 1950s.

Presently, there are about four hundred and thirty-nine (439) fission nuclear reactors across the globe which have 393GW(e) capacity and fifty-six (56) reactors under construction with Asia having the highest while Africa is having the least (Power Reactor Information System, 2022). Though, very expensive to construct and has accident potentials, in term of fatalities per generated energy unit, nuclear energy is the least in comparison with other renewable energies which makes it best optional source of sustainable energy in Africa. In 2015, some African countries (Egypt, Uganda, South Africa, Ghana, Nigeria a) take a move in setting up African network in order to enhance nuclear power development program. In term of this program, only Zambia, Uganda, Tanzania, Sudan, South Africa, Ghana, Kenya and Namibia showed most interest. Nigeria targeted to install nuclear reactor with capacity of producing 4,000 MW by 2021. To achieve this, in 2010 Nigeria Atomic Energy Commission (NAEC) picked Ajaokuta in Kogi state, Lau in Taraba state, Okitipupa/Agbaje in Ondo state and Itu in Akwa Ibom state as potential sites for nuclear sites which was estimated to cost \$2billions (Sah ,et. al, 2018; Bolodeoku,2021). To bring this target to reality, Nigeria signed a Memorandum of Understanding (MoU) with United States of America's Barnelt (Sat, et.al, 2018) also partnered with Russia and Russia State Nuclear Corporation

Rosatom to execute and complete the project (Bolodeoku, 2021). Also, the Imo state government endorsed an agreement with Holding Company to asses' sites in Owerri in Imo state for sitting 5-20 MW nuclear reactors. Still, the target became a mirage as a result of many challenges (Hansen, 2021). Nevertheless, Yau (2022) revealed that Nigeria was on the course as the country was at the bidding stage again in a nuclear program.

3 Challenges Confronting Actualization of Renewable Energies

There are many challenges hindering the actualization of renewable energies. Among them are:

(a) Insufficient Decisive Actions and Implementations

Insufficient power production and lack of proper transmission problems bedeviling African countries which affects the economy drastically despite the huge investments (Obi & Iloh, 2015). Dissecting the cause, the researchers stated that lack of political will and inconsistency in policy implementation by successive governments were responsible.

(b) Insufficient Funds

The transition from fossil fuel to clean energy is capital intensive. For instance, Africa needs about

\$2.8tn. Most African countries are either experiencing economic and financial recession or just recovered fully occasioned by COVID-19 which changes attention of government from pursuance of energy generation

(c) Perceived high-risk Investment Risk Due to Instability in Government

Instability in government as a result of coup is another challenge facing Africa. These coups are frequent phenomenon at an average of four annually between 1960 and 2000 but later dropped to two in Africa (Mwai, 2022). Each successful coup leader comes with different ideas, laws, decrees which might be unfriendly to investment. As a result, many foreign and local investors are afraid to invest in energy sector.

(d) Insecurity

Security challenges due to terrorism, banditries; kidnappings, robberies and other social vices have made most African countries not conducive for development in energy sector. For instance, Nigeria is the most terrorized country in the world apart from Afghanistan and Iraq.

(e) Corruption

Corruption is the bane of the energy sector in most African countries. For example, the most populous country in Africa, Nigeria, spent \$16

billion between 1999 and 2007(Socio-Economic Rights and Accountability Project, 2016) and \$3.88 billion spent between 2010 and 2019 (Adanikan, 2019) with little or no improvement. Perceiving sharp practices, the transparency group, Socio-Economic Rights and Accountability Project (2016) petitioned the Chief Justice of Nigeria to immediately set up panel of inquiry to look into corruption allegations spending a huge amount of money.

(f) Poor Educational System

The percentage of residents of Africa that have access to electricity in Sub-Saharan Africa is the lowest in the world (World Bank, 2012). The problem is not farfetched from Africans' lack of basic knowledge of practical skills in tapping abundance of resources littering our environment in Africa. This lack of basic practical skills is traceable to deplorable state of educational systems in most African countries, Nigeria in particular due to lack of proper funding, incessant strike action, unrest, poor salaries, low incentive, unconducive environment, teaching methodologies, amongst others. Due to the challenges bedeviling our educational system, Guardian newspaper (2021) reported that only two Nigerian dons were among the top global scientists selected by an academic publishing company, Elsevier.

4. Recommendations

In proffering solutions to the challenges energy sector is experiencing, the following recommendations are therefore made:

(a) Private Partnerships, Private Public Partnership and Blended Finance

African countries, most especially Nigeria should encourage private organization to invest in energy sector by providing business-friendly environment by waiving taxes, free visas to foreigners who are willing to invest in the energy sector. Also, Nigerian government should partner with private organizations or international organizations to jointly finance energy plants.

(b) Sustainable Renewable Development Methodologies Should be Embraced.

In the paucity of funds, African countries should adopt the methods of building modular energy plants which are less capital expensive and time consuming.

(c) Visions that will Guide the Development of Various Renewable Energy

Africa's countries should formulate achievable, implementable visions and back them up with political the will and decisive actions that will bring the visions to reality.

(d) Research institutions should be well funded to undertake innovative researches that its output will lead to maximum generation of energy from renewable sources. There should be a collaboration between educational institutions and the energy industry.

5. Conclusion

Many African countries like Ethiopia, South Africa, Kenya, Morocco and Egypt, are ahead in utilizing various renewable energy supplies in Africa while countries like Cape Verde, Djiboiti, Rwanda, and ESwatini have set aspiring targets, yet many other African countries like Nigeria are still moving forward and backward. Though transition in African energy is challenging, but the outcomes at the long run outweigh its challenges. To meet the target better focus should be on policy, foreign assistance, adequate and strict commitment and planning.

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