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An assessment of renewable energy readiness in Africa: Case study of Nigeria and Cameroon

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ABSTRACT

Africa is blessed with abundant energy sources that can promote economic growth and provide sufficient capacity to meet up with the future electricity demand. This paper evaluates the progress made in renewable energy (RE) development in Nigeria and Cameroon together with the roadmaps for future implementation. Since the early 2000, Nigeria has identified RE as an additional source to improve electrical power generation, while Cameroon is yet to have a defined policy for RE development. Presently, in both countries, RE is being developed for empowering the local economies, but the RE incorporation to the national grid is yet to be implemented at a greater scale. Since Nigeria and Cameroon have similar climatic conditions, they can benefit from each other through greater cooperation in the RE sector. For the two countries, there is high solar irradiation and excellent wind speed that can be effectively utilized for electricity generation. For all these to benefit both nations, there is a greater need for good leadership and good governance.

Contents

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Nomenclature

Acronyms	Descriptions
Btu	British thermal units
e-kiss	energy-keep it simple and safe
ECN	Energy Commission of Nigeria
IEA	International Energy Agency
IEO	International Energy Outlook
NASENI	National Agency for Science and Enginnering Infrastrucuture
NCERD	National Centre of Energy Research and Development
NEM	National Energy Master Plan
OECD	Organization of Economic Cooperation and Development
PIB	Petroleum Industry Bill
PV	photovoltaic
RE	renewable energy
SERC	Sokoto Energy Research Centre
SHP	small hydropower
SSA	Sub-Saharan Africa
UNDP	United Nations Development Programme

1. Introduction

Global warming and continuous energy demand in the world market coupled with the rise in energy price have significantly drawn attention to the need of renewable energy (RE) resources. Africa as a continent is blessed with abundant energy sources, but imbalance between electricity production and generation still remains an issue in Sub-Saharan Africa (SSA) countries [1]. Based on the International Energy Agency (IEA) information, the Sub-Saharan Africa has mass population without access to adequate electricity [2]. These are due to disparity in the energy development across the whole continent. In examining Africa modern energy consumption with regions such as Middle East, North America, Latin America and Europe, it is obvious that Africa has one of the lowest per capital consumption rate of energy [2,3]. This among other things is due to the fact that Africa relies mostly on traditional biomass and hydropower energy [3]. Africa as a continent has abundant RE potential, but has not been fully harnessed. Amongst the reason for the slow uptake in RE are high capital cost of initial financial investment as well as lack of adequate knowledge regarding the benefits of RE. Nigeria and Cameroon are among the African countries that are slowly striving to include RE in their future energy development.

Based on the International Energy Outlook (IEO) 2013 report [3], the world energy growth will be 56% between 2010 and 2040, with an increment of 1.5% per annum. In the reference case (see Table 1 and Fig. 1), the total energy demand in non-OECD (Organization of Economic Cooperation and Development) countries – in which Nigeria and Cameroon belong to – had increased by 90% compared with a rise of only 18% in OECD countries [3].

Fig. 1 shows that the total energy in the world rises from 524 to 820 quadrillion British thermal units (Btu) between 2010 and 2040 [3]. This is driven by strong economic and population growth in non-OECD contrasting OECD countries with slow economic growth and population expansion. Fig. 2 shows the outlook of world energy consumption by energy source. There is an increase over the time horizon. Liquid consumption rises yearly at the rate of 0.9% from 2010 to 2040, with a yearly total energy demand increase of 15% [3]. Nuclear and renewables are the fastest growing source of world energy at average growth of 2.5% per year [3]. Fossil fuel continues to be the most source of world's energy supply [3]. It is expected that by 2040 and beyond, liquid fuel, coal and natural gas will continue to supply most of the energy of the world [3].

According to the IEO reference case [3], there is an increase by 93% in the world's net electricity consumption from 2010 to 2014. For non-OECD countries, which include Nigeria and Cameroon, there is lack of access to electricity by many people as compared to the OECD countries. However, net electricity generation in non-OECD countries rises at an average rate of 3.1% annually led by India and China. As the world battles with security concern with environmental consequences, many governments around the world are designing policies which support the development of

Table 1
World marketed energy consumption based on country grouping, in quadrillion Btu, from 2010 to 2040 [3].

Region	2010	2015	2020	2025	2030	2035	2040	Mean annual percent change
OECD	242	244	255	263	269	276	285	0.5
Americas	120	121	126	130	133	137	144	0.6
Europe	82	82	85	89	91	93	95	0.5
Asia	40	41	43	44	45	46	46	0.5
Non-OECD	282	328	375	418	460	501	535	2.2
Europe and Eurosia	47	50	53	57	61	65	67	1.2
Asia	159	194	230	262	290	317	337	2.5
Middle east	28	33	37	39	43	46	49	1.9
Africa	19	20	22	24	27	31	35	2.1
Central and South America	29	31	33	35	39	42	47	1.6
World	524	572	630	680	729	777	820	1.5

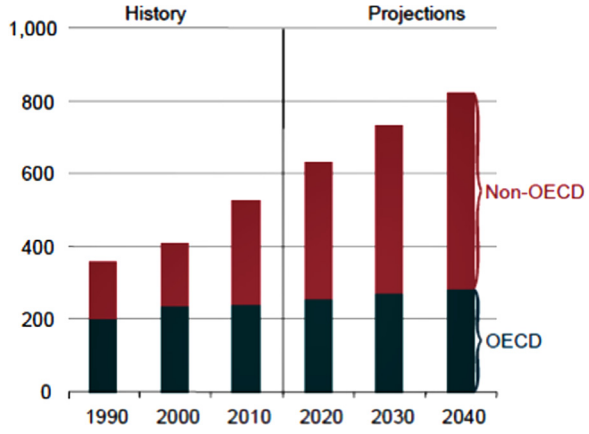

Fig. 1. World energy consumption, in quadrillion Btu for the period from 1990 to 2040 [3].

RE sources. For that effect, RE has been the fastest growing energy source of electricity. Coal fired generation has been the leading source of world electricity generation through 2040 (see Fig. 3). With the exception of coal, other non-renewable like nuclear and natural gas are amongst the fastest growing source of energy in the world. Despite the interest in RE across the world, non-OECD countries like Nigeria and Cameroon are still lacking behind in developing appropriate policies and infrastructure for renewables.

There are several issues hindering the progress of RE in developing countries like Nigeria and Cameroon. The major barriers that are affecting these countries and other African countries are (i) policy regulation and institutional; (ii) information and technical capacity,