

REVAMPING THE NIGERIAN ECONOMY THROUGH STABLE POWER SUPPLY: THE WAY FORWARD

¹I.B. Olusola & ²O.J. Ogunwuyi

¹Electrical Electronics Engineering Department, Osun State College of Technology, Esa-Oke¹

²Electrical Electronics Engineering Department, Osun State Polytechnic, Iree²

Corresponding Author's E-mail: olusolaib@oscotechesaoke.edu.ng

ABSTRACT

Erratic supply of electricity to the general populace and inaccessibility to clean modern energy services has become an age long challenge facing most of the countries in Africa, most especially Nigeria, the so called "Giant of Africa". This problem has deprived the citizens of these countries so many opportunities and benefits of good governance, such as socio-economic development and poverty eradication. It is estimated that about 40% of the population in Nigeria have access to national grid while at the rural level where about 70% of the populace live, the percentage that have access to national grid drops to slightly above 18%. Remote areas which are usually rural, sparsely populated and dispersed are the worst hit, as they may never dreamt of having access to electricity except by sheer luck. There is no doubt that the present energy imbroglio ravaging Nigeria will continue until governments looks into ways of mitigating the problem by diversification of the energy sources to domestic, commercial and industrial sectors; and embrace new available technologies to reduce energy wastages and to save cost. This paper will be reviewing the contributions of various energy sources to the national grid and examine the possible ways of enhancing sustainable economic, environmental and social development of Nigeria, through the use of renewable energy sources. A lot of factors which could lead to sustainable energy in the future for big, small and medium scale businesses, and better health situations for the citizens, are considered in this report. Such factors are the promotion of the usage of solar and wind energy, and other renewable energy resources, efficient energy practices, as well as the application of energy conservation measures in various sectors.

Keywords: National Grid, energy imbroglio, renewable energy, solar and wind energy, energy efficiency, energy conservation.

INTRODUCTION

The importance of energy to economic growth of a nation cannot be overemphasized. Energy can be said to be the wheel upon which the growth, development and progress of any nation is driven. Availability of it happens to be a means of reducing/eradicating poverty, hunger and suffering, and crime rates in any nation of the world. It is well understood that the future economic growth of any nation is dependent on availability of long term stable supply of energy from sources that are available, accessible and are environmentally friendly. "There is no way we can separate the nation's security, climate change and public health from energy availability as these factors fared better when there is adequate and stable supply of energy" (Ramachandra, 2011). In the absence of adequate and stable supply of energy, it has been proved beyond any reasonable doubt that the standard of living of the citizens becomes low and the per capital energy consumption of such nation cannot favourably compete with other developed/developing nations of the world. The energy crisis that engulfed the world not long ago was as a result of rapid population growth and increase in the living standard of the people. "The per capita energy consumption is taken as a measure of the prosperity of a nation" (Rai, 2004). Energy is so important in man's life as the presence

of energy presents a comfortable living temperature, portable and hygienic water for drinking purposes, improved healthcare, up-to-date communication facilities, educational aids for students and teachers. Production sector of a nation is also dependent on the availability of energy such that the agriculture, commerce, manufacturing, industry and mining aspect of production can enjoy mass patronage due to the opportunity of mass production of goods which would in turn create competitions among the producers and invariably lower the retail prices.

"Poverty, deprivation, economic decline, joblessness are some of the effects of unstable supply of energy which could also lead to downward trend in socio-economic developments such as productivity, income growth, education and health" (Nnaji et al, 2010). In many parts of Nigeria, commercial and industrial activities have been paralyzed due to non-availability of adequate and affordable energy supply.

The Council for Renewable Energy of Nigeria (CREN) has estimated that power outages in Nigeria have brought about a loss of over 126 billion naira (US\$984.38 million) in income annually (CREN, 2009). Apart from the losses that resulted from this energy crisis, it has also brought a lot of health hazards which resulted from carbon-monoxide emissions

through wood cooking smokes and exhaust from door to door generators that have currently besieged the nation.

According to the Department of Petroleum Resources (DPR) report for 2014 fiscal year, Nigeria consumes 1,209,622,631 litres of PMS and 552,730,259 litres of DPK in 2014. This shows that Nigeria is solely dependent on fossil fuel energy sources which are unreliable due to challenges that surround its production and usage. More so, this cannot serve the energy need of the nation as demand increases daily. Hence, an alternative means of providing energy should be looked into.

According to Central Bank of Nigeria (CBN) economic report for the first quarter of 2016; at 3,871MW/h, estimated average electricity generation in the first quarter of 2016 fell by 0.08% compared with the level attained in the fourth quarter of 2015. This development was attributed to the fall in generation in the various plants due to vandalism, and the fall in water supply to the hydro power stations. Taking this report into consideration, it could be agreed that the only way out of our current predicament as a nation is to embrace renewable energy generation such as solar and wind generation systems where we have the primary resources required in abundance and without threat of vandalism to its source.

ENERGY SITUATION IN NIGERIA

Nigeria is endowed with enormous energy resources such as petroleum, natural gas, coal, nuclear and tar sand. Others include solar, wind, biomass and hydro. “However, development and exploitation of such energy sources have been skewed in favour of the hydro, petroleum and natural gas” (Onakoya et al, 2013). “Nigeria is Africa's energy giant and the continent's most prolific oil-producing country, which along with Libya, accounts for two-thirds of Africa's crude oil reserves. It ranks second to Algeria in natural gas” (Sambo, 2008). The greater percentage of bitumen and lignite reserves are deposited in Nigeria. Nigeria being the custodian of the sixth largest reserve of crude oil in the world has an estimated oil reserve of 36.2 billion barrels. The capacity of hydroelectricity generation in Nigeria is about 14,250MW. Due to the inadequate development and inefficient management of the sector, there has been a wide gap between demand and supply of electricity in the country which inadvertently resulted in erratic power supply in the country. The economy of Nigeria has been badly

affected due to the non-availability of adequate electricity supply to the production sectors like large and small scale industries. While big industries are fighting tooth and nail to remain in business through the use of generators to power their production machines, greater percentage of small scale industries have folded up due to the fact that they cannot cope with the weight of buying diesel/premium motor spirit (PMS) to sustain powering their businesses on continuous basis.

The situation in the rural area is worse; and it has led to the population in the rural areas dependent on the use of firewood. This has led to consumption of over 50million tonnes of firewood annually. Sourcing fuel wood for domestic and commercial uses is a major cause of desertification in the arid-zone states and erosion in the southern part of the country. The rural populace has little or no access to the conventional energy such as electricity and petroleum products due to bad roads and lack of commitment from the government.

It is obvious that with the restructuring of the power sector and the privatization of the electricity industry, and for logistic and economic reasons especially in the privatized power sector, rural areas that are far from the national grid and/or have low consumption or low power purchase potential will not be attractive to private power investors and such areas may remain in darkness for long (Sambo, 2009).

Since stable electricity is required for development in every facet of human life, its absence has not only left the rural populace socially backward, but has also left their economic potentials untapped. “However, with the availability of abundant renewable energy resources such as solar, wind, biomass, and small hydropower potentials in Nigeria, the logical solution is increased penetration of renewables into the energy supply mix” (Sambo, 2008).

ENERGY RESOURCES IN NIGERIA

Table 1: Energy Resources

S/N	Resource Type		Reserves (Natural Units)	Production level (Natural units)	Utilization Natural Units
1	Crude Oil		35 billion barrels	2.06 million barrels/day	445,000 barrels/day
2	Natural gas		187 Trillion SCF	7.1 billion SCF/day	3.4 billion SCF/day
3	Coal and lignite		2.175 billion tones	Insignificant	Insignificant
4	Tar sands		31 billion barrels equivalent	-	-
5	Large hydro Power		11,250 MW	1,938 MW (167.4 million MWh/day)	167.4 million MWh/day
6	Small Hydro Power		3,500 MW	30 MW (2.6 million MWh/day)	2.6 million MWh/day
7	Solar Radiation		3.5 – 7.0 kWh/m ² /day(481million MW/day using 0.1% of Nigeria land area)	Excess of 240 kWp of solar PV or 0.01 million MWh/day	Excess of 0.01 million MWh/day
8	Wind		(2-4)m/s at 10m height	-	-
9	Biomass	Fuelwood	11 million hectares of forest and woodland	0.110 million tonnes/day	0.120 million tonnes/day
		Animal waste	245 million assorted in 2001	0.781 million tonnes of waste/day in 2001	Not available
		Energy drops and Agric residue	72 million hectares of Agric. Land and all waste lands	Excess of 0.256 million tonnes of assorted crop residue/day in 1996	Not available
10	Nuclear Elements		Not yet qualified	-	-

Sources: (i) Nigerian National Petroleum Corporation (NNPC) 2007

(ii) Renewable Energy Masterplan (REMP) 2005(iii) Ministry of Mines and Steel Development (2008)

Table 2: Commercial Primary Energy Consumption by Type

Type	Average % of Total						
	2002	2003	2004	2005	2006	2007	Average
Coal	0.03	0.03	0.03	0.03	0.05	0.05	0.04
Hydro	11.93	14.20	17.09	12.04	17.03	23.90	16.08
Natural Gas	2.84	1.9	4.54	5.5	7.52	8.73	5.17
Petroleum Products	85.30	83.87	78.04	82.45	75.44	67.32	78.71

Source: CBN Annual Report (2005,2007)

It should be noted from this report that petroleum has constituted over 80% of the consumption in commercial primary energy in the country while coal has remained neglected for so long.

Table 3: Country Statistics of Electricity Generation and Per Capita Consumption

Continent	Country	Population (million)	Generation Capacity (MW)	Per capita consumption (MW)
North America	USA	250	813,000	3.2
South America	Cuba	10.54	4,000	0.38
Europe (Central)	UK	57.5	76,000	1.1
Europe (Eastern)	Ukraine	49	54,000	1.33
Middle East	Iraq	23.6	10,000	0.42
Far East	South Korea	47	52,000	1.10
Africa	Nigeria	180	<4000	0.02
	Egypt	67.9	18,000	0.27
	South Africa	50	45,000	0.9

Source:Adeleye 2016

“Nigeria's per capita electricity consumption is amongst the lowest in the world and far lower than many other African countries. Nigeria's per capita electricity consumption is just 3% of South Africa's. South Africa has 45,000 MW of grid-based generating capacity for a population of 50 million people. Comparing the Nigeria's per capita electricity consumption with that of other nations in the world such as US, UK, South Korea and so on, it would be seen from the table above that Nigeria is far from it in terms of readiness for economic development and transforming into an industrialized nation”. (Adeleye, 2016)

PROJECTED ENERGY DEMAND OF NIGERIA

It is always expected that there would be an increasing demand for fuel energy as the economic development and civilization all over the world increases. Industry is one of the most important energy-consuming sectors in the world. Mitchel reiterated that “energy is essential to our way of life as it provides us with comfort, transportation, and the ability to produce food and material goods. Energy consumption has been seen from time immemorial to be directly related to the gross national product, which is a measure of the

market value of the total national output of goods and services”(Adeyemo, 2001).

“The population of a nation is usually a major driver of energy demand, while its most important determinant is the level of economic activity and its structure measured, by the total gross domestic product (GDP) alongside the various sectors and sub-sectors of the economy”(Sambo et al., 2006). Population projection of Nigeria was expected to grow from 115.22 million in 2000 to 281.81 million by 2030 at an average annual rate of 2.86% between 2000 and 2030. Based on the models developed by the ECN, the country's energy demand was analyzed for the period from 2000 to 2030 with the use of the Model for the Analysis of the Energy Demand (MAED) and the Wien Automatic System Planning (WASP) package (Table 4).

Table 4: Table Total Projected Energy Demand (MTOE)

Scenario	2000	2010	2015	2020	2025	2030
Reference (7%)	32.01	51.40	79.36	118.14	169.18	245.19
High growth (10%)	32.01	56.18	94.18	190.73	259.19	414.52
Optimistic (11.5%)	32.01	56.18	108.57	245.97	331.32	553.26
Optimistic (13%)	32.01	72.81	148.97	312.61	429.11	715.70

Adapted from ECN

It could also be seen that in a reference scenario, the Gross Domestic Products (GDP) is expected to grow at an average of 7% per annum with the manufacturing sector as the main driver of the growth. The manufacturing sector is also expected to account for minimum of 15% of GDP by 2020. If this was achievable, the Millennium Development Goal (MDG) objective of reducing poverty by half by year 2015 would have been a success; however it was the other way round.

In the high growth scenario, the GDP is expected to grow by minimum of 10% per annum where the manufacturing sector is also expected to contribute 22% to GDP by 2030. In this case, Nigeria is expected to transit from an agrarian economy to an industrialized nation where small, medium and large scale industries thrive.

“The optimistic growth scenario I has put a bit of demand on the nation Nigeria as it is expected that the GDP would grow by 11.5% per annum with the manufacturing sector still contributing 22% to GDP by 2030. It is still expected at this stage that Nigeria, is transiting from agrarian economy to an industrialized nation where the morale of the citizens are well boosted to give their all at work for maximum output efficiency”(Sambo, 2009).

The optimistic growth scenario II is not too far from I except that it placed more demand on the nation in terms of better economic growth. The country's GDP is expected to grow by minimum of 13% per annum with the manufacturing sector contributing minimum of 22% to GDP by 2030. This economy projection is achievable provided the nation can invest more on renewable energy sources in conjunction with other energy sources available, thereby making electricity available and affordable for the small, medium and large scale industries, and at the same time to the entire citizenry.

CHALLENGES OF ENERGY SECTOR

There has been a steady increase in Nigeria's energy need, and its increasing population has not been adequately considered in the energy development program. The current urban-centered energy policy is condemnable, as cases of rural and sub-rural energy demand and supply do not reach the center stage of the country's energy development policy. Citizens living in rural areas depend on burning firewood and traditional biomass for their energy needs; causing great deforestation; emitting greenhouse gases, and polluting the environment, thus creating global warming and environmental concerns. “The energy supply has been concentrated to the cities and various places of industrialization, thereby creating an energy imbalance within the country's socio-economic and political environments. The rural dwellers still lack electric power”(Ajayi et al., 2007).

Despite Nigeria's installed petroleum products refining capacity of 445,000 barrel/day and electricity generation capacity in excess of 8,000 MW, Nigeria imports over 70% of its petroleum products requirement, while electricity supply is inadequate at just about 3,000 MW now from nearly 5,000MW generation in 2015.

Other challenges bedeviling Nigeria energy sector are as follows;

- a. The rate at which new power plants and new oil refineries together with associated infrastructure are added into the system is very low.
- b. The new licencees of National Electricity Regulation Commission (NERC) have not made appreciable progress due to problems of workability of proposals, agreements on power purchase and implementation.
- c. Coal and Renewable energy resources are grossly underutilized in the country despite their availability in reasonable quantities.

Whereas, in other part of the world renewable energy has been taken as a priority for sustainable energy provision.

d. Natural gas supply is grossly inadequate for the existing gas power plants due to vandalization of oil pipelines in the Delta region of the country.

e. Oil and Gas exploration in the inland basins of Lake Chad and Upper Benue Trough have not been concluded.

f. Policy reversals in the energy sector due to lack of an overall energy law.

g. The uncontrolled large-scale use of firewood in the rural and peri-urban areas is a recipe for desert encroachment, erosion and loss of soil fertility.

h. Lack of adequate manpower for the energy sector. There has not been enough training for the personnel in the energy industry on the latest skills and handling of modern day equipments and machines in the industry as it is being done in the developed world.

i. Most of the equipment being used today in the generation, transmission and distribution sectors of the industry are obsolete and can barely function at above 50% capacity.

j. Consumption of energy in Nigeria is very wasteful. The energy sector in Nigeria lacks the adequate equipment to determine the true difference between the energy supplied and energy consumed. Hence, only the real power is billed while the reactive power is never considered.

k. Community relations problem in the Niger-Delta region. The relationship between the oil producing community in the Niger Delta and the oil production companies has grown from bad to worse as it has led to different kind of destructions and deaths on many occasions.

WAY FORWARD TO A SUSTAINABLE ECONOMY

Since Nigeria has solely relied on hydro and gas/thermal electricity generation for decades and the industry has refused to grow despite the enormous amount of funds channeled into it, it would be advisable for the nation to consider the overdue investment in the other renewable energy sectors such as wind and solar power resources which are in abundance in the country. More so, energy efficiency is assured with continuous investment in this aspect of the sector to achieve sustainable development in Nigeria. The need to conserve the present energy generated in the country using energy-efficient

products and the appropriate practices is essential for sustainable development. Therefore; it is recommended that the country should do the following:

a. Develop policies on energy efficiency and integrate them into the current energy policies. A comprehensive and coherent energy policy is essential in guiding the citizens towards an efficient usage of its energy resources.

b. Create awareness on renewable energy and energy efficiency.

c. Establish an agency to promote the use of energy efficient products and ensure the appropriate practices.

d. Develop and imbibe energy efficiency technologies.

e. Establish a testing and standard laboratory for renewable energy technologies similar to that in South Africa.

f. Establish a renewable energy funding/financing agency such as India's Indian Renewable Energy Agency.

g. Develop appropriate drivers for the implementation of energy efficiency policies.

h. Clean energy facilities should be embraced in the different sectors of the Nigerian economy.

i. Biogas from wastes as a source of cooking fuel in homes.

j. More efficient passive and full usage of solar technologies in the residential, commercial, and industrial sectors (Oyedepo, 2012).

More so, Nigeria could imbibe the road map of UAE in renewable energy to bolster its regional position as role model in sustainable development such as:

i. Increasing the target for power generation from clean energy to 30% by 2030.

ii. Development of leadership strategies in renewable energy in order to create an innovation-driven environment that generates job as the UAE intends to generate over 90,000 jobs from renewable energy by 2030.

iii. The Abu-Dhabi based company Masdar has invested \$2.7 billion into clean-energy projects over the past decade. Nigerian government can encourage such huge investment from both local and international investors.

iv. With the reduction in lower oil and natural gas consumption, the UAE's savings from the renewable energy sources were between \$1 billion and \$3.7 billion in 2015. Nigeria government can save more than this value with proper investment and administration in renewable energy.

v. Abu Dhabi's Shams-1 is the largest renewable energy project in operation in the

Middle East. Shams-1 is a 100 MW development that is one of the world's largest concentrated solar power (CSP) projects. This is also possible in Nigeria with commitment to achieve it.

vi. Mohammed Bin Rashid Al Maktoum Solar Park, the world's biggest solar park, is being built in Dubai. \$14 billion solar park will eventually produce 5,000 megawatts, which is enough to power 800,000 homes by 2030. Mohammed Bin Rashid Al Maktoum Solar Park will produce power for as little as \$2.99 US cents per kilowatt-hour. This is a wake-up call for the leadership of this great nation to emulate the good things going on UAE.

CONCLUSION

It could be concluded in this report that from the analysis and data presented above, the

country Nigeria is suffering from acute energy shortage. Despite the abundant conventional and renewable energy resources available, the supply of processed energy is far below the demand.

The only way to ensure the attainment of Vision 20-2020 is to emulate the developed and fast growing economies of the world by mainstreaming energy planning into overall national plans.

There should be an overall energy law that will harmonize sub-sectoral energy enactments, to fast-track socio-economic development of the country. More so, government should invest and at the same time encourage investment into renewable energy resources for the good of both the citizens and the investors.

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