

ENERGY EFFICIENCY AND MANAGEMENT AS PANACEA TO ECONOMIC STABILITY IN NIGERIA

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ABSTRACT: *For any country to achieve effective growth and development, its energy has to be diversified. Nigeria depends on mono-cultural crude oil as the main source of energy which is unsustainable and this contributed solely to the economic recession in the country. Therefore, dependence on one energy source will not guarantee the energy security needed in economic sectors such as transportation, education, health, banking, security, factories etc. The paper examines how alternatives to fossil fuel can contribute in the attainment of Nigeria's economic growth and development in terms of energy efficiency and management. On the other hand, the reviews shows that neglecting utilization of renewable energy sources such as wind, solar energy, geothermal, biomass poses a major threat to the attainment of energy security in the country. Mitigation to this challenge includes sectorial funding, research and development, promotion of energy efficiency and conservation management, and effective energy pricing policy.*

KEYWORDS: energy efficiency, energy management, economic stability, sustainable energy, and renewable energy.

INTRODUCTION

Energy efficiency simply is an energy saving measures which involves the application of technological means of less energy utilization for provision of same level energy required for a certain services. It's a significant tool in reducing the amount of energy needed to provide products and services. For instance, insulating a dormitory allows a building to use less heating and cooling energy to achieve and maintain a desirable temperature [1].

Energy efficiency is a significant parameter in ascertaining a safe, affordable, reliable and sustainable energy system for the future. This measure is the cheapest and easiest means of addressing energy security as well as environmental and economic challenges ranging from

combating climate change, cleaning of the natural air we breathe, enhancement of business competitiveness and drastic reduction of energy cost for consumers. Doing more energy requiring task with a less energy have an outstanding effect on our national economy by saving huge amount of money from reduced costs, spurring innovation, unemployment inter alia.

Energy management is the strategy for energy optimization and adjustment. It encompasses an expansive range of activities and expertise in optimal use of energy. This include but not limited to areas of control and measurement; development of management strategies, plans and programs, essential implementation of techniques, technology and tools to improve the efficiency, productivity and to crown it all a sustainable energy. If this system is managed it reduces energy requirements per unit capita while maintaining a constant or reducing the cost of producing same output from same system [1].

All the developing countries in the world, Nigeria inclusive rely so much on energy for economic and social survival. Energy is a requisite force driving most Nigerian economic activities, and it's pertinent to know that "The greater the energy consumption, the more the economic activities and that translates to emergence of a greater economic nation.

Nigeria is one of the developing countries in the world with abundant natural resources such as crude oil, coal, water, minerals including potential energy inclusive. Ironically, increasing access to energy remains the biggest, continuous and most pressing challenge to Nigeria's economic revival. Economic growth is a necessity for evolution from being a third world nation to a developed nation. For Nigeria today, the greater the economic growth, the better the chances of economic development. With proper utilization of energy potentials to meet the expectation, the nation would experience an accelerated economic growth.

Energy efficiency does not only involve cost reduction but enhance chance of revenue proliferation through greater productivity. Ovienuwo (2006) agrees that "energy efficiency is the indispensable component of any effort to improve productivity" and of course contribute to economic resuscitation. Energy efficiency should be the baseline for transition in Nigeria from the present economic retardation to a resource-efficient economic state.

For effective businesses to flourish which is the backbone of any economy, it needs to meet a conventional level of standardization. A rational use of energy results in significant benefits in areas of cost savings and promoting efficiency. Standardization can contribute to better energy management by supporting the spread of best practices and providing end users with necessary

tools for analysis and energy consumption patterns. Energy efficiency improvement has the potentials to produce benefits at all levels of the economy and the society

OBJECTIVE OF THE STUDY

Specifically, the research paper has the following objectives.

- 1 Find out the impact of economic growth with relevance to energy efficiency
- 2 Indicate the ways Nigeria can improve its energy capacity with renewable sources
- 3 to examine the impact of reliance on mono-cultural economy as a major source of economic growth
- 4 To access how energy diversification helps in economic resuscitation in Nigeria economic development
- 5 How energy efficiency can promote job creation, industrial proliferation, and job creation.

STUDY BACKGROUND

The biggest national challenge we have today in Nigeria is over reliance on petroleum products which led to non-diversification of energy consumption that would have spurred appropriate energy mix. The prominence the country placed over oil upon discovery is extremely higher practically because is not substitutive in terms of consumption thereby neglecting other sources of energy which the country have in abundance like coal in eastern part of the country believed to be Sub-bituminous i.e.it has slow burning features with effective heat production. Before the Discovery of crude oil in Nigeria Many people use coal (which contain low Sulphur and ash content) as source of fuel and till today remain the oldest fuel in the country, but with the discovery of crude oil this beneficial resources was abandoned with billions of untapped reserves.

Energy consumption and economic growth are directly proportional, so the impacts of increased consumption leads to more revenue generation which enhances economic activities thereby promoting economic and socio-economic development such as Job creation, poverty alleviation, and industrial proliferation among others.

SOURCES OF ENERGY AND THEIR IMPACTS

There are two types of energy viz. Potential Energy and kinetic Energy. Among all these, sun is considered as the ultimate source of energy to the biosphere

Potential energy refers to energy stored at rest, once the object moves (Motion) the potential energy is converted to kinetic energy and hence called energy in motion.

It's pertinent to know that energy has variety of forms ranging from thermal energy, solar (radiant), mechanical, electrical, chemical, and nuclear energy. Energy is stored in many distinctive ways, Independent of the forms, energy sources are divided into two forms --

1. Renewable- energy is the energy generated from natural processes and are continuously replenished. Renewable sources of energy can be recycle or recovered when used and are effective considering the impact of green house gases contributing to global warming and climate change This includes sunlight, geothermal heat, wind, tides, water, and various forms of biomass. This energy cannot be exhausted and is constantly renewed

2. Non-renewable energy otherwise known as conventional energy or non-recoverable energy such as fossil fuels and are energies that are non-traditional with low environmental impact. The term alternative is used to contrast with fossil fuels according to some sources, alternative energy have less environmental effects, a distinction which distinguishes it from renewable energy which may have less or no significant environmental impact.

Several energy forms are discussed below which forms a significant building block for economic stability In Nigeria;

Natural Gas Energy

Nigeria has the largest natural gas reserves in the Africa continent and is among the ten most enriched nations in the world, the quantity of natural gas reserves in Nigeria is almost twice as much as the oil, and the horizon for the availability of natural gas is inevitably longer than that of oil. The known reserves of natural gas is more than 190 trillion barrels standard cubic feet (bscf) of natural gas and expected to last for more than a century as a domestic fuel and a major export. Even though a remarkable progress has been recorded by the present administration in maximizing potentials and value addition to the nation's natural gas reserves, about 40% of natural gas is flared which implies a drastic drop from the 70% proportion flared before. The hitherto flared gas is being channeled into gas powered projects for rapid utilization and monetization with a view to maximizing value addition to the nation's natural gas resource. The gas flared is economically wasted and this wastage is due to the infrastructural deficit in the country which can be mitigated by to building suitable infrastructure to reduce this wastage and accelerate supply and increase patronage form stakeholder of this energy product and this could enhance revenue generation, job creation and to crown it all poverty reduction in the country. Natural gas can be also being

converted into liquid and this is a product that's today witnessing an increase global market demand. Natural Gas has been affirmed to be the fastest growing source of primary energy today and as a nation we stand a bigger chance of harnessing this potential to boost our economy [1].

Coal Energy

This is a non-renewable energy source because its creation takes millions of years. The energy in coal comes from the energy stored by dead organisms containing carbon deposits that lived millions of years ago, when the earth was partly covered with swampy forests.

Nigeria is endowed with 22 mines of coal resources which have a total proven capacity of 2.7 billion tonnes. And is the first energy resource to be exploited in Nigeria. It then immediately became the power of the country but its relevance began to drop immediately after oil discovery. The level of significance attributed to coal by the nation began to drop very quickly and today it is insignificantly used as an energy resource. In many countries which use coal as an energy resource like United States, increased coal consumption reflects the increasing output of industry, transportation, and even agriculture. Coal resources in Nigeria are sub-bituminous with low sulphur and ash content and that makes it an attractive force to so many African countries like Ghana; Egypt as well as European countries which will definitely show interest in the partnership. Strategic exploitation of this will witness an unprecedented industrial revolution which will spur gross economic activities.

Electricity Energy

Electricity is simply the flow of electrical power. It is a secondary energy produced from conversion of some sources such as coal, natural gas, oil, nuclear power and other natural sources, which are primary sources. The energy sources in making electricity can be renewable or non-renewable, but electricity is neither renewable nor non-renewable.

Electricity is a vital energy for economic growth, its generation has been used to empower human technologies and engines for more than a decade and its supply has become an indispensable part of human life. This energy is a necessary condition for growth and sustainability of any economic nation, developing or developed. Krizanich is saying Food is to a hungry man and energy is to economic growth of a nation. In all ramifications electricity consumption increases productivity which translates to economic momentum building.

A significant population of Nigerians today has no access to this Energy; the majority of urban areas where there is supply also consume half of its capacity. With an increased population coupled

with diversification of economic activities, energy demand is rising rapidly, but electricity supply remains relatively stagnant. The inefficiency as well as inadequate facilities to boost the supply has also been a major cause of the increasing gap between demand and supply of this energy.

Electricity consumption have diverse impact in socio economic activities of any nation and consequentially the living standards of it citizens.

The essence of this energy in a nation is one so pertinent that generating sets is owned by most Nigerians. This shows that electricity is not only important for fueling economic activities and economic growth but a necessary tool for the attainment of sustainable and comfortable life [1].

Functions of this energy are very numerous and increase economic but the electricity is in short supply,

Prudent and rational use of energy has been professed as a measure to enhance consumption of electricity. Engineers and scientists have also advocated the potential rational energy use depending on scientific knowledge and technology. This will aid energy conservation and sustainability (Jochem, 2004). Towards this end, the long term technical potential for rational use of energy could be driven by various efforts. Among these efforts, increasing energy efficiency is paramount.

The inability for the sector to efficiently meet the demand of populace has been detrimental to our economic growth as well as stability as a nation. No doubt that the sector is facing lots of inconveniences from poor funding to operational and technical problems but if this sector is fixed Nigeria will among the first twenty economies in the world which has been a Century vision bemoaned by the inadequate energy system in the country [2].

In almost all the developing nations its only Nigerian cities like of Abuja, Lagos, Port Harcourt, kano and Onitsha have a closing time which is attributed to lack of electricity and these are our economic power house. Energy efficiency provides another option for meeting air quality goals in that combustion volumes are reduced proportionately with fossil fuel consumption. Energy

Efficient electricity management will be a vital force in driving growth in the energy, manufacturing and social sector because it benefits does not only effects factors of Production but also capital accumulation.

The fact that we want to survive economically this important energy sector must be integrated, electricity production should become an economic policy and uncompromised state emergency declaration is needed.

Petroleum Energy

In Nigeria, crude oil is the dominant source of commercial energy use, accounting for over 70% of national energy consumption, of this, the transport sector accounts for about 70% of commercial energy consumption.

Crude oil has been a major economic growth determinant. For decades it has claimed the supreme position in the export list of the country .Nigeria is one of largest oil producing country in with average revenue of 822.65 Billion Naira revenue from 2010 to 2016 with a proven reserve of 35.2 billion barrels[].

However, as a member of the Organization of Petroleum Exporting Countries (OPEC), Nigerian oil attracts important patronage from Global market simply because Nigerian oil is of high quality and most environmental friendly relative to oil from other countries. Nigeria's export blends are light, sweet crudes and have low sulphur contents of 0.05 - 0.2%.The local consumption of oil in the country is low. With only 3 of 4 refineries at work in Nigeria there is inadequate capacity to meet the increasing demands for petroleum products. Nigeria's four refineries have a total capacity of 445,000 barrels of oil per day but these refineries are currently unable to meet domestic demand of 300,000 barrels of oil per day[]. This is as a result of inadequate maintenance and a general declining technical inefficiency causing incessant shortages, hoarding and long queues at petrol filling stations. The effect of oil as an energy source is obvious and the impact is mostly experienced in the economic accounts. Petroleum as an energy oil resource contributes significantly to economic growth due to global recognition. For this energy to be efficient, infrastructural development needs utmost consideration to effectively enhance supply and appreciable domestic consumption which will not only translate to expressive revenue generation but accelerated socio economic advancement in the country[].

RELEVANCE OF ENERGY TO ECONOMIC DEVELOPMENT

Energy is an essential commodity for most human activities, directly as fuel or indirectly to provide Power, light, mobility.

Traditionally , populations depend on their own physical strength for labor, the power of domesticated animals, such as horses and oxen, then on water and wind, steam engines, hydrocarbons (fuel motors for land, sea and air vehicles) and finally - electricity. Energy combined with technology speed up human force (e.g. motor fuel for cars, electricity for household appliances), thereby playing a crucial role in pre- and post-industrial and then IT societies. For other essential needs such as space heating and cooking, the transition has been from local biomass

(e.g. firewood, agriculture waste) to industrialized fuels (e.g. LPG, natural gas) and also electricity (Stern, 2011).

Global access to reliable energy services such as renewable energy sources that are complementary with economic actors' incomes has a strong potential for positive socio-economic development in many areas such as

1. Technological innovation and employment generation
2. Increase sources of revenue generation.
3. Rural depopulation.
4. Reduces dependence on Import by enhanced patronage of domestic product.

Energy insecurity is an impediment to economic and social development of any nation by creating a structural barrier and supplemental costs at both micro and macro level.

More so, energy is required to meet basic human needs. Thus, population access to modern forms of energy is essential for the provision of clean water, sanitation and healthcare, provision of reliable and efficient lighting, heating, cooking, mechanical power, transport and telecommunication services.

Energy, especially electricity, provide several social benefits which are in direct correlation with economic growth such include the followings

- Agricultural and industrial development especially in rural areas;
- Conducive environment for comprehensive education due light availability which can be an attractive force to so many classical tutors.
- Access to electricity energy, efficient fuels and cooking appliances reduce domestic pollution that causes so many diseases.

In terms of national security as our troops improve the energy efficiency of their equipment, buildings and general practices, they save money that can be invested directly in defense programs and current operation against Islamic extremist, Boko haram will witness an unprecedented progress.

Concisely, efficient energy management leads to health and well-being impacts, energy affordability and access, increased disposable income, industrial productivity and competitiveness, Infrastructural proliferation, natural resource management, reducing greenhouse emission and to crown it effective decrease in energy related public expenditures.

CONCLUSION

From the above citations and reviews, it's obvious that there is direct relationship between energy consumption and economic growth. The supreme position of energy as an instrument to national economic growth cannot be overemphasized, and for effectiveness there is urgent need to intensify effort in energy diversification for optimal economic growth.

Energy is the vital backbone of any economy. Research and development backed up by energy efficiency will be beneficial to Nigeria and world at large. Increased investment especially in infrastructure will be needed to foster increased energy production. The private-public partnership project could be carried out to see the increase in provision of energy.

Nigeria almost has all the means to increase its energy security for the present and future development of economic growth with renewable source of energy such as water, wind, geothermal, solar energy, ocean waves, tides, and biomass. Its estimated by Draft National Energy Master Plan, 2007 that Nigeria has approximately 35 billion barrels of crude reserve, 2.7 billions tones of coal, average daily solar radiation of 6.25 hours between 3.5 hours at the coastal and 9.0 hours in the northern part of the country. Daily, 5.08×10^{12} KWh of energy is received from the solar radiation. Therefore, if electrical appliances with 5% efficiency are used to cover on 1%, then 2.54×10^6 MWh of electricity can be produced which is equivalent to 4.66 million bpd.

Also, Nigeria has seven river basins (hydro electric potentials) and estimated to produce 734.2 MW but currently stands at 12,220MW. It's estimated that biomass can contribute to 144 million tons per year. Nigeria is currently consuming approximately 43.4×10^9 Kg of fuel wood per year with an average daily consumption of 0.5-1.0Kg of fuel fire wood per individual. Biomass can contribute to about 37% demand of energy in Nigeria for economic growth if utilized appropriately.

Wind distribution depends on the location of a state with average production of 8MWh/yr in Yola, Adamawa state, 51MWh/ yr in Jos, Plateau state, and 97MWh/yr in Sokoto state.

These are all indications that Nigeria can build up its cleaner energies and boost its energy security with less environmental pollutants which are even more affordable than the fossil it depends upon currently.

RECOMMENDATIONS

The increased availability of energy services is a key to stimulate economic development along the different stages of the development process. The following recommendations could go a long way in improving economic activities of the country.

Increased Sectorial Funding

Energy sector is capital intensive and requires significant investments to ensure a desirable energy delivery. Government need to increase budgetary allocation to the sector and ensure speedy release of funds to maximize the potentials of this sector. An effective public and private sector partnership will certainly overcome investment problem in the system. Adequate funding is really a tool that will ensure sectorial effectiveness.

Energy consumption produces emissions that pollutes environment. But investments in energy efficiency across the biggest sectors of our economy could abate up to 1.1 gigatons of greenhouse gas emissions annually – that's equal to taking out about all cars and trucks of the Nigerian road for one year.

Research Development

There is need to increase research and development in the energy sector so that innovation can be fostered. Research and development into renewable sources of energy could be fostered and this could enhance economic growth. Increase energy supply around the country

Scientific observations have shown that an economic growth is a function of consistent supply of energy. Increase in energy supply in addition to optimal production and utilization in an energy deficient nation like Nigeria will have a direct positive influence on national economic security.

Infrastructural development is one of the significant trends developed nations uses in their economic stabilization. As a way of enhancing a growing economy, there is need for proper maintenance of available infrastructures and rapid erection of more by enhancing a private sector participation via flexible and industry friendly regulatory policies review which are considered to be detrimental to international investors infrastructural participation. Enhance infrastructural operations will inevitably increase production, consumption and economic growth.

Promote Energy Efficiency, Conservation and Management

Lack of knowledge in energy from production to conservation and management has been an impediment to sectorial growth in Nigeria. Public awareness and consistent orientation on energy efficiency standards and its overall effect on the citizens will help in energy conservation. Orientation in areas of buildings and use of domestic appliances in consumption power and counseling on use of lower energy consuming appliances will help save more energy that could be channeled for another Purpose.

Effective Energy Pricing policy

Since energy is pivotal to the development of nations. Its use is directly correlated with healthy and efficient economic growth. Blackouts cripples industrial sector, lack of electricity affects our life in all ramifications and since energy consumption will drive the economic indices a standard and affordable pricing policy review is needed so that all and sundry participation will be witnessed. When energy prices are exorbitant, there will be a rampant abuse of resource by larger population of low income class that can't afford it and when prices are a bit too low there tends to be inefficient use of energy. So an effective and considerable pricing policy needs to be effected to harness this potential