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AN OVERVIEW OF ENERGY CRISIS AND THE RENEWABLE ALTERNATIVES: THE NIGERIAN EXPERIENCE

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ABSTRACT: *Among the mirages of challenges confronting the global community today, that of energy is very prominent. Sometimes, it is the crisis, politics, shocks, uncertainties, tendency for depletion, inadequacy in supply, high cost and non-availability to larger percentages of the people and so compounding the poverty level. Nigeria is not exempted from all these worries like many other nations of the world. However, the mark difference in some of these other nations is diversification and development from the non-renewable fossil fuel or hydrocarbon to the renewable alternatives which are eco-friendly, abundant, replenishables, readily available and likely more cost effective and affordable if promoted. Nigeria is greatly endowed in renewable energy alternatives but with little or an insignificant attention. In this paper therefore, an attempt was made in explorative research method to have a position paper on Nigeria's oil industry, the politics and the need to promote the renewable alternatives. Some research questions dealt with were; what Nigeria's energy profile is like in the context of the world energy index and what is the relative estimate of Nigeria's Renewable Energy Base in World's Renewable Energy Index Profile? Among others, it was discovered that Nigeria is blessed with diverse alternative energy sources from the various secondary data examined (Hydro-power = 18% and others = 82%). It is "the others" that this paper seeks to throw more lights on to meet our energy demands.*

KEYWORDS: Energy, Crisis, Renewable, Alternatives, Hydro-Carbon, Eco-System, Economy

INTRODUCTION

The sustenance of the entire universe is premised on energy, energy flow, energy chain, energy storage and conversion, energy mix and unfortunately energy misuse which will likely mar the whole existence and life if care is not taken. For instance, nuclear energy weapons and arms race needing control, biological weapons of warfare, natural catastrophes and eventual eco-system damages. It is a world of energy which if not regulated, managed and controlled, can still bring about the water loo. Ranging from the primary source of energy to our world through the closest star to the earth called sun providing solar illumination and radiation converted through photosynthesis by plants into a stored form known as carbohydrate or fat and oil for herbivores to consume which in turn is fed on by carnivores or omnivores, the energy chain/flow goes on through food chain/web mechanism. The reminder of energy in plants and animal decomposition also becomes fossil fuels or hydro-carbons while those pressurized under intense temperature becomes coal – another energy deposit. Through the knowledge of science and technology, other diversions of energy dimensions have evolved. The splitting of atoms is known to generate such high energy which is nuclear power today. The pressurized gas given its components and constituents has resulted into gas as another alternative source of energy while from time immemorial given Archimedes's principle of up thrust in physics as

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an example, hydro-power which is energy through water has been known to man. Lastly but not the least are solar energy which still radiates as ever and wind mills. The bone of contention now not minding the politics of energy in our world today which is very serious is its economies and challenges. The critical worries now are the tendency over time of the world's main energy supply base – fossil fuels depleting with the serious damages to our ecosystem in form of green-house gasses, ozone layer depletion leading to intense ultra violet rays emission on earth, global warming, oil spillage, deforestation and desertification, high level ocean surge, seismic vibrations in form of earthquake and tremors and a number of congenial diseases due to pollutants from man's various activities in the energy web further reducing life span, expectancy and general welfare and wellbeing. Nigeria is not left out in all these challenges and consequently, the eventualities of the depletion of sources of energy.

Statement of Problem

Given crisis world over in the energy mix whether from supply and demand sides, the angle of politics, likely depletion or need to promote the renewable alternatives, nations of the world are fast taking their destinies in their hands by promoting diversification from the fossil fuel hydrocarbons that has been and still causing the world so much crisis to a more readily available, non-depleting, cheaper and eco-friendly renewable alternatives but from all indications, despite her enormous resources, Nigeria is still lacking and lagging behind in this move which globalization features may further aggravate hence, this study pointed out the need for the utilization of our renewable sources of energy for domestic economic purposes.

Objectives

The paper is to complement the ongoing efforts globally at promoting other sources of energy through the renewable alternatives. The general objective of the study is to have an overview of energy crisis and the renewable alternatives in Nigeria. The specific objectives of the study are to determine the following;

(a) To determine the benefits of renewable alternative energies over the fossil fuels.

(b) To determine Nigerian's probable position in the renewable energy mix..

(c) To justify the need for the nations of the world to annex science and technology appropriately to promote and develop renewable energy alternatives to save the world from the impending energy implosion either fossil fuel damaging effects on the eco-system (oil spillages) or its politics causing global conflicts (blood oil and blood money) or that of impoverishment of nations and people by oil cartels.

Research Questions

The following questions are to be addressed in this paper namely;

1. Can the world survive without fossil fuels or its minimal usage while promoting renewable alternatives?
2. What is the place of Nigeria in the renewable alternative mix?
3. Is there any future for renewable alternative energies given the world energy politics and its economy or cabals?

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Objectives of the Study

This study is to examine the following:

1. Identify and determine the sources of renewable energy globally and specifically, Nigeria.
2. Identify the demerits and short comings of fossil fuel energy sources in terms of global warming, green house problems and ozone layer depletion and,
3. Discuss how Nigeria can operationalize the renewable energy sources.

LITERATURE REVIEW AND THEORETICAL FRAMEWORKS

Since the time Isaac Newton came up with the principles of motion to James Watt glowing tube, Michael Faraday's electricity current, George Stevenson's locomotive engine to automobiles with internal combustion, jet engines, nuclear reactors, solar powers, bio-fuel, bio-gas name it, we have energy evolution in our world. Basically energy in stored form is potential while in action is kinetic. The relativity of elements and compounds readily releasing the stored energy is one main source of challenge in the energy value chain. In living organisms, from green plants or primary producers to primary consumers like herbivores to secondary consumers either as carnivores or omnivores, the energy flow vibration from photosynthesis to translocation in stems, roots, leaves, fruits, receptacles among others is first in the mouth by mastication where digestion of carbohydrates starts to the intestines and finally by assimilation in cells mitochondria, energy for the organisms' metabolic activities is librated. Dead organisms either as plants or animals produces hydrocarbons that goes through fractional distillation (varying temperature and pressure) to have components like premium motor spirit called petrol, aviation fuel, kerosene, diesel and other petro-chemical products. A function of type of engine, given internal combustion mechanisms, energy is librated for different uses.

In hydro-technology, water current rotates turbine engines to generate electricity, irrigation farming among others which goes for wind mills and turbine also. In the same light through science and technology is also nuclear energy which comes from electrons when atoms are split in nuclear reactors. Uranium is one good means of generating nuclear energy. However side effects like nuclear wastes disposal, pollution and risks (Chernobyl disaster in Russia) among others are the worries though it produces high level energy, also relatively cheap and stable.

The last but not the least categories are solar energy which comes from the sun, the bio-fuel and bio-gas in bio-mass. All these are tagged renewable energies due to their non-exhaustive sources. They are self replenishing, over abundant, readily available natures gift to mankind, eco-friendly and life preservers unlike the non-renewable, risky, dangerous, scarce, expensive, limited and non-replenish able eco-destroying ones also tiring the whole world apart by the politics (blood oil, oil politics, oil glut, petro dollars and so on).

Justification Theories

In the quest to promote renewable energy in place of hydrocarbon fossil fuel options, different schools of thought have opined differently in favour or against the idea and such is not strange if the language "oil politics" is anything to go by. Therefore, the following theories are

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examined to ascertain the credibility or otherwise of promoting the development and use of renewable energy options among nations Nigeria in particular. The theories are:

- Primary versus secondary forms of energy (P vs .SFoE)
- Renewable versus non renewable forms of energy (R vs.NRFoE)
- Commercial and non commercial energy (C&NcFoE)
- Modern and traditional energy (M&TFoE)
- Conventional and non-conventional energy (C&NcFoE).

Given views in the literatures, primary energy do come from natural means and resources trapped or captured from the outflow in the main source with no form of transformation or conversion but simply cleaning and separation. The renewable energy options being advocated falls into this classification compared to the secondary energy sources whereby energy acquired from primary sources must be collected, transformed or converted to some other forms above merely separating and cleaning which is the attribute of petroleum products and electricity energy from it. One sterling justification in favour of renewable energy options in the category of primary source of energy is that they are very economical to use and the benefits to the cost is favourably positive specifically now to justify renewable energy options to the non-renewable forms, literatures agreed that the renewable energy options are derived from limitless natural resources that are self sustaining and so not subject to depletion in comparism to the non-renewable options that area subject to depletion over time when being used. Renewable energy options are abundant, self-sustaining and always available in any quantity needed or demanded.

Since the economy of most nations of the world like Nigeria is tied to the sales in fossil fuels and other non-renewable energy sources, justification on the pedestal of commercial and non-commercial bases for renewable energy options is very necessary. That the non-renewable energy alternatives like coal, petrol, gas and diesel to mention a few have commercial values by having market space (locally and internationally) is not in doubt but the renewable alternatives can also have commercial values through opportunities in the market space to sell the technology for their utilization in form of accessories, installation and energy conversion to other forms that can make them be sold in the market space. Electricity from solar sources can be fed into the national grid and then sold to make money just like bio-gas from bio-mass can also be sold in local and foreign markets. It therefore, means that renewable energy sources are also commercially viable to nations and can fit into the energy markets as well domestically and internationally which will be advantageous to a nation like Nigeria as well whose main source of income now is crude oil.

The next justification is in the aspect of conventional and non-conventional energy mix. Available technologies presently in generating energy world wide for non-renewable options are tagged conventional but incidentally seen to be very expensive and destructive to the eco-system so needing replacement which renewable alternatives fortunately have the possibility for and so are categorized as non-conventional. The technologies needed to generate renewable energies are found to be available, eco-friendly, durable and manageable.

So far, it has been identified and justified given the yardsticks mentioned earlier that renewable energy options are basic source of energy (primary) with limitless and abundant source of

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supply since they are renewable. They equally are commercially viable needing new technologies that are eco-friendly compared to the present ones in the non-renewable mix like petroleum and lastly, the renewable alternatives can adequately meet the energy requirements of nations and peoples adequately. No doubt, nations like Nigeria should promote and invest in such.

World Energy Index and the Renewable Alternatives Mix

That energy drives the world and everything that goes on within it is not debatable, however, the mix, supply demand, poverty and politics seems to be too much for the world and the nations there in to cope with and managed sufficiently and effectively. The need is therefore imperative to understand what world energy profile looks like and the distribution/spread among the nations (WEP verse D&s N). In the mix constituent, we can then explore the renewable options and mechanisms for development to meet for instance observed or perceived World Energy Deficit or Gap (OPWEDG) or simply World Energy Requirement Gap (WERG).

The World Energy Index on the supply side (WEI supply) is largely on fossil fuels also called hydro-carbons. Others are the nuclear and the renewable options that are gradually gaining attention which African countries like Nigeria must consider going into..

Currently the World Oil Reserves by region is as follows, given views in Energypedia (2015) and dailyfusion.net;

Table 1;World Energy Profile by Regions

Middle East	**(56%) =0.56**
Africa	**(9%) =0.09**
Asia & Oceana	**(3%) =0.03**
North America	**(16%) =0.16**
Central & South America	**(8%)= 0.08**
Europe	**(1%)=0.01**
Euroasia	**(7%) =0.07**

Source: Energypedia (2015)

In the above table, given energy demand idea, it shows that Europe, America and Asia where the greatest level of industrial activities takes place today in the world have a combined reserve of 35% compared to 56% of the Middle East and that of Africa where Nigeria is captured having 9%. All these makes developing the renewable options inevitable which all African nations like Nigeria must also key into.

Incidentally, this fossil fuel reserve in terms of total world oil reserves according to the same source (Energypedia 2015) is as follows:

Oil sands Bitumen	(30%)	=	0.3	(Not readily available for combustion)
External Heavy Oil	(25%)	=	0.25	(Not readily available for combustion)
Conventional Oil	(30%)	=	0.3	(Readily available for combustion)
Heavy Oil	(15%)	=	0.15	(Not readily available for combustion)

The implication of the above is that from supply side given the fossil fuels reserves across the globe, the sources not readily available for combustion equals 70% or 0.7 compared to 30% or 0.3 readily available for combustion laying credence, aside other negative sides of fossil fuels

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to the needs to promote the renewable options to argument the supply side in meeting the demand that is perfectly inelastic that is, any energy demand can only be met be equal energy supply and nothing else outside the energy circle.

Furthermore, it is equally important to know how nations of the world stand in terms of oil reserves. According to dailyfusion.net (2012), the world's top 10 oil reserves holders are as follows

Table 2; World Oil Reserves:

Iran	(9.4%) =0.094
Canada	(10.5%) =0.105
Saudi Arabia	(16.2) =0.162
Venezuela	(18%) =0.18
Iraq	(8.6%) =0.086
Kuwait	(5.9%) =0.059
Libya	(2.3%) =0.023
Russia	(2.9%) =0.929
United Arab Emirates	(5.9%) = 0.059
Nigeria	(15%) =0.15

Source: Dailyfusion.net (2012)

No gainsaying the fact above that all the countries of the world should promote and develop the renewable option to fossil fuel since the reserve is not absolute anywhere. It is therefore necessary to examine the estimated worldwide Renewable Energy options and job opportunities which according to World Watch Institute (2005) is as follows in composition;

Table 3; World Renewable Energy Options and Job Opportunities

ENERGY OPTIONS	JOB OPPORTUNITIES
Small Scale Hydropower	39,000 =1.81%
Geothermal	25,000=1.16%
Solar PV	170,000 =7.88%
Wind Power	300,000 =13.9%
Solar Thermal	624,000 =28.92%
Biomass/Biofuels	1,000,000 = 46.34%
Total	2,158,000 =100%

Source: World Watch Institute (2005)

The renewable energy option from the above is not only promising, eco-friendly, able to be renewed again and again but will generate constantly, given the energy composition mix, adequate energy to power the world and all the activities therein. Hence, Nigeria in this profile should be examined.

According to Energypedia (2015), aside the fact that Nigeria runs a monoculture economy where over 95% of her foreign exchange earning comes from crude oil, the state of energy sector in the country and demand and supply shows that only half of the population or rural dwellers (10%) has access to electricity with about 80% demand and supply gap. The energy resource profile of the country is as follows:

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Table 4 ;Nigeria's Energy Resources Profile

Resources	Value	Units	Rank	Period	Source
Wind potential	0	Area (km^2) class 3-7 wind at 50m	158	1990	NREL
Solar potential	2,783,723,951	Mwh/Year	35	2008	NREL
Coal reserves	209.44	Million short tons	49	2008	CIA
NATURAL GAS	5,246,000,000,000	CUBIC METERS (CUM)	8	2010	CIA World Fact Book
Oil reserves	37,500,000,000	Barrels (bbl)	10	2010	CIA World Fact Book

Source; Energypedia (2015)

Despite the above profile, it was observed in some literatures that Nigeria has one of the least energy efficient economies in the world ranking 21 out of 186 globally. No doubt, renewable energy sources development can help the nation and so in 2006 the country launched a renewable energy plan in areas like solar energy, small and large hydrothermal power stations, biomass, biogas and wind energy. In this renewable energy programme of Nigeria government (renewableenergy.gov.ng/projects) the following projects were initiated even to promote cleaner energy sources:

1. Global Biofuels Ltd for biofuel production at Ilemeso in Ekiti State, Ondo, Osun, Oyo and other Nigerian states that lie between latitudes 7^o and 14^onorth of the equator.

2. Green Carbon Afrique to develop sugarcane based biofuel plants in Girei and Daiusa Local Government Areas of Adamawa State.

3. Integrated Rice Processing and Power Generating Facilitator with carbon quest and Adamawa State Renewable Energy Programme.

4. International Center for Energy Environment and Development (ICEED) for clean cook stoves to replace firewood in the rural areas.

5. Naija Light Solar Electrification Programme; Solar Kit and Energy Saving bulbs.

6. Energy efficient Housing Scheme, Abuja Green City, Renewable Energy Village, The Nigeria Clean Energy Access Programme (NCEAP), Rural Women Energy Security (RUWES project), Compressed Natural Gas (CNG vehicles).

Energypedia news (April, 2015) shows that in many other African countries like Senegal, Tunisia and others across the globe, projects like the previously mentioned ones were already being initiated in policy programmes, promoted and financed by the governments and corporate concerns locally and foreign. For Nigeria therefore, one may ask the question how far with these renewable energy options and programmes of the government? The answer is that it is still a far cry to the expected and so possibly, the 2015 International Energy Workshop of the International Renewable Energy Agency (IRENA) may help to further gear up the nation that is "to support countries (like Nigeria) in their transition to a sustainable energy future given the

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platform for international cooperation, center of excellence, repository of policy technology, resource and financial knowledge on renewable energy including bioenergy, geothermal, hydropower, ocean, solar and wind energy in the pursuit of sustainable development, energy access, energy security and low carbon economic growth and prosperity that are desired in Nigeria.

Challenges of Nigeria's Renewable Energy Programmes and Plans

Some of the noticeable and identifiable challenges militating against Nigeria in her quest at developing and promoting her renewable energy resources are as follows:

1. Policy inconsistencies and summersault on the part of the policy makers majorly the government..
2. Financial limitations leakages.
3. Corruption and mismanagement of the available resources.
4. Technological hindrances and limitations.
5. World oil politics in the crude oil production, processing and sales (The Oil Cartel locally and foreign).
6. Inadequate relevant and related manpower.
7. Poor technological transfer from the endowed developed nations to the less developed ones.
8. Poor technological absorption capacity of renewable energy options by some nations.
9. International energy conspiracy against developing nations (the dumping ground syndrome).

The plausible solution is for nations like Nigeria to be determined and focused in promoting their renewable energy options. This will engender not only safer environment and eco-system for the people but a cheaper energy source that is affordable, available, clean and not depletable.

SUMMARY AND CONCLUSION

It is evidently clear that the world must transit into renewable energy profile option not just for a safer environment but to also guarantee affordable limitless energy for all to power our world and all the activities therein. Nigeria therefore cannot afford to be left behind in this move and the nation equally is more than well endowed to fall in line provided there is the will, determination and resolution to do so. The government and all other stakeholders must take the bull by the horn on this issue not just in the area of appropriate policy design and engineering on renewable energy but also develop the needed manpower. Equally, the United Nations should prevail on the Developed Economies of the World to transfer the renewable energy technology to the Less Developed Economies so as to globally reduce the devastating effects of global warming, Ozone layer depletion, green house problems and ecosystem damages of fossil fuels exploration.

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Again for Nigeria, the renewable energy pathway remains the most viable option for the country at meeting the country's energy requirements and also guarantee a safe environment for the citizenries and earn the badly needed foreign exchange.

Policy Statements and Recommendations

The action plan on renewable energy development in Nigeria and by extensions our world can utilize the following recommendations and policy statements views;

1. The Nigeria governments should vigorously promote the policies on renewable energy development in the country.
2. The nation's educational programmes and schools curriculum aimed at promoting the development of the renewable energy sector of the country should be developed.
3. Corruption and mismanagement of funds meant to develop the programmes on renewable energy must be fought to standstill.
4. Adequate budgetary provision for the programmes by the government must be done with the support of the private bodies and the economic infrastructure must be put in place.
5. International cooperation and synergy on renewable energy promotion and development must be supported by the government and the people as well as the United Nations Organisation (UNO).
6. Nigerians as a whole must be educated on the benefits in the renewable energy mix and why we should all be part of it.

In conclusion, saving our world is a task for all irrespective of peoples, nations and continent and one good way of doing this against hydrocarbon pollutions, global warming, ecosystem degradation and general energy poverty or fuel poverty in some other parts of the world is to promote and develop renewable alternative energy sources which Nigeria is part of and should still develop with greater vigour and determination.

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