ENERGY CRISIS: (A CASE FOR PARADIGM SHIFT IN FAVOUR OF RENEWABLE ENERGY SOURCES)

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ABSTRACT

The future of mankind remains bleak and precarious if we do not come to terms with stark realities of basic environmental problems like proper refuse disposal, blocked drains, land misuse, deforestation and lately tackling the menace of greenhouse gas (GHG) emission and improper disposal of non-degradable materials, not even the bio-degradable wastes. Yet our economy is voraciously consuming automobiles and other appliances whose functioning are already considered harmful to the environment. Our nation is operating energy policy while individuals source energy for their needs anyhow. Various factors, natural and man-made contributing to energy crisis was considered. Merits and demerits of different energy sources are highlighted. A case for paradigm shift in favour of renewable energy sources as alternatives is strongly advocated. As the world advances in research to break away from crude oil through alternative means, ranging from zero-emission coal fire plants through revolutionary solar and wind technologies to safe nuclear energy, electronic cars and pollution-from cars that run on hydrogen; the economic strength of many nations as the suppliers of energy is greatly challenged.

Keywords: Renewable Energy Sources, Energy Crisis, Optofluidics

INTRODUCTION

Energy is a source of power, and man obtains his energy from two chief sources-physical fuels and non-physical fuels. Some examples of physical fuels include coal, wood, oil, gas and others. Energy is very vital for mains economic development and survival. A critical condition in which the demand and need for energy sources outpace their supply is known as energy crisis and this has been attributed to both natural and man-made factors. The natural factor can be traced to geological features of some nation's subterranean regions leading to unavailability of energy sources deposits such as coal, crude oil, natural gas, uranium and geyser. Low water volumes and absence of big rivers for damming are also among natural factors that account for energy crises. Dull sunshine all the year refund makes energy technology less viable. Some man-made factors that may head to energy crisis include wars, oil politics, tampering with energy installation, indebtedness to energy suppliers, financial handicap of poor countries and poor technological know-how on how to manufacture, install or service heavy or complicated energy producing devices such as nuclear power station, big dams and solar energy power stations.

The modern civilization depends on a variety of energy sources for its very existence. Every day we rely on fossil fuels in some way-to transport us to places, to cook our food, or to light, heat and cool our homes. The world already consumes 75 million barrels of oil a day (Awake, 2005) of the total oil reserves, which are estimated to have been some 2 trillion barrels in volume; approximately 900 billion barrels have already been consumed. At present production rates, oil supplies are predicted to last another 40 years (Awake, 2005) the carbon dioxide we create by burning oil continues to heat the planet, yet the economy and the environment are still usually discussed as separate issues.

As the world advances in research to break away from crude oil through alternative means such as zero-emission coal-fired plants, revolutionary solar and wind technologies, and clean, safe nuclear energy, better batteries for hybrid and electric cars and pollution free cars that run on hydrogen, our economic strength as a key supplier of energy will be greatly challenged (Daily Independent, April 2008). It should be noted that as at 1989 Nigeria's oil reserve was expected to have reached 20 billion barrels and production to have also increased from 1.89 million barrels per day (mbpd) to 2.5 mbpd (Awake, 2005) this implies that the reserve/production ratio or the depletion time of Nigeria's crude oil, if there is no further efforts to increase the reserve and if the production still remains at the expected 1989 level, may be within the next 25-30 years (Awake, 2005). Now, our response to this will either be proactive or reactive. If we choose to be proactive, then we must double efforts to diversify our economy, invest heavily into alternative, renewable, clean and efficient sources of energy in order to protect our citizens domestically and corporately and to position ourselves to complete for the future. If we choose to be reactive, then we will keep hoping that the price of crude oil continues to rise and alternative sources are never discovered and crude oil becomes a marginal demand as alternative sources of energy are discovered (Awake, 2005). There is only one credible rout to travel, and that is through the proactive path. But for this, we must step out of the rut of corrupt, selfish agendas that keep us myopic and step out courageously with renewed vision to compete for the future.

Already, we produce crude oil and import refined fuel. This is an anomaly that hints at our attitude when it comes to taking responsibility for our challenges and enforcing the sincerity and willingness to power a solution. In pointing the way forward, it is clear that a credible public private partnership is imperative. We are going to have to step out and accept collective responsibility for charting a way forward. Energy supply in all its ramifications, electricity, fossil fuel, diesel and the works have been a challenge to the public sector as well as to the private sector (Awake, 2005).

ENERGY SOURCES

Traditional Sources of Energy

Coal

Of all the fossil fuels, coal is the most abundant, with enough estimated reserves to last 1,000 years (Awake, 2005) globally; coal-fired power stations supply nearly 40 percent

of the world's electricity. Australia is the world's largest coal exporter, supplying almost a third of all the coal traded worldwide (Awake, 2005) yet, a recent World watch institute press release states "Coal is the most carbon-intensive fossil fuel, releasing 29 percent more carbon per unit of energy than oil, and so 80 percent more than natural gas it accounts for 43 percent of annual global carbon emission approximate 2.7 billion tones" (Awake, 2005) Aside from its environmental impact what effect can coal burning have on human health? To cite one example, a recent *United Nations Global Environment outlook* report stated: "In China smoke and small particles from burning coal cause more than 50, 000 premature deaths and 400, 000 new cases of chronic bronchitis a year in 11 of its large cities (Awake, 2005).

Oil

The world already consumes 75 million barrels of oil a day. Of the world's total oil reserves, which are estimated to have been some 2 trillion barrels in volume approximately, at present production rates; oil supplies are predicted to last another 40 years (Awake, 2005). However, geologists Celin J, Campbell and Jean H Laherrere claimed in 1998: "Within the next decade, the supply of conventional oil will be unable to keep up with demand. These oil industry experts warned: "Conventional wisdom erroneously assumes that the last bucket of oil can be pumped from the ground just as quickly as the barrels of oil gushing from wells today. In fact, the rate at which any well or any country can produce oil always rises to a maximum and then, when about half the oil is gone, begins falling gradually back to zero from an economic perspective, when the world runs completely out of oil is thus not directly relevant: what matters is when production begins to taper off" (Awake, 2005).

Where is oil production expected to taper off? Petroleum geologist Joseph Riva says that "planned oil production expansions…….. are less than half that needed to meet the 2010 world oil demand projected by lEA (International Energy Agency)". (Awake, 2005). *New scientist warns:* "production rates fall while demand continues to raise oil prices are likely to spike or fluctuate widely, raising the prospect of economic chaos, problems with transporting food and other supplies, and even war as countries fight over what little oil is available" (Awake, 2004).

While some analysis see dwindling oil supplies as a problem, others feel that the end of our dependence on oil cannot come quickly enough writing in *unte reader,* Jeremiah Greedon says: "The only thing worse than running out of oil might be not running out of oil. The carbon dioxide we create by burning oil continues to heat the planet, yet the economy and the environment are still usually discussed ass separate issues". Highlighting the consequences of just one countries addition to oil, the Australia Broadcasting Commission reports: "The 26 million vehicles in the United Kingdom generate one third of all the U.K's carbon dioxide (which leads to global warming) and one third of all the U.K's air pollution (which kills around 10, 000 people each year)" (Awake, 2005).

Natural Gas

Over approximately the next 20 years "natural gas is projected to be the fastest growing primary energy source worldwide", States the IEO 2003 report natural gas is the cleanest burning of the fossil fuels and it is thought that the earth holds vast reserves of natural gas (Awake, 2005).

However, "no one really knows exactly how much natural gas exists until it is extracted". States the Washington, D.C. based Natural Gas Supply Association "Each estimate is based on a different set of assumptions.....it is thus difficult to get a definitive answer to the question of how much natural gas exists" (Awake, 2005). Methane is the primary component of natural gas, and methane is "a very potent greenhouse gas in fact, methane has an ability to trap heat almost 21 times more effectively than carbon dioxide" states the previously quoted association. Nonetheless, this source says that a major study performed by the Environmental Protection Agency and the Gas Research Institute "concluded that the reduction in emissions from increased natural gas use strongly over weighs the detrimental effects of increased methane emissions" (Awake, 2005).

Atomic Energy

"Some 430 nuclear reactors supply about it percent of the world's electricity," reports *Australian Geographic.* In addition to these existing reactors, the IEO 2003 report says "As of February 2003, the nations of developing Asia accounted for 17 of the 35 reactors currently under construction worldwide." (Awake, 2005).

ENERGY CRISIS

Energy crisis simply means a critical condition in which the demand and the need for energy sources far outpace their supply (Aniodo, 2004). It is a state of uncertainty in which mankind may no longer be guaranteed of steady supplies of his energy needs. This uncertainty and all its attendant problems constitute energy crises (Aniodo, 2004). It is pertinent to consider some of the factors responsible for energy crises. Natural factors are more or less due to geological features of some nation's subterranean regions heading to unavailability of energy source deposits such as coal, crude oil, natural gas, uranium geysers, couple with low water volumes, and absence of big river for damming (Aniodo, 2004).

In Nigeria, for example, low water levels are known to have led to occasional shortage of energy supply by the National Electric Power Authority. Again in Nigeria, experiments are on top fear to substitute gas for petroleum to power automobile the Peugeot Automobile of Nigeria (PAN) is in the forefront in this wise (Aniodoh, 2004). Other countries which have nuclear power installations include Canada, France, Great Britain, India, Italy, Japan, Pakistan, Russian and Germany.

On the negative side, energy crises can greatly hamper economic development of a nation since energy is a sine qua non for industrialization and other goodies of life. Inadequate energy supply therefore will definitely retard a nation's economic growth.

Excessive importation of oil can impoverish a nation. For example, an energy analyst blamed Brazil's debts, which it incurred as a result of huge oil importation (Aniodoh, 2004). The debts in 1983 were put at 102 billion US dollars (Aniodoh, 2004) Brazil did not take measures to curd oil importation despite the high oil price of about 18 dollars per barrel, which was brought about by the energy crises of 1973. The country continued to acquire foreign loans obtained through International Monetary Fund (IMT) to offset the resultant deficits. Brazil energy supply at the time was put at 90% oil (Aniodoh, 2004). Although the energy crises of the seventies brought about uncertainties and great difficulties into the world economic structure especially in the Western countries where inflation and unemployment prevailed, some other oil producing countries including Nigeria became very rich as a result of the petro-dollars that followed in (Aniodoh, 2004). The period in Nigeria is still fondly remembered as a period of oil boomer.

Following the energy crises of the seventies, some seriously affected nations such as Britain, Brazil and others embarked on oil explorations (Aniodoh, 2004) such efforts led to the discovery of the North Sea oil by Britain. Other nations also discovered and produced oil in commercial quantities. This brought about keen competition between these new oil producing nations and OPEC (organization of oil producing countries) nations. These new oil producing nations flooded energy market with oil, thus forcing down the price (Aniodoh, 2004).

NEW DEVELOPMENT IN ENERGY

Wind

Mankind has long harnessed the power of the wind to propel ships, turn grinding mills, and pump water. In recent years, though, enthusiasm for wind power has swept the globe High-tech windmills now generate enough nonpolluting, renewable power worldwide to provide electricity in many countries like Denmark, Germany, Spain, India and others (Awake, 2005). The United States had 13,000 windmills generating electricity as at then. And some analysts claim that if the suitable sites in the United States were developed, that country could generate more than 20 percent of its current electric needs from the wind (Awake, 2005).

Sun

The sun is the earth's primary energy source. Many scientists believe that coal and oil are the decayed remains of trees and plants that drew their energy from the sun (Awake, 2005). That water that flows into hydroelectric dams is initially drawn from the Oceans by heat from the sun and is transported over land in the form of clouds. The sun's warming rays also propel the breezes that drive wind-powered generators. Yet it is estimated that only about half a billion of the sun's energy reaches the earth (Awake, 2005).

Although awesome in power, the star we know as the sun is just one among billions of similar massive sources of energy in the universe (Awake, 2005). Man-made photovoltaic cells convert sunlight into electricity when the sun's rays excite electrons in the cell (Awake, 2005) world-wide, nearly 500 million watts of electricity are produced

by this method, and the market for solar cells is growing steadily. At present, though, photovoltaic cells are relatively inefficient, and the electricity produced from the cells is expensive when compared. With that produced from fossil fuels (Awake, 2005). In addition toxic chemicals, such as cadmium disulfide and gallium arsenide, are used in the cells manufacture (Awake, 2005) because such chemicals persist in the environment for centuries, notes bioscience, a disposal and recycling of the materials in inoperative cells could become major problem (Awake, 2005).

Geothermal Energy

If a person were to dig a hole in the earth's crust toward its hot core, which is an estimated 4,000 degree Celsius, the temperature would increase, on average, by about 30 degree Celsius for every kilometer dug (Awake, 2005). However, for people who live close to thermal springs or volcanic fissures, the earth's heat is more readily available. Hot water or steam produced by hot spots in the earth's crust is used in 58 countries to heat homes or generate electricity Iceland satisfies about half its energy need by harnessing geothermal power (Awake, 2005) other countries such as Australia are looking into tapping the energy trapped in large areas of hot, dry rock buried just a few kilometers beneath the earth's surface. "*Australian geographic* reports" some researchers believe that by pumping water down to that trapped heat and then using the hot water to turn turbines as it returns to the surface under very high pressure, we could generate power for decades even centuries.

Water

Hydroelectric power plants already supply over 6 percent of the world's energy needs. According to the *International Energy Look 2003* report, over the next two decades "much of the growth in renewable energy sources will result from large-scale hydroelectric power projects in the developing world, particularly among the nations of developing Asia." However, bioscience warns "The impounded water frequently covers valuable, agriculturally productive, elluvian bottom land furthermore; dams alter the existing plants, animals and microbes in the ecosystem (Awake, 2005).

Hydrogen

Hydrogen is a colourless, odourless, combustible gas and is the most abundant element in the universe (Awake, 2005) on earth, hydrogen is an integral part of plant and animal tissues, is bound up in fossil fuels, and is one of the two components that form water (Awake, 2005). In addition, hydrogen burns more cleanly and more efficiently than fossil fuels. The journal of *science news online* states that water "can be split into hydrogen and oxygen when electricity passes through it." While this method could produce abundant amounts of hydrogen, the journal notes that "this see might straight forward process isn't yet economical" "Factories already produce some 45 million tons of hydrogen globally, mainly for use in fertilizers and cleaning agents (Awake, 2005). But this hydrogen is extracted in a process involves fossil fuels- a process that also gives off the poisonous gas carbon monoxide and the greenhouse gas carbon dioxide (Awake, 2005) still, many see hydrogen as the most promising of the alternative fuels and feel it

is capable of satisfying mankind's future energy needs. This optimism is based on recent dramatic improvements in a device known as the fuel cell (Awake, 2005).

Fuel-Cell Power

A fuel cell is a device that produces electricity from hydrogen – not by burning it but by combining it with oxygen during a controlled chemical reaction (Awake, 2005) when pure hydrogen is used rather than a hydrogen rich fossil fuel, the only by-products of the reaction are heat and water (Awake, 2005). In 1839, Sir William Groove, a British judge and physicist, developed the first fuel cell (Awake, 2005). However, fuel cells were expensive to build, and the fuel and components were awkward to obtain. Thus the technology lay dormant until the mid 20th Century when fuel cells were developed to provide power for American spaceships. Modern spacecrafts still use fuel cells to provide onboard power, but the technology is now being refined for more down-to-earth uses (Awake, 2005). Today, fuel cells are saving developed to replace the internal combustion engine in motor vehicles, to provide electricity for commercial and domestic buildings, and to power small electric devices, such as mobile phones and computers, (Awake, 2005). Even so, the power generated from existing stationary fuel cell plants is more than four times as expensive as that from fossil fuel sources. Still, hundreds of millions of dollars are saving invested in developing this emerging technology (Awake, 2005).

Nuclear Energy

In conventional thermal power station, water is heated to boiling in a cool, or on fired boiler, so that the heat could drive the rotor of the generation. In a nuclear reactor the boiling water reactor (BWR) for instance, the equivalent heating of the water takes place when the water flows along narrow rods containing uranium fuel (Daily Times, 1977). The nuclear fissions which produce the required heat take place inside the rods; every motion-producing device in a generation station has a fuel, such as coal, gas, oil in thermal stations and water in the hydroelectric generator (Daily Times, 1977). In the nuclear reactor, the fuel is uranium.

Uranium fuel is in the form of small cylindrical pellets stacked in tubes, the width of a little finger; these tubes are grouped in square bundles of 8 rods each surrounded by a sheet of metal shroud the few rod is handled as a unit known as a fuel assembly (Daily Times, 1977). A reactor core may consist of up to 444 fuel assemblies. It is housed in a cylindrical pressure vessel, known as biological shield. The shield can be about 134 mm thick to prevent nuclear leakage (Daily Times, 1977) Nuclear fuel U235 is produced from natural uranium which is enriched with the fissionable isotope (Daily Times, 1977). A boiling water reactor with capacity of 600 MW will need annual consumption of about 18 tons of Uranium fuel, a small quantity compared with the consumption of fuel in a coal oil fired power station. When a reactor is operating the chain reaction is controlled, the power output is proportional to the number of neutrons producing the fission reaction (Daily Times, 1977). The heat output is measured by measuring the average number of thermal neutrons passing through a square centimeter of the reactor per second. The quantity is known as the Neutron Flux. By keeping the number of fuel neutrons under control by means of mentron absorbing control rods, made of

cadmium, the total amount of energy released in the reactor can be controlled. If the chain reaction is not controlled the end product is the atomic bomb (Daily Times, 1977).

The water in reactor which serves as the moderation is kept under pressure such that it boils at 266 degrees centigrade (Daily Times, 1977). The steam produced flows from the reactor to the turbine where it forces the turbine blade system to rotate and with it the rotor of the electrical generations. When the steam has expanded through the turbine and given off its thermal energy, which is first converted into kinetic energy in the turbine and then into electrical energy in the generator. Sea water is pumped through the condenser facilities its condensation into water. The condensate is pumped through a demineralizer via a pre-heater and feed water pumps back into the reactor (Daily Times, 1977).

BIOFUEL

Nigerian National Petroleum Company (NNPC) in 2006 initiated plan for biofuel in the country part of the reason was that Nigeria would be $150 million (about N21 billion) annually richer when the country adopts the development and application of biofuel as an alternative energy source to crude oil (Nigeria Company, 2008). The aim of the programme was to improve automotive exhaust emission in the country, reduce domestic use of petrol, free up more crude oil for export and position Nigeria for development of the green fuel (Daily Times, 1977). To this end, the national oil company has been mandated by the government to develop the potential within cassava and sugar cane crops, both of which are plentiful in Nigeria. Two potential crops have been identified for the fuel ethanol initiative in Nigeria: Sugar cane and cassava. Nigeria is currently reputed to be the leading producer of cassava in the world of about 30 million tons annually (Daily Times, 1977).

The potential must be seen against the background that the average yield in Nigeria is put at about is tons per hectare as compared to 30 tons per hectare obtainable in other countries (Daily Times, 1977). Moreover, cassava as most perceived as a food crop in Nigeria and not as an industrial crop part of which the biofuel programme is expected to radically change incidentally, food crisis had become a major threat to stability in some African countries brought about by the rise in prices and shortages due to increased use of agricultural products for biofuel.

COMBATING ENERGY CRISIS

Soussan (1988) suggested three options for dealing with energy crisis. These are conservation, substitution and supply enhancement (Aniodoh).

Conservation

The principle of conservation implies using fuel more efficiently such that the same amount of work can be done with less fuel or more work done with the same amount of fuel conservation is however limited by the lack of availability of efficient, appropriate machinery. Although more energy efficient technology has been developed their capital costs are beyond the reach of the poor developing countries of the world.

Substitution

The principle of substitution states that if a specific fuel or range of fuels is too expensive, unavailable or has to be imported in certain cases an alternative fuel supply can be substituted. This principle assumes the existence of cheaper and available alternative, which can be used to power the same machinery or alternative machinery to do the same job. Substitution possibilities are more widespread; Soussan further observed that as far as commercial fuels are concerned, the main possibilities appear to be replacing imported fossils fuels with indigenous fossil fuels, nuclear power and sources of energy such as solar power, wind power and some forms of biomass fuels.

Some nuclear energy experts recommend nuclear power as a cheap and reliable source of electricity which does not require either local energy resources or major fuel imports. There are strong hopes that nuclear powered cars will be built in near future in a bid to beat energy crises and to help reduce millions of tons of carbon dioxide pollutant environment of which cars contribute about 40 percent (Aniodoh, 2004).

Optofluidics

Optofluidics could be poised to revolutionize energy production (Photonics Magazine, November 2011) this is the process of combination of optics and microfluidics, the delivery of fluids through extremely small channels or tubes. Optofluidics principles for energy production can already be found at work where prisms and mirror on the roofs of homes and buildings are commonly used to direct and concentrate sunlight to heat water (Photonics Magazine, November 2011) is believed that by taking this a step further with precision design plus nano- and micro technology optofluidics can offer more efficient solutions for “Solar fuel” generation.

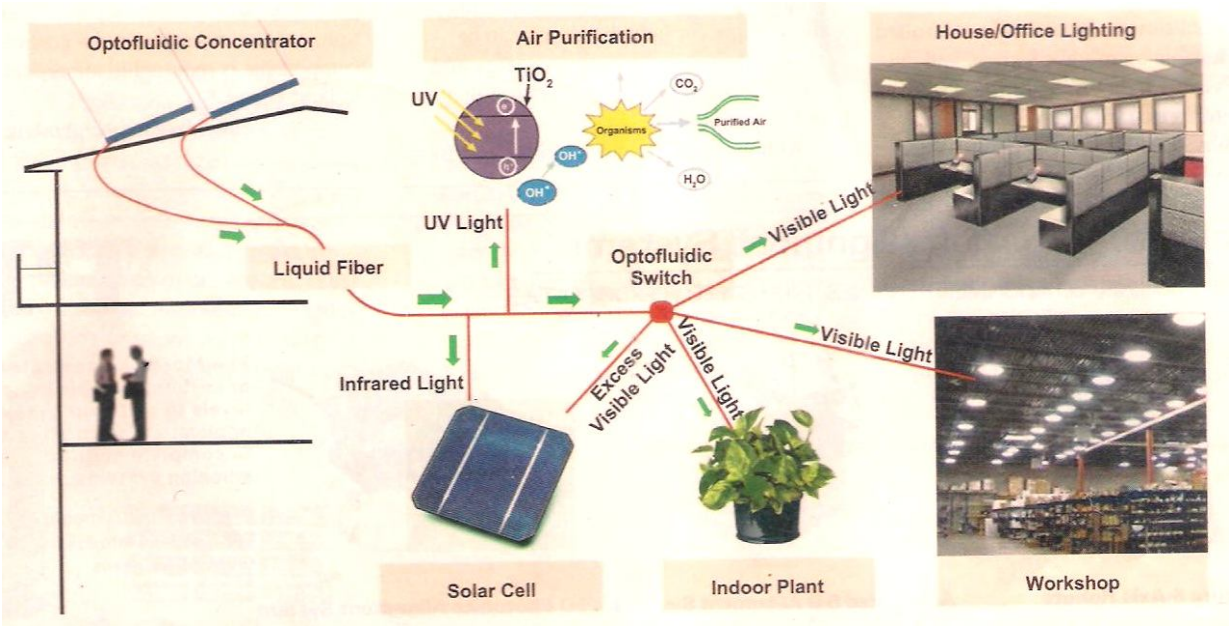

Figure above is newly proposed solar lighting system is composed of an optofluidic soalar concentrator, optical fibres (polymer core or liquid core), an optofluidic switch and the optical lighting terminals. These components constitute a reconfigurable optofluidic illumination network. Images courtesy of EPFL. (Source: photonics spectra. November 2011)

The term solar fuel incorporates not only photovoltaics but also the conversion of energy from the sun into fuel to power other systems that otherwise would require electricity (Photonics Magazine, November 2011) for example, it is used to convert water and carbon dioxide into methane in large industrial biofuel plants (Photonics Magazine, November 2011). The mechanism used to generate solar fuel includes photocatalysis and biofuels. In photocatalysis, the interaction of light with nanoparticles or materials deposited on the surface of a reactor encourages the chemical reaction that generates fuel. In biofuels, algae or similar organisms are used to convert energy from the sun into a usable fuel (Photonics Magazine, November 2011). Directing light and concentrating it where it can be most efficiently used could greatly increase the efficiency of existing energy producing systems as well as innovate entirely new terms of energy production. (Photonics Magazine, November 2011).

Also, systems that use solar radiation for water purification and for indoor lighting during the daytime are on stream (Photonics Magazine, November 2011) for this application, a fresnel lens-type solar collection array can be used to collect and focus sunlight directly into optical fibers. Coupling sunlight to a guiding element allows the light to be chanelled to otherwise in accessible areas- for cridoillumination, for example once inside, light could be directed to the ceilings of office spaces, indoor solar panels or even microfluidic air filters (Photonics Magazine, November 2011) using sunlight to drive an indoor solar panel means that the panel would be protected from the elements and last longer also on stream is a tunable *optofluidic* soar comtrator optofluidic switch, which are the core parts of an optofluidic solar lighting system. As show in the fig below, sunlight is concentrated and coupled into the fibers by the optofluidic solar concentrator panel installed on the roof of the building and adaptable to, the position of the sun (Photonics Magazine, November 2011).

The infrared portion of light is separated and directed into the infrared photovoltaic solar cell while the ultraviolet portion is extracted and can be used instead of the Uv lamp for air purification during the daytime. Finally, the residential visible part of the sunlight is directed into each room for interior illumination (Photonics Magazine, November 2011). The light flow is dynamically controlled by the tunable optofluidic switch, and the excess visible light can be furthers used to generate electricity via photovoltaic solar cells (Photonics Magazine, November 2011). In a comparison between two different solar energy systems for indoor lighting-photovoltaic and solar indoor lighting it was posited that the peak energy density of sunlight on the Earth's surface is about 1000WM2 at noon. (Photonics Magazine, November 2011). At this power, it was calculated that 1m2 of solar cell can generate just 200W of electrical power to fluorescent lamps. On the other hand, for an indoor solar lighting system, the luminous power from a 1 – m2 area of sunlight collector generates 3000w of electrical power to fluorescent lamps at the same optical flux output. Therefore, directly

transporting the sunlight for indoor lighting can be excellent way to conserve energy and could be much more effective that photovoltaic technology.

Although optofluidics involves precise control over fluids and optics at the small scales it must be scaled up for successful application to energy problems a challenge that has yet to be addressed. It was highlighted that most optofluidic implementations so far have been essentially planar, using traditional microfluidic chips. But using the third dimension would be one way of sealing optofluidic concepts (Photonics Magazine, November 2011).

CONCLUSION

All levels of government in the country should as a matter of exigency try to revive the spirit of agriculture. Revamping the farm settlements is strongly recommended. If this happens, it is going to solve a lot of problems like food problem, problem of unemployment. Many of youths that are jobless and causing trouble all over the country will be occupied. It is going to solve the social problem, which is related to unemployment; it is going to boost our economy because if we revamp our farms, we will have the capacity to produce a vast range of agricultural products in this country. We can export, we don't have to live just on oil or petroleum and we will not continue to live in fool's paradise that oil will continue to sustain our economy for ever. Energy crisis exerts both positive and negative effects on man. One of the positive effects is that it has made man to think of alternative, should his present energy sources deplete. On the negative side, energy crisis threatens economic development and human survival. The problems posed by energy crisis can be surmounted through conservation, substitution and supply enhancement.

On a more specific note, some energy experts have expressed concern over Nigeria's new found love for biofuel, which is a solid, liquid or gas fuel derived from agricultural products, stating it could cause huge revenue reduction for the country and equally engender food crisis. But biofuel is generally used to boost fuel, especially the gasoline and there should be no cause for alarm producing biofuel to mix with ordinary fuel depending on the percentage of gasoline. Furthermore, when it comes to production of it, various options of energy are open. All over the world people are looking at how they can cut emission-environmental discharges to the atmosphere. Though protection of environment is very important, it is also pertinent to consider whether there is enough food to feed the nation. It is strongly opined here that there is nothing intrinsically wrong in having biofuel as part of our energy mix.

Nigeria has all the resources needed to create renewable energy sources. The total technically exploitable hydropower potential based on the country's river system is enormous. More than over, deserving more attention in Nigeria at this time, is the potential contribution of distributed small hydro schemes for disperser energy needs of scattered rural communities public-private sector partnerships must engender the investment in research needed for this all important and urgent task of creating renewable and clean energy supplies it is not wrong to be an energy driven economy it

is however "Sinful" not to quickly break away from a petroleum based economy before the consequences hit us. Research must go into squeezing energy out of coal in environmentally friendly ways. New scripted efforts must take advantage of our huge natural resources like the sun. We must involve technology, we must act now. The government on its part must put the relevant policies in creating an enabling environment. There are many things we as individuals can do on our own. We can deliberately consume less electricity, cut down our driving around, use biofuels instead of hydro-carbons and generate electricity from methane released from garbage d umps. In short, we can use more renewable energy such as the sun, Ocean tides, bio-fuels, liquid hydrogen and power our vehicles on electric cells and batteries.

There is already a clean source of electric energy if it can be made absolutely safe and this is nuclear energy which is clean and renewable. The only drawback is what to do with the processed uranium. It is not beyond human ingenuity to find a solution to what to do to the uranium residue after use in the electrical and industrial production what is obvious is that the world cannot continue as before. The future of mankind depends on finding a new source of energy to run our towns, cities and countries. The effect of dependence on hydro-carbons is too glaring in flooding and erosion of coastal cities and disappearance of Island nations.

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