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Sustainable Power: Impact of Generator Driven Economy on the Environment *(pp. 55-61)*

[1] Idiata, David.J, [2]Omoruyi, Sylvester.O [3]Aiwize, Evbosakhare A
[1]Department of Civil Engineering
[2]Department of Electrical/Electronic Engineering
[3]Department of Chemical Engineering
Edo State Institute of Technology and Management, Benin City, Nigeria

Abstract: Nigeria's largely inadequate power generation has dropped by 300mw, from 2200mw to 1900mw. The acute electricity supply hinders the country's development; notwithstanding the availability of vast natural resources in the country while only about 40% of the population of the country has access to electricity. The 60 percent of the population therefore has to depend on generators which use fossil fuel for their power. Fossil fuel combustion for electric power generation is responsible for 65% of all emissions of sulfur dioxide, the main component of acid rain. Electricity generation is the fourth highest combined source of Nox, carbon monoxide, and particulate matter. These emissions including carbon dioxide are the major contributor to climate change, environmental problems in the paper and causes health problems (breathing and cancers). As a result of the environmental problems associated with fossil fuel and generator use there is need for sustainable power consciousness.

Key words: power; sustainable energy; electricity; emissions; energy

1 INTRODUCTION

Power generation in Nigeria, which hovers around 3,000MW at best, is considered largely inadequate for the requirements of the country with a population of 140 million. Nigeria's large inadequate power generation has dropped by 300MW, from 2200MW to 1900MW. (www.afriquejet.com).

An analysis of Nigeria's electricity supply problems and prospects found that the electricity demand in Nigeria far outstrips the supply, which is epileptic in nature. The acute electricity supply hinders the country's development, notwithstanding the availability of vast natural resources in the country (Ajao et al, 2009).

According to Sambo, 2008 adequate energy, he remarked that energy has a major impact on every aspect of modern life adding that, "It plays a vital role in the development of our

nation," therefore, "inadequate supply of energy restricts socio-economic activities to basic human needs, limits economic growth and adversely affects the quality of life,".

The ECN DG observed that the Power Holding Company of Nigeria (PHCN) was generating only about 1,800megawatts at the moment against its installed capacity of 6,000megawatts due to shortfall in supply of gas to power stations which has caused erratic availability of power in the country (Sambo, 2009).

Declaring a state of emergency and setting up committees with absolute lack of technical communication will only amount to speaking in tongues and can only produce reports that at best be heaped in the most remote part of a library. To ensure what he described as "availability and sustainability", revealed that it is the policy of most countries to build new power generating stations irrespective of the conditions of the existing ones. He likened electricity to oxygen in every living thing. Only about 40% of the population of the country has access to electricity which indicates that there was a gap to be bridged in order to meet the national aspiration (Iwori, 2008).

2 SUSTAINABLE ENERGY

Two striking features that characterize energy use trends by humankind in the last 120 years are:

a) The increase, not only in amount of energy used but also in energy use per person and

b) The shifting of the sources from natural sources that uses solar as its primary energy e.g. wood, animal and human energy to fossil fuel i.e. energy stored long ago beneath the earth: coal, gas, petroleum, oil shale and tar sand (Watt, 1973).

Sustainable energy/power is the provision of energy such that it meets the needs of the present without compromising the ability of future generations to meet their needs (en.wiki.org/sustainable_energy).

Sustainable energy sources are most often regarded as including all renewable sources, such as plant matter, solar power, wind power, wave power, geothermal power and tidal power. It usually also includes technologies that improve energy efficiency. Conventional fission power is sometimes referred to as sustainable, but this is controversial politically due to concerns about peak uranium, radioactive waste disposal and the risks of disaster due to accident, terrorism, or natural disaster.

Sustainable energy or power therefore deals with energy that does not jeopardize the environment and the case in Nigeria is a challenge in the sense that over 60 percent of the population of over 140 million gets there power from the use of either gasoline driven or diesel driven generators, these as a matter of fact has its attendant effect on the environment.

3 ENERGY SOURCE AND THE CHALLENGES

The petrol and diesel needed to drive generator are fossil based fuel. The term fossil refers to any remains or evidence of ancient life. The fossil fuels, then, are those energy sources that are formed from the remains of once-living organisms (Montgomery, 2000).

In a nutshell, the fossil fuels were created from incomplete biological decomposition of dead organic matter (mostly plants and marine organism). When organic matter is buried and escape oxidation, it can be converted by complex chemical reactions in the geologic cyst to hydrocarbons. (Botkin and Keller, 1998 and Idiata et al, 2007). The world today depends on fossil-based fuel for its energy production, use and consumption. We are faced with a dilemma-a situation in which a choice must be made between undesirable alternatives in the use of fossil fuel. Continuing reliance on fossil fuels, with the attendant environmental problems, is one alternative (Idiata et al, 2008).

4 ENVIRONMENTAL CONCERNS

Global warming is no longer speculation. The threat is real and has far reaching consequences. While it is a frightening topic among some people, others and very many too are unaware of its implications. A lot of factors come into play and the size of the impacts varies from one region to another (Imevbore, 1994).

Environmentalists have been sounding warnings on rampant discharge of pollutants into the atmosphere, green house effect, global warming and depletion of the ozone layer which are seriously threatening the life support system which God generously bestowed on the earth (Caven, 1994).

Most scientists agree that emissions of pollutants and greenhouse gases from electricity generation account for a significant portion of world greenhouse gas emissions; in the United States, electricity generation accounts for nearly 40 percent of emissions, the largest of any source. Transportation emissions are close behind, contributing about one-third of U.S. production of Carbon Dioxide (http://seattletimes.nwsource.com).

In the United States, fossil fuel combustion for electric power generation is responsible for 65% of all emissions of sulfur dioxide, the main component of acid rain (www.epa.gov/air). Electricity generation is the fourth highest combined source of NOx, carbon monoxide, and particulate matter in the US (www.epa.gov/cgi-bin).

5. ENVIRONMENTAL IMPACT

Two very important developments on the globe: increased carbon dioxide release into the atmosphere and ozone depletion of the stratosphere, have given much concern to the modern world. Evidence of climatic change in the distant and recent past is pursued both on a world scale and on local scale (Agu, 1994). At the local scale not less than 84 million Nigerians i.e. 60 percent needs electricity which cannot be serviced by the PHCN (Power Holding Company of Nigeria). This population has no option but to depend on petrol or diesel driven generators and considering the fact automobiles also depends on the same source. The attendant environmental effects are summarized below according to Idiata, et al 2007 and Idiata, et al 2008

5.1 Acid Rain

Acid rain is a phenomenon that occurs when the rain that falls from the atmosphere is acidic in nature. Acid rain is caused from the burning of fossil fuels. The acidic gases produced from such burning gets into the atmosphere where it reacts with water or rain to form an acidic solution. This acidic gas gets into the atmosphere from exhaust pipes of industrial machines and processes and automobiles. The chemical reactions in the atmosphere convert SO_2, NOx and other volatile compounds (VOCs) to acidic compounds and associated oxidants. This phenomenon is principally due to the oxides of sulphur from the burning of fossil fuels as indicated below.

Oxides of sulphur

$$S + O_2 \longrightarrow SO_2$$

$$SO_2 + \tfrac{1}{2}O_2 \longrightarrow SO_3$$

$$SO_3 + H_2O \longrightarrow H_2SO_4$$

Carbon monoxide

$$2C + O_2 \longrightarrow 2CO$$

$$CO_2 \longrightarrow CO + O$$

$CO_2 + C \longrightarrow 2CO$

$CO_2 + H_2O \longrightarrow H_2CO_3$

Oxides of nitrogen

$N_2 + O_2 \longleftrightarrow 2NO$

$NO + \frac{1}{2}O_2 \longleftrightarrow NO_2$

$NO_2 + O_3 \longrightarrow NO_3 + O_2$

$NO + NO_2 \longrightarrow HNO_2$

$NO_3 + NO_2 \longrightarrow HNO_3$

5.2 Poor Visibility

a. Inorganic particles: the particulates or particles e.g. Dust, smoke, soot and ash released during burning can cause poor visibility, fog and mist due to the formation or condensation of water around the particles in very low vertical heights. In March 2010 due to poor visibility aircrafts were grounded for days in Nigeria.

b. Photochemical smog: Pollutants such as hydrocarbon and NO_X in the presence of sunlight and ozone (or active O) forms different compounds such as formaldehyde, acrolein, acrosol and peroxyl acyl nitrate (PAN) all these causes a phenomenon called photochemical smog. Photochemical smog reduces visibility and causes irritation, cracking of rubber and fading of dyes and damages plant and vegetation.

5.3 Global Warming

Greenhouse effect: this phenomenon is caused principally by the presence of Carbon dioxide and Water Vapour in the atmosphere which trap large fraction of the infrared rays emitted from the earth's surface to the atmosphere. This trapped radiation heat thus increases the temperature of the globe causing global warming.

$C + O_2 \longrightarrow CO_2$

Coke

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

Natural gas

6 CONCLUSION

These emissions by the burning of fossil fuel into the atmosphere are a big challenge to the government, organizations, industries and the people. These emissions are also known to both scientifically and medically proven to cause or aggravate health conditions in persons exposed to them ranging from breathing to cancer problems. The following are the way forward:

- Reducing the emission of other gas pollutant into the atmosphere
- Educating the public on waste and indiscriminate fossil fuel burning effects.
- Alternative source of energy is advocated
- Government should provide constant energy for the people.

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