

**GREEN ENERGY COGENERATION: A FRIEND OF THE ENVIRONMENT**

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**ABSTRACT**

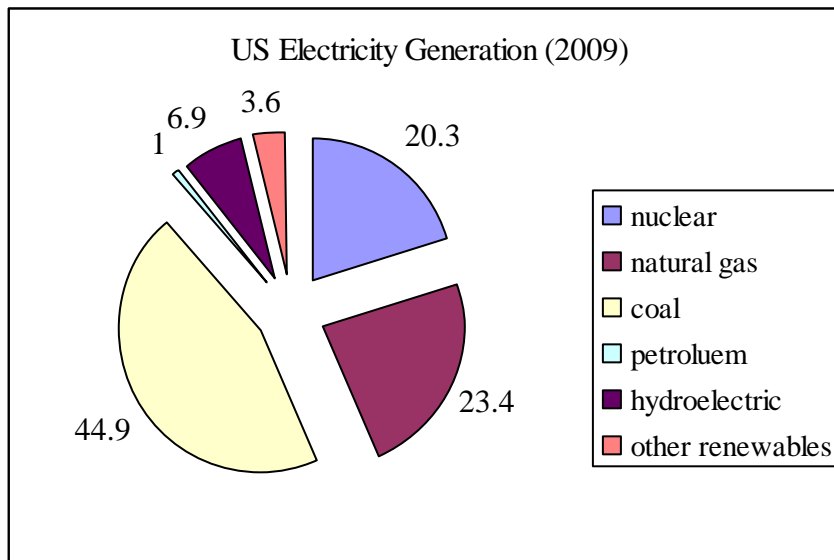
Electricity generation is the process of creating electricity from other forms of energy. Electricity has been generated at central stations since 1881. Today, no country in the world can depend on just one source to meet its energy demand. Nigeria is endowed with abundant renewable energy resources, the significant ones being solar energy, biomass, small and large hydropower with the potential for hydrogen fuel, geothermal and ocean energies. Green energy is a renewable source of energy that is environmental friendly and considering the issue of Global Climate Change it is the focus of this paper.

**keywords:** Green Energy; Electricity; Renewable Energy; Environment; Cogeneration

**INTRODUCTION**

Electricity is most often generated at a power station by electromechanical generators, primarily driven by heat engines fueled by chemical combustion or nuclear fission but also by other means such as the kinetic energy of flowing water and wind. There are many other technologies that can be and are used to generate electricity such as solar photovoltaics and geothermal power ([www.wikipedia.org/electricity\\_generation](http://www.wikipedia.org/electricity_generation)).

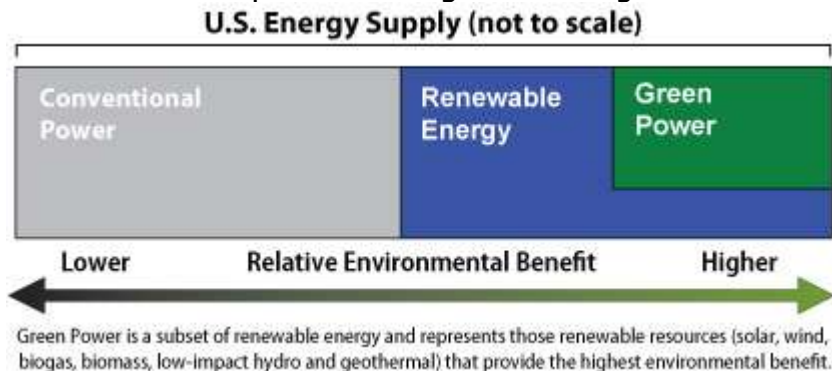
For a country to provide the needed energy or electricity for its population there is need to adopt several energy generation sources (cogeneration) like in the case of US in Fig 1.



**Fig 1: US Electricity generation. (wikipedia).**

Green power is a subset of renewable energy (Fig 2) and represents those renewable energy resources and technologies that provide the highest environmental benefit. EPA defines green power as electricity produced from solar, wind, geothermal, biogas, biomass, and low-

impact small hydroelectric sources. Customers often buy green power for avoided environmental impacts and its greenhouse gas reduction benefits.



**Fig 1: Interrelationship of Energy sources**

Green power sources produce electricity with an environmental profile superior to conventional power technologies and produce no anthropogenic (human caused) greenhouse gas emissions.

**Renewable energy** includes resources that rely on fuel sources that restore themselves over short periods of time and do not diminish. Such fuel sources include the sun, wind, moving water, organic plant and waste material (biomass), and the earth’s heat (geothermal). Although the impacts are small, some renewable energy technologies have an impact on the environment. For example, large hydroelectric resources can have environmental trade-offs associated with issues such as fisheries and land use.

**Conventional power** includes the combustion of fossil fuels (coal, natural gas, and oil) and the nuclear fission of uranium. Fossil fuels have environmental costs from mining, drilling, or extraction, and emit greenhouse gases and air pollution during combustion. Although nuclear power generation emits no greenhouse gases during power generation, it does require mining, extraction, and long-term radioactive waste storage ([www.epa.gov/greenenergy](http://www.epa.gov/greenenergy)). Green energy sources are sustainable. 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.

**Sustainable energy** 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. A broader interpretation may allow inclusion of fossil fuels as transitional sources while technology develops, as long as new sources are developed for future generations to use.

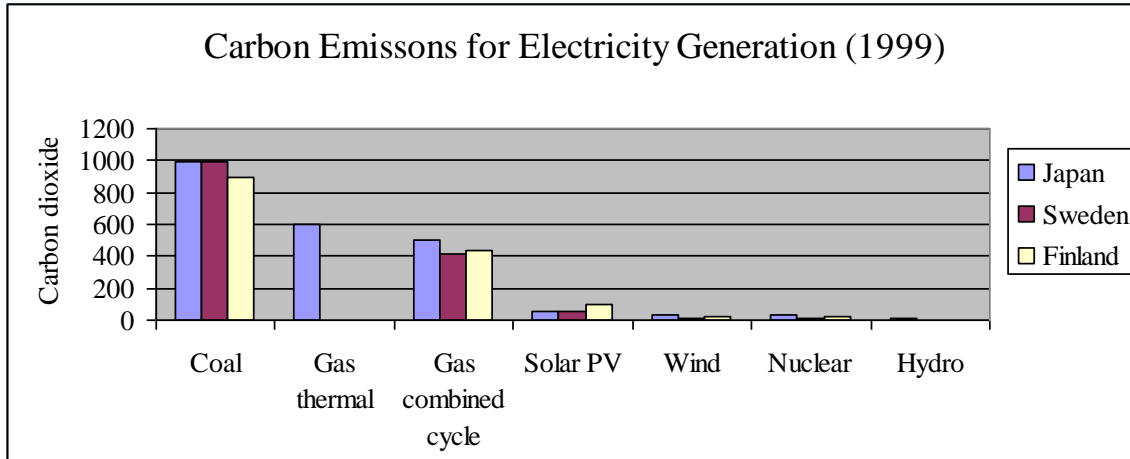
## **ENVIRONMENTAL PERSPECTIVE OF ENERGY GENERATION**

One of the key issues of energy generation today has become a global challenge and as such the environmental impact of an energy source is very important. Considering this issue Green energy is the most environmentally friendly source ([www.wikipedia.org](http://www.wikipedia.org)).

This is also one of the main drawbacks of the system as fossil fuel power plants are polluting and are a main cause of global warming (nuclear power being an exception).

Fossil fuel provides about 90 percent of the total world energy. The burning of fossil-based fuel causes some of these environmental phenomena like materials & properties corrosion; acid rains; visibility problems; greenhouse & ozone layer depletion (global warming) etc. these environmental phenomena is as a result of the addition (effects) of one or more of the following emissions into the atmosphere: carbon dioxide; sulphur and its oxides; nitrogen and its oxides; water vapour; particulates and also CFCs (Idiata, Olubodun and Ukponmwan, 2008 and Garba et al, 2007).

A look at the graph below gives us the carbon emission rates of the different sources energy.



**Fig 2: Carbon Emission rate of Energy sources.**

Energy production of electricity is always set up as a combination of renewable energy (green energy) plants, as well as other power plants as fossil-fuel power plants and nuclear power. This combination however is called COGENERATION, which is essential for energy supply.

**NIGERIA POWER SITUATION AND GREEN POWER**

Nigeria's largely inadequate power generation has dropped by 300MW, from 2200MW to 1900MW. 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 ([www.afriquejet.com/news](http://www.afriquejet.com/news)). Nigeria is endowed with abundant renewable energy resources, the significant ones being solar energy, biomass, small and large hydropower with the potential for hydrogen fuel, geothermal and ocean energies. The adoption of renewable energy technologies in a decentralized energy manner, especially for rural communities and in stand-alone applications, will improve electricity supply and enhance the overall economic development (Ajao et al, 2009).

Municipal Solid Waste: Electricity can be produced by burning "municipal solid waste" (MSW) as a fuel. MSW power plants, also called waste to energy (WTE) plants, are designed to dispose of MSW and to produce electricity as a byproduct of the incinerator operation ([www.powerscorecard.org](http://www.powerscorecard.org)).

Biomass: Biomass played a significant role among renewables in 2000, however, providing 48 percent of the energy coming from all renewable sources. Biomass is used for power generation in the electricity sector and for space heating in residential and commercial

buildings. Wood and agricultural residues are burned as a fuel for cogeneration of steam and electricity in the industrial sector ([www.eia.doe.gov](http://www.eia.doe.gov)).

Agricultural residues have an enormous potential for production. In favourable circumstances, biomass power generation could be significant given the vast quantities of existing forestry and agricultural residues - over 2 billion t/yr. world-wide.

## **CONCLUSION**

Continuing reliance on fossil fuels, with the attendant environmental problems, is one alternative. The other alternative is to change energy use to other sources such as nuclear energy, hydropower, solar energy, tidal energy, wind energy; geothermal energy biomass etc. This potential is currently under-utilized in many areas of the world (Agricultural residue).

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