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A New Assessment and Evaluation Criteria for the Choice of an Energy Resource in Nigeria (Renewable or Non-Renewable)

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ABSTRACT

Energy resources technology is very vital to the economic, social; and political development of any county. Energy is needed both for domestic and industrial purpose and most developing countries such as Nigeria are blessed with abundant energy resources (renewable and/or non-renewable) but the basic problem lies in the lack of technological capability to extract and process these resources to their own benefit, grouped among renewable resources include solar, hydropower, hydro tidal energy, geothermal and biomass, while the non-renewable (depletable) energy, resources include the fossil fuels (coal, crude oil and natural gas nuclear fuels, uranium core or thorium) and for an energy resource to be economically feasible and viable it must satisfy these techno-economic criteria

i. Time frame; ii. Breadth of application; iii. Fuel supply; iv. Environmental effect; v. Safety factor; vi. Social customs; vii. Political factors.

Keywords: Renewable resource, non-renewable resources, economic feasibility criteria, fossil fuels, depletable resource, steam turbines

I. INTRODUCTION

Renewable or non-depletable energy resources are the ones which could be regenerated back when the quantity available for consumption has been exhausted while the non-renewable or depletable energy reserves are those that are not amenable to regeneration when the available quantities for utility has exhausted and cannot be recovered any longer using the most advanced technologies. Depletable reserves are mainly the fossil fuels and nuclear energy - Ashley H. et al (1976) i.e Coal, Petroleum, Natural gas, uranium reactor core, thorium while the non-depletable reserves include solar power (energy from the sun's radiation); hydropower (energy from the kinetic head of falling water) Tidal energy (wind energy) and Hot springs emerging from the heart of the earth's Crust-Fisher J. C. (1974). The fossil fuels occur as mineral deposits and are not distributed uniformly throughout the earth, but are concentrated to varying degrees in deposits of varying sizes at different depths in different regions of the world; - Karam R.A. et al (1975).

At any given time some of the known regions of the world that contain these mineral deposits were photographed or mapped aerially for the purpose of production or mining or extraction while others remain untapped or undeveloped due to lack of know-how or a deliberate federal legislation to conserve resources-NNPC Publication (1994); as known deposits of crude oil has been discovered by ELF Petroleum Nigeria Limited (an Oil Prospecting and Production Company in Nigeria) in the Anambra basins and Uzo-Uwani in Enugu State but these remain untapped due to some hidden policy.

At present crude deposits occur in the oil mineral producing states of Abia, Imo, Delta, Rivers, Cross-River, Ondo and Bayelsa and are proportionately being exploited, generating the needed energy for Diesel - Electric Generators, Car/Lorry Engines, Aviation jet engines, domestic cooking purposes etc.

The renewable energy resources are not fully utilized at present in this country due to the advanced technologies involved.



II. ENERGY RESERVES IN NIGERIA

Virtually all forms of energy reserves are available in Nigeria i.e

- (1) Coal Energy
- (2) Petroleum Energy
- (3) Natural Gas "
- (4) Nuclear Energy in form of Radioactive minerals
- (5) Solar Power
- (6) Tidal Energy
- (7) Hydropower
- (8) Geothermal Energy
- (9) Biomass Energy

Coal is formed from the vegetable matters of swamp forests. It occurs in layers called seams which often alternate with layers of clay and other rocks. The first stage in the formation of coal is peat which is formed of partially decomposed vegetable matter compressed by over lying layers of silt. As the deposition of vegetable matter and silt continues, the peat is compressed into lignite which later is compressed into coal. Coal is found in Nigeria in

parts of Enugu hill, around Nnewi and Ogidi, at Anambra, Benue, Jos hills in Plateau etc. Petroleum otherwise called crude oil is formed from the decomposition of minute marine organisms which collected in the sediments on the floors of some seas. Sometimes the oil-bearing rock layers were sandwich between layers of impermeable rocks which prevented the oil from sopping away.

The oil slowly moved along sedimentary rocks eg. Sandstones etc and collected in pools. Water collects below the oil and gas which has a lesser density collects above the oil. Sometimes only gas may occur hence we have Natural gas reserve or field as in Escravos. Field at forcados which is being produced by Shell Petroleum Development Company Ltd (Warri).

Nuclear energy reserves are still under study and advanced research is going on with a view to its exploitation at the National Energy research centres at UNN, NAU, OAU, COOU, UNILAG and Sokoto University. Radioactive minerals have been discovered in parts of Plateau, Bauchi and Adamawa States.

III. FOSSIL FUELS, SOLAR ENERGY, TIDAL ENERGY, NUCLEAR ENERGY AND GEOTHERMAL ENERGY

Tidal energy and Geothermal energy reserves are still being investigated in order to exploit them maximally for other energy mix benefits. Biomass energy is the kind of energy resource as a result of the fermentation of human, animal and agricultural wastes which produces methane extractable for the purpose of generating heat energy.

Solar energy is the heat energy reaching the earth surface from the sun. The sun is about 150 million kilometers from the earth. In the sun fusion of hydrogen nuclei release vast quantities of energy that radiate from it in the form of electromagnetic waves. We do not receive all the heat energy reaching the earth's atmosphere from the sun. Nature has protected us from receiving such an uncomfortable amount of heat. The water vapour and the gases in the atmosphere above us absorb some of the heat. The clouds and dust particles also scatter the heat radiation (or rays). On the whole we receive about 70% of the heat from the sun depending on the location on the earth's surface and weather conditions (meteorological effects). This shielding effect on the upper part of the atmosphere has been named Green-house effect.

IV. DEVELOPMENT OF THE CHOICE CRITERIA

Some assessment methods were synthesized for selecting an energy reserve for any particular use or application; they include:

Breadth of Application:

There are many possible sources of energy which might be viable to meet national needs except that they are constrained to very small quantities or to specialized localities examples are tidal energy, geothermal and sea temperature. These forms of energy are found to be incapable of assuming a greater burden on a national scale.

Fuel Supply:

The two energy resource of Coal, Petroleum and Natural gas are available in sufficient quantity to ensure a life-time supply of major energy needs of a developing nation such as Nigeria.

Safety Aspects:

The exploitation of any of the resource must take into consideration the safety of the miners in case of coal or the Rig operators in case of Petroleum

or Natural gas wells since exhaust fumes or collapsible platforms might cost many billions of Naira.

Environmental Effects:

The principal effect on the environment is the possibility of emission of pollutants in the atmosphere. The reduction of pollution effects on the environment might bring enormous cost implication when a particular energy choice is made example we might have to battle with radiation hazards as a result of the use of Nuclear energy.

Time Frame:

For an energy resource to be technically and economically feasible it must be capable of sustaining continuing project



development and new technology application in the near future.

Social Customs:

The culture, religion or the social behaviour of a particular country's citizens might adversely affect the choice of an energy resource for a National energy programme.

Political Factors:

The political aspirations of a National Government might influence the choice of an energy resource example a country which belongs to an oil-cartel might favour the use of a Petroleum Energy to the detriment of other energy choices.

V. CONCLUSION AND RECOMMENDATION

We have discussed the various forms of energy sources from which power to drive engines, generate electricity, cook food, power industrial machinery etc and the various choice criteria available to distinguish between each. Technology plays a vital role in effectiveness and economics of energy utilization. We have to find the right mix of fuels and the right technologies. Sources of energy are judged to be potentially significant where available quantities are large and where technological and economic considerations show that the costs are competitive or close to competitive.

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