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RENEWABLE ENERGY RESOURCES: A GEOGRAPHICAL REVIEW

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ABSTRACT

Energy is a fundamental need of mankind for better survival. It is randomly distributed in the extensive spheres over the earth i.e. Atmosphere (Solar and Wind), Hydrosphere (Surface Water and Tides), Lithosphere (Coal, Petroleum Oil, Natural Gas and Soil) and Biosphere (Plants and Animals) etc. It is the free natural endowment for utilization of human being to his better survival. The energy is the vital mode of human welfare as for industrial, agricultural, and economic development. Any kind of nation's development is directly or indirectly related to the available potential of energy resources in its constitutional area.The India is fast growing developing country in the world. It requires more energy for its economic development. The more energy is required for gaining such proportion for growing Industries, Agriculture, transportation, and settlement etc. but the nation does not able to create required amount power from traditional (Conventional) modes of power resources. So low efficient energy modes, electricity load shading, high supply cost, irregular and uncertain power supply etc. problems are standing in front of development.

KEYWORDS: *Energy, Atmosphere, Hydrosphere, Lithosphere, Biosphere, Economical Development.*

INTRODUCTION:

The India is fast growing developing country in the world. It requiresmore energy for its economic development. The more energy is required for gaining such proportion for growing Industries, Agriculture, transportation, andsettlement etc. but the nation does not able to create required amount powerfrom traditional (Conventional) modes of power resources. So low efficientenergy modes, electricity load shading, high supply cost, irregular and uncertainpower supply etc. problems are standing in front of development. TheMaharashtra state is one of the developed statesof country.The economical progression of the state is rapidly goes up day by day. It has near about 15% of the country's GDP. State's GDP has also been growing at a rate of 14.5%with highest contribution coming from industrial and services sector.

Now a days, the state facing some importance disparities in the key indicators in the state. There is high difference between demand and supply of energy in the form of electricity. According to 12.4 and 9.7 million households are in urban and rural areas respectively. The per head electricity consumption is 780kwh whereas it is only 92kwh in tribal and rural district of Maharashtra.The demand for energy in the form of electricity is continuously increase which is directly proportional to the increasing population of the state. Day by day the rates of electricity is also increased according demand and supply ratio. Every activity of human being is directly or indirectly depends upon the electric energy.

However, there is a great hope from new advanced, pollution free, and ecofriendlymodes of energy resources as non-conventional energy resources; suchas Hydro Power, Solar Energy, Wind Energy, Bio-fuels,Tidal Energy, Geo-thermal Energyand Gravitational Energy etc.

B) MAJOR TYPES NON-CONVENTIONAL ENERGY RESOURCES:

There are following six major types of non-conventional energy resources as follows;

1) Hydro-Power:

Fig. 01 :Hydral Power Plant

The hydropower refers tothe energy generated from running or falling water.The water turbines are situated at the bottom hydal power plants, by using gravitationally, falling water are able to rotation of water turbine very speedily. This process of motion of water turbines are able to produce the kinetic energy. This energy is refers to 'Hydro-Electricity'.

Basically, availability of water for generation of hydro-power is depends on amount of rainfall. The hydropower plants arealways situated in regions of the higherrainfall. At present, hydroelectricity is vital source of electricity in our country.

2)Solar Energy:

The Sun is a only one vital source of all energy for the earth. It is most abundant, inexhaustible and universal source of energy.The heat as well as light energy radiated from the sun is called insolation or solar energy. The solar

Fig.02 :Solar photovoltaic Power Plates

radiation comes due to the nuclear fusion reaction occurred at the sun's surface. The Hydrogennucleus fuses into helium nucleus. This solar energy from these reactions radiates from the sun and escape into space.

Several differentkinds of radiant energy continuously comes from the sun. i.e.Ultra violet rays, and X-Rays.The sun is a large semi-liquid mass of very hot gaseshaving diameter is about1.39x106kms. The average distancebetween the earth and sun is 1.5x108kms. The beam radiation received from the sun onthe earth is reflected in to space, another 15% is absorbed by the earthatmosphere and the rest is absorbed by the earth's surface. This absorbed radiation consists of light and infrared radiation without which the earth would be barren.

Solar Constant : 'It is a total amount of solar radiation receives by the earth's atmosphere' This is the amount of energy received in unit timeon a unit area perpendicular to the sun's direction at the average distance of theearth from the sun. Because of the sun's distance and activity vary throughout the year. The NationalAeronautics and Space Administration's (NASA) standard value the solarconstant, expressed in three common units, is as follows:

(i) 1.353 kilowatts per square meter

(ii) 116.5 Langleys per hour (1 langelyis equal to 1cal/cm2 of solar radiation received per day)

Among the various renewable energy sources,solar energy has attained worldwide recognition; becauseits plenty of availability, clean energy environmentfriendly, maintenance lesser, noise less and more reliable.India is most suitable for solar energy receiving highestsolar insolation, with 300 sunny days India can generate600TW of power. 17% of power generated from solar outof total renewable energy sources in installed capacity inIndia. Solar energy can be produce mainly in two waysof commercial process.i.e. Concentrated solar thermal plants (CSP) and Photo voltaic.

3)Wind Energy:

Fig. 3: Wind-Mill Turbines set up by Suzlon Energy, Dhule (MS)

A 'wind' can be defined as a flow of air from one to another place, this term is called as wind. The earth has its own wind circulation system. Basically wind are generates due to the gravity and air pressure over the earth. The wind has--tremendous energy potential.Ancient seamen used wind power to sail their ships.The wind wheel, like the water wheel, has been used by man for a long time for grinding corn and pumping water. The gross wind power potential of India is estimated to be about 20,000 MW, wind powerprojects of 970 MW capacities were installed till March. 1998. Areas with constantly high speed preferablyabove 20 km per hour are well-suited for harnessing wind energy. (Prakash Kumar Sen at el, 2015). Wind power generation cost is lower than that of diesel power and almost equal to thermal power cost. Wind energy is conversion of kinetic energy (i.e. energy of motion of the wind) into mechanical energy that can be utilized to generate electricity.

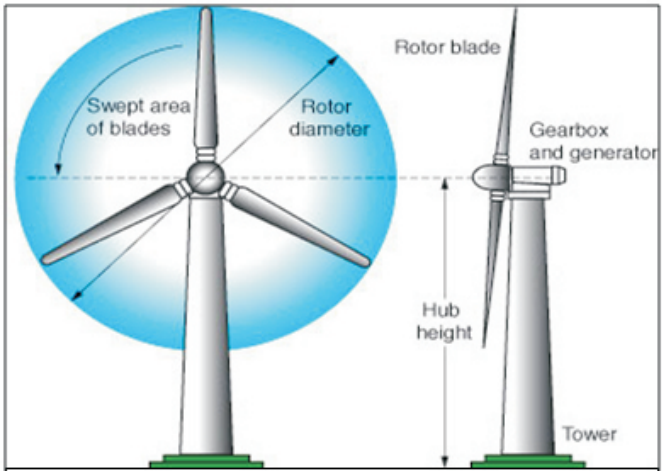

Fig 04 :Wind-Mill Turbines : Basic Components

The wind blows against the blades and theyrotate about the axis.Wind-energy is readily converted into electrical energy by converting the turbine into an electrical generator. An area where a number of wind electric generators are installed is known as a wind farm.The essential requirements for establishment of a wind farm for optimal exploitation of the windare the following:

- High and certainity of wind
- Adequate land availability
- Suitable geology
- Easily reachable site
- Suitability for power grid
- Availability of capital
- Better Govt. Policy

Technically, modern wind turbines are start operating when wind speeds reachabout 19 kmph (about 12 mph); achieve their rated power at about 40 to48 kmph (about 25 to 30 mph) and shut down to wind speeds of about100 km/h (about 60 mph).The best sites for turbine generators have annual average windspeeds of at least 21 km/h (13 mph). Scientists have estimated that as much as10 percent of the world's electricity could be provided by wind generators bythe middle of the 21st century.

4)Energy from Biomass/Bio Fuels:

The earth has it's own 'Biosphere' having very huge variety of plants, animal and micro organisms. This biomass consistliving and non-living biotic components, which are able to produce the certain energy.India is very rich in biomass. It has a potential of 19,500 MW (3,500 MW from bagassebasedcogeneration and 16,000 MW from surplus biomass). Currently, India has 537 MWcommissioned and 536 MW under construction. The facts reinforce the idea of a commitment byIndia to develop these resources of power production.

The most successful forms of biomass are sugar cane bagasse in agriculture, pulp andpaper residues in forestry and manure in livestock residues. It is argued that biomass can directlysubstitute fossil fuels, as more effective in decreasing atmospheric CO2 than carbonsequestration in trees. There are four common methods are important for production of energy from biomass, such as;

Combustion: Direct combustion of sold as well as liquid biomass is simple way of deriving energy from biomass. Basically combustion process produces heat energy, there after we can use this released heat energy in several forms and electricity generation too.

Gasification: Gasification is a chemical processes occurs with the decomposition and combustion of biomasses, by which gases are released. Gasification requires high temperature. In the simple words, the gasification is refers to the high-temperature thermochemicalconversion with the product gas called producer-gas. The gasification releases carbon monoxide, hydrogen, carbon dioxide andnitrogen, and has a heating value of 4 to 6 MJ/Nm3, or 10 – 15 percent of the heating value ofnatural gas. (Antonia V. Herzog, et al.)The intended use of the gas and the characteristics of the particular biomass (size,texture, moisture content, etc.) determine the design and operating characteristics of the gasifierand associated equipment.

Fermentation : The fermentation is purely chemical process occurs during the decomposition of biotic remains.

Anaerobic digestion : The production of combustible from biomass in lower temperature called anaerobic (without air) digestion. The biogas or 'Gobar gas' is the a typical example of of anaerobic digestion. The biogas has about 60 percent methane and 40 percent carbon dioxide with a heating value of about 55 percent that of natural gas. An anaerobic digesters includes an inlet, where the organic waste are deposit into the digester tank. In which the biomass going to heated and increase its decomposition rate,finally it convert by bacteria into the gas. Which is highly inflammable.

There are three categories of bio-mass energy, such as;

a)Living Bio-Mass:

It includes all domestic animals, which are able to produce the energy for cultural as well as economical activity of human being.i.e. horse, bullock, buffalos, camels, so on. These are conventional but renewable source of energy. These may very better option for non-renewable energy resources which are on the way of extinction from the earth.

b) Bio Gas:

On the same hand, some biotic fossil material, solid biomass produces the bio gases. Which are flammable

having high energy efficiency.A biogas is obtained by using thedecomposition of dung as well as biotic waste. Which can be directly used as domestic fuel especially in the rural areas. This technique is based on the decomposition of organic matter in the absence of air to yield gas consisting of methane (55%) and carbon dioxide (45%) which can be used as a source of energy. This energy is piped for use as cooking and lighting fuel in specially designed stoves and lamps respectively. Bio gas contains 55-70% methane and 30-45% carbon dioxide as wellas small quantities of(N2, H2, H2S) some gases. It is lighter than the air andhas an ignition temperature of approximately 700oC. The temperature of theflame is 870oC. its calorific value is approximately 4713kcal/m3.

c) Bio-Fuels:

Biofuelsare the oils derived from plant like soybeans, palm oil trees, jatrophaand oilseeds like rapeseed canproduces thehydrocarbon petroleum products such as 'bio-diesel'. The ethanol is also an important bio-fuel, which can be produce from maize and sugarcane and other agricultural crops. The production of ethanol from lignocellulosic biomass i.e. wood, straw and grasses are being very important. In particular, when the enzymatic hydrolysis of lignocellulosic biomass will open the way to low cost and efficient production of ethanol.

5) Tidal Energy:

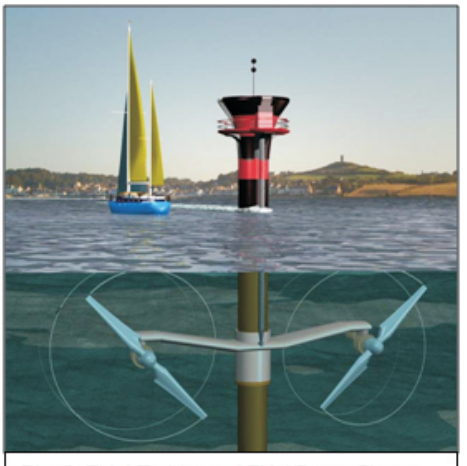

Fig. 5 :Tidal Turbines of Tidal Power Plants.

Tidal energy generation is another vital non-conventional energy resource, which is also better option to non-renewable energy resources. The tide is may be defined as periodical process of rise and fall of the ocean water, it refers to 'Tides'. The tides occur due to the gravitational attraction force of the moon. Thesetides can be used to produce electrical power which is known as tidal power. High tides are able to rotatea tidal turbine, which are horizontally placed in tidal power plant, generates the kinetic energy. It is estimated that India possesses 8000-9000 MW of tidal energy potential. The Gulf of Kutch is best suited for tidal energy in India.

6) Geo-Thermal Energy:

The Geothermal energy is a very advance and clean source of power. The Earth's thermal energy produce from radioactive decayinghappens in the core of the Earth. The heat at interior of the earth is about 50000 C. This energy can only be applied in geologically active areas. Earth's inner heat energy is used for making steam, thereafter; this steam is used for turbine rotation. This energy is manifested in the hot springs. India is notvery rich in this source,Geothermal energy, the natural heat within the earth, arises from the ancient heat remaining in the Earth's core, from friction where continental plates slide beneath each other, and from the decay of radioactive elements that occur naturally in small amounts in all rocks.

7) Gravitational Kinetic Energy:

The Erath's gravity is also a major source of energy production.Due to gravity,every weighted object falls down towards the earth crust. This force responsible for movement of the object can be able to produce certain amount of 'Gravitational KineticEnergy' over the earth. This energy is depending on height and weight of the object in relation to the height of falling or distance of motion. e.g. if we want to break the glass manually in small size pieces but we can break into certain big size pieces. On the other hand, if we leave the glass downward from certain height, the glass will breaking down into many small size pieces as compare to manually breaking. In this example, 'The

Gravitational Kinetic Energy' is responsible force for breaking the glass into small size pieces without applying any man power.

The commercial production of this Gravitational Kinetic Energy is awaited till today. But, it has very wide scope in future; it can be better alternative to non-renewable energy resources as like other. It needs to inventory efforts for producing energy by using this direct gravity of the earth.

C) CONCLUSION:

The energy requirement is increase day by day with increasing population growth. But available energy resources are not sufficient for present need. In this way, all human activities are based on energy consumption, no economic development is possible without sufficient energy supply. Today, non-renewable energy resources are on the path of extinction, we should search new advance alternatives for steady development processes. The renewable energy resources better option in this regards. At the same way human being also having great responsibility of the protecting 'Nature' from depletion. It can be possible only through use and recycle of renewable energy resources.

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