UTILIZATION OF NON-CONVENTION ENERGY SOURCE TO FULFILL OUR REQUIREMENT OF POWER DEMAND AND REDUCE POLLUTION

Prakash Kumar Sen[1], Dev Kumar Khande[2], Shailendra Kumar Bohidar[3]

[1]*Student, M.Tech. Manufacturing Management, BITS Pilani*

[2]*Student, Mechanical Engineering, Kirodimal Institute of Technology, Raigarh, (India)*

[3]*Ph.D. Research Scholar, Kalinga University, Raipur*

ABSTRACT

There are many natural sources to develop electricity without depends on any sources of non - renewable energy and without environmental pollution. Even though the power generated is less but the benefits gained from this energy is the ability to raise the standard living of residents in remote areas and it does not emit any pollution gas which is able to give an unacceptable effect in the local environment, get free from pollution and helps to maintain good health. Non-convention energy source is able to support the mission of protecting the environment particularly to the ecosystem. It is helpful to reduce the greenhouse effect also. The primary source of energy is fissile fuel, however these fissile fuel sources are finite also with their fastly widespread use degradation of environment takes place, which causes global warming, urban air pollution and acid rain, It strongly suggest that the time is now come to harness and use the non-conventional and environment friendly energy sources is vital for steering the global energy supplies towards sustainable path. This paper presents a use of non-conventional energy sources such as solar power, wind power, hydro power, bio mass and biogas for the fulfillment of power demand to some extent and gives remedial measures during extreme emergencies of electrical power.

Keywords: Non-Conventional and Conventional Energy Source, Solar Power, Hydro Power, Biomass and Biogas, Tidal Energy

I. INTRODUCTION

Energy is most important input for social and economic development of any country. The demand for energy has been increased for agricultural, industrial and domestic activities. Energy is the primary and most universal measure of all kinds of works by human being s and human and nature. Everything what happens in the world in the expression of flow of energy in one of its forms. Every country draws its energy needs forms a variety of sources. We can broadly categorize this as conventional and non-conventional. this conventional source include the fossil fuels (coal, oil and natural gas),hydroelectric power and nuclear power, while the nonconventional sources such as sunlight, wind, rain, tides, and geothermal heat, which are renewable.[**1**]energy security has an important bearing on achieving national economic development goals and improving the quality of life of the people. India‘s dependence on crude oil will continue for most part of the 21st century. In addition, global warming, caused largely by greenhouse gas emissions from fossil fuel energy generating systems, is also a major concern energy which comes from natural resources. Despite the obvious advantages of renewable

energy, it presents important drawbacks, such as the discontinuity of generation, as most renewable energy resources depend on the climate, which is why their use requires complex design, planning and control optimization methods. Overall the increasing consumption of conventional fuels coupled with environmental pollution has led to the development of eco-friendly non-conventional energy sources [2]. The development of remote rural areas could not take place even after more than 50 years independence, as the grid could not be extended due to its high cost, scattered nature of the area and low load factor. In recent years, the considerable research and development has been initiated to energize such areas through renewable energy sources, the energy needs using energy resources in individualistic manner, the demand can be best met using combination of the resources in integrative manner in cost effective and sustainable manner.

II. NON-CONVENTIONAL AND CONVENTIONAL ENERGY SOURCE

In the world there are two type of energy source which is conventional or non-conventional. The conventional sources of energy are generally non-renewable sources of energy, which are being used since a long time. These sources of energy are being used extensively in such a way that their known reserves have been depleted to a great extent. the conventional are fossil fuels ,coal, petrol, diesel, oil, gas, uranium etc. which is limited and the daily use of this fuel in industries and automobile causes the environmental pollution. The fossil fuels are not going to last longer and that remaining reserves should be conserved for the petro-chemical industry. But unfortunately, both nuclear and coal energy pose serious environmental problems. The combustion of coal may upset the planet's heat balance. The production of carbon dioxide and sulphur dioxide may adversely affect the ability of the planet to produce food for its people. Coal is also a valuable petro-chemical and from long term point of view it is undesirable to burn coal for generation of electricity. The major difficulty with nuclear energy is waste disposal and accidental leakage [3]. There for we need to reserve them and find the best way utilization of non-conventional energy source. The contemporary non-conventional sources of energy like wind, tidal, solar etc. The non-conventional sources are available free of cost, are pollution-free and inexhaustible. Man has used these sources for many centuries in propelling ships, driving windmills for grinding corn and pumping water, etc. Because of the poor technologies then existing, the cost of harnessing energy from these sources was quite high. Also because of uncertainty of period of availability and the difficulty of transporting this form of energy, to the place of its use are some of the factors which came in the way of its adoption or development. The use of fossil fuels and nuclear energy replaced totally the non-conventional methods because of inherent advantages of transportation and certainty of availability; however these have polluted the atmosphere toe great extent. In fact, it is feared that nuclear energy may prove to be quite hazardous in case it is not properly controlled. it was decided by almost all the countries to develop and harness the non-conventional sources of energy, even though they are relatively costlier as compared to fossil-fuel sources. It is hoped that with advancement in technology and more research in the field of development of non-conventional sources of energy, these sources may prove to be cost-effective as well. The future of wind, solar, tidal and other energy sources is bright and these will play an important role in the world energy scenario [4]

III. SOURCE OF NON-CONVENTIONAL ENERGY

3.1 Solar Energy

Solar energy has the greatest potential of all the sources of renewable energy and if only a small amount of this form of energy could be used, it will be one of the most important supplies of energy especially when other sources in the country have depleted.

Energy comes to earth from the sun. This energy keeps the temperature of the earth above that in colder space, causes the water cycle and generates photosynthesis in plant. The solar power where sun hits atmosphere is 10^{17} watts whereas the solar power on earth surface is 10^{16}watts.the total the total world-wide power demand of all needs of civilization is10^{13} watts. Therefore, the sun gives us 1000 time more power than we need, if we can use 5%of this energy, it will be 50 times what the world will require.1 kW/m^2, attempts have been made to make use of this energy in raising steam which may be used in driving the prime movers for the or pose of generation of electrical. Utilization Of solar energy is of great importance to India since it lies in a temperature climate of region of the world where sun light is abundant for major part of year.

Application of solar energy:

3.1.1 Solar Cooker

The solar cooker is one of the important applications of the solar energy. In village 95% of people use the fossil fuel, wood, cow dung etc. therefore the solar cooker is another option for cooking food in village or urban areas. It not produces any kind of pollution content like smoke. It save money and fuel preserves the nutritional valve of the food. It has got limitation or taking more time to cook but an ideal appliance for rural and rural population who can keep the food in this cooker while working in the field and take food during lunch time.

3.1.2 Solar Distillation

Solar stills are systems designed to filter or purify water. The numbers of systemsdesigned to filter water have increased dramatically in recent years. As water supplies have increased in salinity, have been contaminated, or have experienced periods of contamination, people have lost trust in their drinking water supply. Water filtration systems can be as simple as a filter for taste and odor to complex systems to remove impurities and toxins. Solar water distillation is one of the simplest and most effective methods of purifying water. Solar water distillation replicates the way nature purifies water. The sun's energy heats water to the point of evaporation. As the water evaporates, purified water vapor rises, condensing on the glass surface for collection [5]. This process removes impurities such as salts and heavy metals, as well as destroying microbiological organisms. The end result is water cleaner than the purest rainwater. Solar energy is allowed into the collector to heat the water. The water evaporates only to condense on the underside of the glass. When water evaporates, only the water vapor rises, leaving contaminants behind. The gentle slope of the glass directs the condensate to a collection trough, which in turn delivers the water to the collection bottle.

3.1.3 Solar Dryers

Using the sun to dry crops and grain is one of the oldest and most widely used applications of solar energy. The simplest and least expensive technique is to allow crops to dry naturally in the field, or to spread grain and fruit out in the sun after harvesting. The disadvantage of these methods is that the crops and grain are subject to damage by birds, rodents, wind, and rain, and contamination by windblown dust and dirt. More sophisticated solar dryers protect grain and fruit, reduce losses, dry faster and more uniformly, and produce a better quality product than open air methods[6].The basic components of a solar dryer are an enclosure or shed, screened drying trays or racks, and a solar collector. In hot, arid climates the collector may not even be necessary. The southern side of the enclosure itself can be glazed to allow sunlight to dry the material. The collector can be as

simple as a glazed box with a dark colored interior to absorb the solar energy that heats air. The air heated in the solar collector moves, either by natural convection or forced by a fan, up through the material being dried. The size of the collector and rate of airflow depends on the amount of material being dried, the moisture content of the material, the humidity in the air, and the average amount of solar radiation available during the drying season [7]

3.1.4 Solar Cooling

Solar cooling consists of using thermal energy collected from the sun as the principal energy input for the cooling system to cool and dehumidify the space [8]. This replaces the existing electrical power input typically required in a vapor compression refrigeration cycle. The benefit of this system is that it has the potential to reduce the amount of electricity used (and carbon dioxide produced from the generation of electricity) during Canada's hot summer months when the demand on the power grid is at its highest. These systems can be effective as the availability of solar radiation coincides with the energy demands imposed on buildings by cooling loads, allowing for the greatest amount of cooling to be generated when it is needed most.

3.1.5 Solar Collector

A solar collector is a device for collecting solar radiation and transfers the energy to a fluid passing in contact with it. Utilization of solar energy requires solar collectors. These are general of two types first one is non-concentrating or flat plate type solar collector and second on is concentrating type solar collector. the solar energy collector, with its associated absorber, is essential component of any system for the conversion of solar radiation energy into more usable from heat or electricity. In the non-concentration type, the collector area is the same as the absorber area. On the other hand, in concentrating co collectors the area intercepting the solar radiation is greater, sometimes hundreds of times greater than absorber area. By means of concentrating collectors, much higher temperatures can obtained then with non-concentrating type. Concentrating collector may be used to medium pressure steam. They use many different arrangements of mirrors and lenses to concentrate the sun's ray on the boiler. This type shows better efficiency than the flat plate collector.

3.1.6 Solar Thermal

Solar Thermal power is heat energy obtained by exposing a collecting device to the rays of the sun. A solar thermal system makes use of the warmth absorbed by the collector to heat water or another working fluid, or to make steam. Hot water is used in homes or commercial buildings and for industrial processes. Steam is used for process heat or for operating a turbine generator to produce electricity or industrial power. There are several basic kinds of solar thermal power systems including "flat plate "solar water heaters; concentrating collectors, such as central tower receivers; and parabolic trough and dish collectors [9].

3.1.7 Photovoltaic

Photovoltaic are solar cells that produce electricity directly from sunlight. The solar cells are made of thin layers of material, usually silicon. The layers, after treatment with special compounds, have either too many or too few electrons. When light strikes a sandwich of the different layers, electrons start flowing and an electric current result [10].Photovoltaic are used throughout the nation and elsewhere to operate appliances, provide lighting, and to power navigation and communication aids. Photovoltaic panels provide power for equipment in space ships and satellites. PV cells supply power needed to operate many kinds of consumer products such as calculators and watches. Photovoltaic systems provide electricity to remote villages, residences, medical centers, and other isolated sites where the cost of photovoltaic equipment is less than the expense of extending utility power lines or using diesel-generated electricity [11].

3.2 Hydro Power

Hydropower is a renewable, non-polluting and environmentally benign source of energy. Hydropower is based on simple concepts. Moving water turns a turbine, the turbine spins a generator, and electricity is produced. The use of water falling through a height has been utilized as a source of energy since a long time. It is perhaps the oldest renewable energy technique known to the mankind for mechanical energy conversion as well as electricity generation. The first hydro power plant was of 130 kW set up in Darjeeling during 1897,which marked the development of hydropower in the country. Similarly, by 1924 Switzerland had nearly 7000 small scale hydropower stations in use. Most of the small hydro power plants are run of river scheme, implying that they do not have any water storage capability. The power is generated only when enough water is available from the river. When the stream flow reduces below the design flow value, the generation will reduce as the water does not flow through the intake structure into the turbine Small hydro plants may be standalone system in isolated areas but could also be grid connected. The connection to the grid has the advantage of the easier control of the electrical system frequency of the electricity, but the disadvantage of being tripped off the system due to problems outside of the plant operator's control. Power generation from the water depends upon the combination of head and flow. Both must available to produce electricity. Water is diverted from a stream into a pipeline (penstock) where it is directed downhill and through the turbine. The vertical drop creates pressure at the bottom end of the pipeline. The pressurized water from the end of the pipe creates the force that drives the turbine. The turbine in turn drives the generator where electrical power is produced. More flow or more head produces more electricity. Electrical power output will always be slighter less than water power input due to turbine and system inefficiencies. Head can be expressed as vertical distance or as pressure such as pounds per square inch (psi)[12]. Net head is the pressure available at the turbine when water is flowing which will always be less than the pressure when water flow is turned off, due to the friction between water and pipe. it is used for power generation

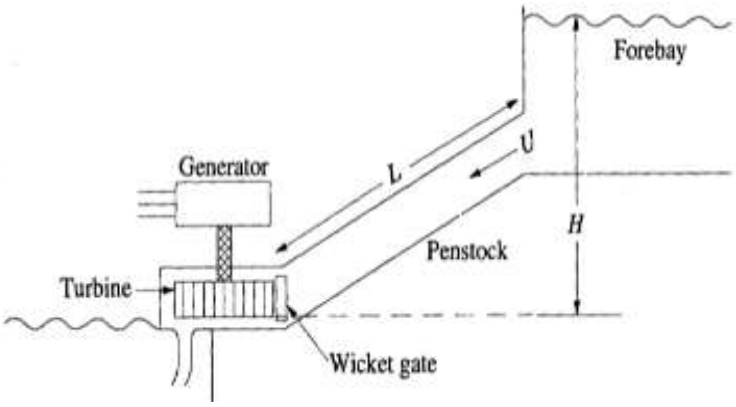

Fig.1 Hydroelectric Power Plant [13]

3.3 Wind Energy

The wind wheel, like the water wheel, has been used by man for a long time for grinding corn and pumping water. Ancient seamen used wind power to sail their ships. With the development of the fossil fuelled and hydro-electric plants, there was decline in the use of wind power due to the less cost involved in the new methods. Another difficulty with wind power was the problem of energy storage. The energy could not be made available, on demands, due to uncertainties of wind. Due to these two reasons, no further attempt was made to develop wind power for large scale power generation. In recent years, however, as a result of energy crisis in the world, it has been decided to investigate all possible means of developing power, as alternatives to fuel fired

plants. The wind could supply a significant portion of the world's energy demand. An estimate by an American Professor indicates the potentialities of wind power. According to him about 350,000wind mills each rated for about 1250 KW to 2200 KW could develop power of the order of 190,000 MW. With the advancement in the knowledge of aero-dynamics it has been possible to build larger and more efficient wind power plants. A typical example is the 1250 KW installation at Grandpa's Knol in U.S.A. Whereas some success has been achieved in developing small and medium size plants, the prospects of large scale generation i.e., 1 MW or above are not, as yet very encouraging[14].

Several types of wind wheels have been used but the advantage of propeller rotating about a horizontal shaft; in a plane perpendicular to the direction of the wind make it the most likely type to realize economic generation on a large scale. A propeller consisting of two or three blades (with an aero foil section) and capable of running at the high speeds is likely to be the most efficient. Present technology has been able to build systems with 60 m long blades, on towers as high as 305 m. A large tower system, to support many small rotor-generator units, can also be built. Wind pressure rotates the wind vanes or propellers attached to a shaft. The revolving shaft rotates the rotor of a generator, through a mechanism of gears couplings etc. Thus, electricity is generated. The wind power plants can be operated in combination with steam or hydro power station, which will lead to saving in fuel and increase in firm capacity, respectively of these plants. Wind energy can prove to be a potential source of energy for solving the energy problem. It can certainly go a long way to supply pollution-free energy to millions of people, living in the villages all over the world. The economic viability of wind mills is better in situations where conventional transmission costs are extremely high (because of inaccessibility and small load) or where continuous availability of supply is not essential so that only a limited amount of storage on standby power need be provided.

3.3.1 Uses of Wind Energy

(i)Small micro-generation and hybrid systems.
(ii) Machines and wind farms,
(iii) Offshore wind power,
(iv) Wind resources and environmental issues,
(v) Connection and integration,
(vi) National and regional programmed, and
(vii) Economic and institutional issues.

3.4 Biomass

Biomass is an important energy which is considered as one of the most promising renewable energy sources, and it attracts more and more attention owing to meet the challenges of increasing energy demand. Gasification for power generation is one of new techniques for utilization of biomass energy. It has been largely recognized that biomass will play a substantial role in the global energy balance. Compared with other renewable energy resources, biomass is abundant in annual production, up to 2740 Quads, with a geographically widespread distribution in the world. World Energy Outlook predicts a 53% increase in global energy demand by 2030, 70% of which will come from China and other developing countries. In China it has abundant biomass resources contained wood-chip, agricultural residues etc. and large population that farmer takes up nearly 60%, And because it is believed that energy obtained from biomass has a carbon-neutral cycle, for fuel gas/product gas production by gasification as the produced fuel gas can be flexibly applied in boilers, engine, gas turbine or fuel

cell [15]. So biomass energy utilization will be very promising. Furthermore, there has been great interest in the idea of the development of new technologies for power generation from biomass. It is the conversion of biomass to biogas in the gasifer by heating in oxidant or gasifying agents such as air, oxygen or steam. The purified gas will be burnt in gas turbines or power gas engines for power generation. The application of biomass gasification and power generation (BGPG) technology would be one of the most advanced methods ways to use biomass as an energy source. Biomass resource is widely available in China, which chiefly comes from agricultural residues and forest residues. Now Chinese government pays more attention on biomass and its conversion technologies through fund support for researches and some demonstrations [16], so it is of great importance to know the status and technologies of biomass gasification for power generation.

3.4.1 Use of Biomass

(i) Heat and electricity generation,

(ii) Energy crops and residues,

(iii) Liquid fuels,

(iv) Socio-economics, case studies, and environmental impacts, and

(v) Gasification processes.

3.5. Tidal Power

Tidal power also called tidal energy is a form of hydropower that converts the energy of tides into electricity Tidal power is the only form of energy which derives directly from the relative motions of the Earth–Moon system, and to a lesser extent from the Earth–Sun system. Tidal forces produced by the Moon and Sun, in combination with Earth's rotation, are responsible for the generation of the tides. Other sources of energy originate directly or indirectly from the Sun, including fossil fuels, conventional hydroelectric, wind, biofouls, wave power and solar. Nuclear energy makes use of Earth's mineral deposits of fissile elements, while geothermal power uses the Earth's internal heat which comes from a combination of residual heat from planetary accretion (about 20%) and heat produced through radioactive decay (80%).Tidal energy is extracted from the relative motion of large bodies of water. Periodic changes of water levels, and associated tidal currents, are due to the gravitational attraction of the Sun and Moon. Magnitude of the tide at a location is the result of the changing positions of the Moon and Sun relative to the Earth, the effects of Earth rotation, and the local geography of the sea floor and coastlines. Because the Earth's tides are ultimately due to gravitational interaction with the Moon and Sun and the Earth's rotation, tidal power is practically inexhaustible and classified as a renewable energy resource. A tidal generator uses this phenomenon to generate electricity. Greater tidal variation or tidal current velocity can dramatically increase the potential for tidal electricity generation. The movement of the tides causes a continual loss of mechanical energy in the Earth–Moon system due to pumping of water through the natural restrictions around coastlines, and consequent viscous dissipation at the seabed and in turbulence. This loss of energy has caused the rotation of the Earth to slow in the 4.5 billion years since formation. During the last 620 million years the period of rotation has increased from 21.9 hours to the 24hours we see now; in this period the Earth has lost 17% of its rotational energy. While tidal power may take additional energy from the system, increasing the rate of slowdown, the effect would be noticeable over millions of years only, thus being negligible [17].

IV. ADVANTAGES OF NON-CONVENTIONAL ENERGY SOURCES

1. Non-convention energy is an indigenous resource available in considerable quantities to all developing nations and capable, in principle of having a significant local, regional or national economic impact.
2.Sevral renewable option are financially and economically competitive for certain application, such as in remote location, when the cost of transmitting electrical power or transporting conventional fuels are high, or in those well-endowed with biomass, hydro or geothermal resources.
3. This conversion technology tends to the tends to be flexible and modular, it can usually be rapid deployed
4. Rapid scientific and technology advantages are expected to expand the economic range of non-conventional energy application over the next 8-10 years, making it making it imperative for international decision makers and planners to keep abreast developments.

V. DISADVANTAGE OF NON-CONVENTIONAL ENERGY SOURCE

1. Non-conventional energy is that it is difficult to generate the quantities of electricity that are as large as those produced by fossil fuel generators. This may mean that we need to reduce the amount of energy we use or simply build more energy facilities. It also indicates that the best solution to our energy problems may be to have a balance of many different power sources.
2. Disadvantage of non-conventional energy sources is the reliability of supply. Renewable energy often relies on the weather for its source of power. Hydro generators need rain to fill dams to supply flowing water. Wind turbines need wind to turn the blades, and solar collectors need clear skies and sunshine to collect heat and make electricity.

VI. CONCLUSIONS

The non-conventional energy source is pollution free. It is good for our environment and another source of energy which is never end till earth is existing. Promoting innovative and effective use of application of non-conventional energy source. Non-conventional energy technologies, to find the valuables and cost effective applications of non-conventional energy resources suitable for use. the local, regional and global environmental benefits of non-conventional energy applications, Ensuring the renewable energy takes its proper place in the sustainable developments, supply and use of energy for greatest benefit of all, taking due account of research requirements, energy efficiency, conservation and cost criteria, and find the best way to utilized the non-conventional energy source.

REFRENCES

[1]. Vijay Kandalkar at el.” Utility of Non-conventional Energy Sources to MeetIncreasing Power Demands by Solar Power Plant” Volume 3, Issue 4, April 2013, ISSN 2250-3153
[2]. PijushKantiBhattacharjee at el. “Solar-Rains-Wind-Lightning Energy Source Power Generation System” Vol. 2, No. 2, April, 2010 ISSN 1793-8163
[3]. M. Thirugnanasambandam, S. Iniyan, and R. Goic, “A Review of Solar Thermal Technologies”, Renewable and Sustainable Energy Reviews, Elsevier, vol. 14, 2010, pp. 312-22.
[4]. R. EATOCK TAYLOR.” Non-Conventional Energy Sources”ISSN 0974-5904, Vol. 03, No. 02, April 2010, pp. 125-141

[5]. P. P. Singh, S. Singh and S. S. Dhaliwal, "Multi-shelf domestic solar dryer", Energy Conversion Management, vol. 47, **(2006)**, pp. 1799-815

[6]. L. M. Bal, S. Satya and S. N. Naik, "Solar dryer with thermal energy storage systems for drying agricultural food products: A review", Renewable and Sustainable Energy Reviews, vol. 14, **(2010)**, pp.2298-2314.

[7]. D. Jain, "Modeling the performance of the reversed absorber with packed bed thermal storage natural convection solar crop dryer", Journal of Food Engineering, vol. 78, **(2007)**, pp. 637-47

[8]. H. Henning, "Solar assisted air conditioning of buildings-an overview", Applied Thermal Engineering, **(2006)**.

[9]. R. Smitabhindu, S. Janjai and V. Chankong, "Optimization of a solar-assisted drying system for drying bananas", Renew Energy, vol. 33, **(2008)**, pp. 1523-3123

[10]. A. Feltrin and A. Freundlich, "Material considerations for terawatt level deployment of photovoltaics",Renewable Energy, vol. 33, **(2008)**, pp. 180-5

[11]. T. Schmidt, D. Mangold and H. Muller-Steinhagen, "Seasonal thermal energy storage in Germany",ISES solar world congress, **(2003)**.

[12]. Chauhan D S, Gagan Singh "Simulation and Modeling of Hydro Power Plant to study Time Response during Different Gate States" International Journal of Advanced Sciences and Technologies Vol 10 Issue No. 1, 42- 47 2007

[13]. Vineesh V, A. Immanuel Selvakumar "Design of Micro Hydel Power Plant" ISSN: 2249 –8958,Volume-2, Issue-2-December 2012

[14]. Abdeen Mustafa Omer**"** A review of non-conventional energy systems and environmental pollution control" Vol. 1 (7), pp. 1 27-1 54, September 2010, ISSN 21 41 -2391

[15]. T. Khatiba, A. Mohameda and K. Sopianb, "A review of solar energy modeling techniques", Renewable and Sustainable Energy Reviews, vol. 16, **(2012)**, pp. 2864-2869

[16]. McVendry, "Energy production from biomass (part1): gasification technologies," Bio resource Technology, vol.83, pp.37-46, 2002.

[17]. Shaikh Md. RubayiatTousif et al."Tidal Power: An Effective Method of Generating Power" ISSN 2229-5518

.