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Renewable Energy: Requirement of the Future Era

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Abstract: ***Energy consumption of a nation is usually considered as an index of its economic development and well being. India's economy which is third largest in the world is growing rapidly. Policies are prepared for country's modernisation and expansion of the manufacturing facilities. This modernisation and expansion needs huge energy requirement. However, the relationship between economic growth and increased energy demand is not always a straightforward linear one. For example, under present conditions, 6% increase in India's Gross Domestic Product (GDP) would impose an increased demand of 9 % on its energy sector. India is the fourth largest energy consumer in the worlds after US; China & Russia. Thus the energy sector assumes a critical importance in view of ever increasing energy needs which require huge investment to meet them. The most of the energy need is met through fossil fuel, in which coal has a dominant share, as it contributes upto 44% of the total primary energy production. Increased consumption of coal is mainly due its availability and affordability relative to other fossil fuel for coal-fired power generation, use as cooking fuel in rural areas, heavy demand in industries. Energy is also needed for improving the quality of life and for increasing opportunities for development. In India 600 million people do not have access to electricity and about 700 million use biomass as their primary energy resource for cooking, but its share in the primary energy mix has declined by almost ten percentage points since 2000, as households moved to other fuels for cooking, notably liquefied petroleum gas (LPG).The oil, other fossil fuel, is mainly consumed in transport sector. Demand for diesel, account for 70% of road transport fuel, has been particularly very high as this has large share of road freight traffic. Today nearly 72% of the primary energy is generated from the non-renewable fossil fuels as coal and oil, which have taken years to form, are fast depleting due to excessive use. Abundant use of fossil fuels is adversely affecting not only our economy and environment but also our future. So in order to meet the energy demand of our future generation we can not entirely depends on these sources. We have to find out some sustainable energy sources such as Solar energy, Wind energy, Hydro Power, Tidal energy etc to meet our today's demand of energy without putting them in danger of getting expired or depleted and can be used over and over again to meet energy requirement of future generation. Sustainable energy should be widely encouraged as it do not cause any harm to the environment and is available widely free of cost.***

Keywords: Sustainable energy, Ozone layer depletion, Bioenergy, Solar energy

I. INTRODUCTION

Increasing industrialization and unsustainable consumption patterns are escalating the environmental and human problems due to depletion of resources and energy. Energy is the key parameter for economic development of any country. In the case of the developing countries like India, the energy resource assumes a critical importance in view of the ever increasing energy needs, requiring huge investments to meet them[1]. Energy sources are classified as conventional and non-conventional energy sources. Conventional energy sources are those which have been in use for a long time, e.g., coal, petroleum, natural gas but they are exhaustible and deplete with time except water and also cause environmental pollution when used, as they emit smoke and ash. Non-Conventional Sources includes solar, hydro, wind, tidal, biogas, wave Power and biomass, geothermal. These Non-Conventional /renewable energy sources are inexhaustible and the most important feature of is that it can be harnessed without the release of harmful pollutants[2].

II. INDIAN ENERGY MIX

Coal dominates the energy mix in India, contributing to 44% of the total energy production. It is because of a rapid rise in coal consumption mainly because of the expansion of the coal-fired power generation fleet, although increased use of coking coal in India's steel industry has also played an important role. The availability and affordability of coal relative to other fossil fuels has contributed to its rise, especially in the power sector. Demand for bio-energy (consisting overwhelmingly of solid biomass, i.e. fuelwood, straw, charcoal or dung) has grown in absolute terms, but its share in the primary energy mix has declined by almost ten percentage points since 2000, as households moved to other fuels for cooking, notably liquefied petroleum gas (LPG) . Oil consumption in 2014 stood at 3.8 million barrels per day (mb/d), 40% of which is used in the transportation sector.

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Demand for diesel has been particularly strong, now accounting for some 70% of road transport fuel use. This is due to the high share of road freight traffic, which tends to be diesel-powered, in the total transport use and also to government subsidies that kept the price of diesel relatively low. Coal and other fossil, fuels which have taken three million years to form, are exhaustible and likely to deplete soon. Today, 85% of primary energy comes from non-renewable and fossil sources (coal, oil, etc.) In the last two hundred years, we have consumed 60% of all resources. World's oil reserves are continually diminishing with increasing consumption and will not exist for future generations. Further use of these energy sources are increasingly affecting our environment and endangering life for future generation So for sustainable development, therefore it is essential that these resources should be optimally used and we should switch over to alternative sources of energy i.e. non-conventional /renewal energy sources which are freely available and are non- exhaustible, most of all are pollution free.

At gross level, air pollution causes two worldwide problems that are contamination of the upper atmosphere and alteration of weather and climate[3]. Few examples of environmental issues due to abundant use of fossil fuel/conventional fuel of global significance are ozone layer depletion, global warming, and loss of biodiversity[4].

One of the most important characteristics of this environmental degradation is that it affects all mankind on a global scale without regard to any particular country, region, or race. The whole world is a stakeholder and this raises issues on who should do what to combat environmental degradation. Rapid reductions in greenhouse gas emissions must take place in the immediate future if we are to minimize the adverse effects of climate change on our economic, social and natural systems. Achieving this goal requires putting in place practical, progressive low-emission development strategies that promote integrated clean energy solutions and broader sustainable development objectives. So we cannot heavily depends on these sources and In order to meet energy demand for future generation we have to switch over some alternative sources of energy so that we can achieve sustainable development of our society.

As well as having a large potential to mitigate climate change, renewable energy can provide wider benefits. If renewable energy is implemented properly, it can contribute to social and economic development, energy access, a secure energy supply and reducing negative impacts on the environment and health[5].

III. SUSTAINABLE DEVELOPMENT

Freedom and sustainable development are mutually exclusive ideas. To achieve sustainability, economic growth cannot be based on over exploitation of the resources but must be managed to enhance the resource base. Sustainable development can be defined as the development that meets the needs of the present society without compromising the need of future generations. This theory is focused on two main concepts:

1) Concept of need: Essential need of every poor of the world.
2) Idea of limitations: posed by the limitation of technology on the degradation of environment.

Energy is the key parameter for sustainable development so it should be used in most economical manner so that future generation can live in the better way without compromising with resources to its extreme capacity. Further, the way presently energy is being used makes our activities unsustainable. Energy Programs running by the government supports the development of sustainable energy systems. They are designed to meet the present energy demand in a sustainable manner and comply with environmental and social norms.

IV. SUSTAINABLE ENERGY

Sustainable energy is a form of energy that meet our today's demand of energy without putting them in danger of getting expired or depleted and can be used over and over again. Sustainable energy should be widely encouraged as it do not cause any harm to the environment and is available widely free of cost. Basic requirement for sustainable energy system to gain sustainable development is to maximize use of renewable energy. Renewable sources of energy are sustainable, totally inexhaustible and occur naturally. Unlike fossil fuels that are finite, these are ever lasting and also a non-polluting source of energy and it does not emit any greenhouse gases when producing electricity. It includes:

1) *Bioenergy:* It can be produced from a variety of biomass feedstocks, organic component of municipal solid waste and other organic waste streams. The range of bioenergy technologies is broad and the technical maturity varies substantially. Advanced biomass integrated gasification combined-cycle power plants and lignocelluloses based transport fuel technologies are at pre commercial stage. Liquid bio fuel production from biological conversion approaches are at research and development phase[6]. The production of biogas from a variety of waste streams and its upgrading to biomethane is already penetrating small markets.

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2) *Geothermal Energy:* Heat from the molten core of the earth is a huge source of sustainable energy. This geothermal energy from the earth's interior can be utilized for space heating or for boiling water to generate steam for driving turbo generators. The world's largest geothermal energy production exists near San Fransico in US. Similar geothermal facilities are located in the Phillippines, Mexico, Japan, Itlay and Iceland, generating a total power of about 3,000 megawatts. The high temperature (> 150^{o}C) geothermal resources are used for power generation. Geothermal resources in the moderate temperature range (90-150^{o}C) can be used for space heating while the low temperature (< 90^{o}C) are used for domestic purposes. Geothermal energy is currently extracted using wells[7] and other means that produce hot fluids from hydrothermal reservoirs or engineered geothermal systems with artificial pathways. The basic types of geothermal power plants in use today are steam condensing turbines and binary cycle units.
3) *Hydro Energy:* Water energy has been used since ancient times by diverting water from streams, rivers or turbines. From the last century a substantial amount of hydrostatic energy is obtained from high dams. The water under high pressure, flows through the base of the dam and drives turbo generators producing hydroelectric power. Many developing countries have great potential for large hydel power projects.
4) *Solar Energy:* Solar energy generates from the thermonuclear fusion reactions taking place in the sun. Nuclear fusion reactions take place between deuterium-deuterium and deuterium-tritium.

$$_1H^2 + {}_1H^2 \longrightarrow {}_2He^3 + {}_0n^1 + 3.27\ MeV$$

$$_1H^2 + {}_1H^2 \longrightarrow {}_1H^3 + {}_1H^1 + 4.03\ MeV$$

$$_1H^2 + {}_1H^3 \longrightarrow {}_2He^4 + {}_0n^1 + 17.59\ MeV$$

$$_1H^2 + {}_2He^3 \longrightarrow {}_2He^4 + {}_1H^1 + 18.3\ MeV$$

Solar energy can be used to generate electrical power, thereby providing an alternative to thermal and nuclear power. At present two methods seems to be cost effective photovoltaic cells (solar cells) and solar trough collectors.
Besides generating electricity solar energy can also be utilized for driving vehicles. Use of solar heating facilities reduces the demand for natural gas in commercial and residential sectors. Solar energy can be used to produce hydrogen which in turn, can be used as fuel for existing vehicles. Hydrogen is a clean burning gas without any pollution because the product of combustion is only water vapour. However, hydrogen does not exist in free state on earth and it should be produced by electrolysis of water. Solar energy can be used to produce hydrogen by electrolysis of water.

$$2H_2 + O_2 \longrightarrow 2H_2O + Energy$$

Present vehicles could easily be adapted to run on hydrogen with some modification in the fuel tank system. The service stations should dispense hydrogen gas into vehicle fuel tanks, which would consist of material that would absorb large amounts of hydrogen and release it slowly. This slow release would ensure safety against the hazard of explosion.

5) *Tidal Energy:* Rise and fall of the tides produces a lot of energy twice a day. Scientists have tried to utilize this tidal energy, which is eternal and pollution free. At present tidal power plants are in operation in Russia, France and Nova Scotia. For any tidal power project to be of practical use, a fluctuations of atleast 6 meters is required between the high and low tide. 15 such locations are present around the world. The Bay of Fundy in North America is one of such locations and a large tidal power plant is being developed.

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6) *Wind Energy:* Wind is a dispersed source of energy and this is the limiting factor for the large scale utilization of wind as a source of power. It is a renewable energy source available free of cost. For obtaining substantial amount of power from wind, massive wind machines must be used. Wind machines are useful in supplying electric power to remote and rural areas. It is economically competitive for remote areas. Wind mills have been in use in China, Portugal, USA etc. Many wind turbines are in operation today throughout the world. Experience and detailed studies from many regions have shown that the integration of wind energy poses no insurmountable technical barriers[8]. As wind energy consumption increases and as larger wind power plants are considered, existing concerns may become more acute and new concerns may arise[9]. Dispersed wind energy systems are more environmentally benign than any other alternative source of energy.

India has large potential of renewable energy sources. Presently total available capacity 305554.25 MW of Power, more than 1/3 of energy consumed comes from renewable resources, predominantly from Large Hydro. The breakup of Renewable energy sources, as per web-site of MNRE, as on July31, 2016on the basis of Installed Grid Interactive Renewable Power Capacity in India is as under:

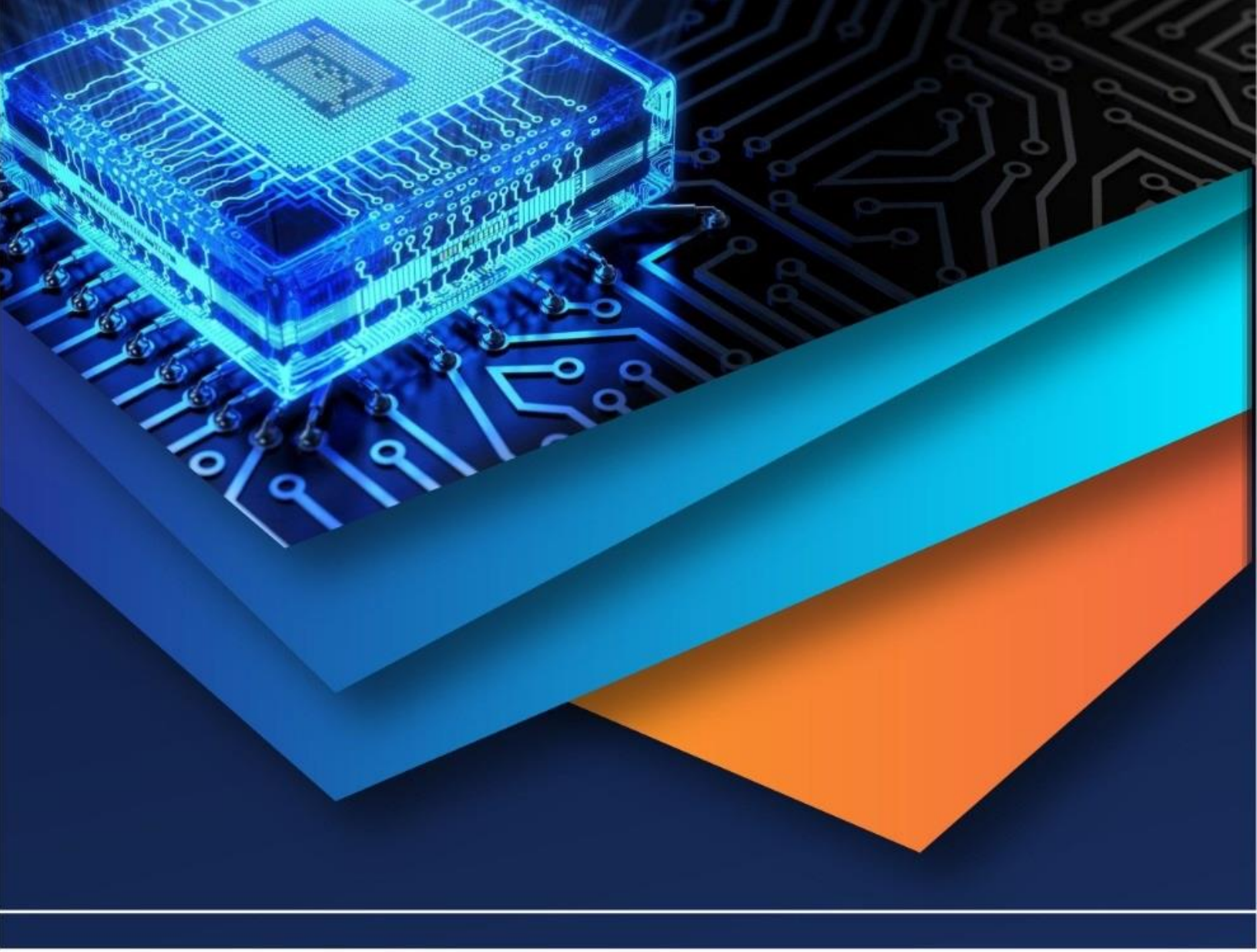
a) Wind Power: 27,441.15 MW (61.3%)
b) Solar Power: 8,062 MW (18.0%)
c) Biomass Power: 4,860.83 MW (10.9%)
d) Small Hydro Power: 4,304.27 MW (9.6%)
e) Waste-to-Power: 115.08 MW (0.3%)

V. CONCLUSION

The excessive dependence on fossil fuel is dangerous to our national security which is vulnerable to political instabilities, trade disputes, wars, and high prices. Increasingly, governments around the world are turning to renewable energy to end our dependence on fossil fuels. It is mainly due to major advantages associated with the use of renewal energy. One major advantage with the use of renewable energy is that as it is renewable it is therefore sustainable and so will never run out. Their fuel being derived from natural and available resources reduces the costs of operation .It is also cheaper and more economically sound than other sources of generated energy. Switching to renewable energy sources also means steady pricing on energy. Since the cost of renewable energy is dependent on the invested money and not the increasing or decreasing or inflated cost of the natural resource. Even more importantly, renewable energy produces little or no waste products such as carbon dioxide or other chemical pollutants, so has minimal impact on the environment. So to protect the environment from toxic pollutions for our self and for our future generation, which in turn keep people healthier, we must encourage maximum use of sustainable sources of energy. To be sustainable, development must process both economical and ecological sustainability.

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