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A Review Paper on Renewable Energy Resources

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Abstract **The main objective of this review paper to present about the basic overview of renewable energy resources. The huge consumption of conventional fuels such as coal, petrol, diesel etc. causes environment pollution. So the need of renewable resources is very useful for power generation. The renewable energy like wind energy, solar energy, geothermal energy, ocean energy, biomass energy and fuel cell technology is used to reduce energy shortage. In this review paper the energy scenario of India till March 2017 is also discussed. Renewable energy uses energy sources directly from nature : the sun, the wind, the water , the earth's heat and plant. Renewable energy technologies are converted these fuels into useful form of energy like electricity or mechanical energy. Today we highly dependent upon fossil fuels for fulfill our energy demand. But due to limited quantity and environment pollution these fuels cannot be used for fulfill our energy demand in future. So Renewable resources would play important role for fulfill our energy demand in future.**

Keywords —Biomass Energy, Conventional Fuels, Energy Scenario, Geothermal Energy, Renewable Energy, Solar Energy.

I. INTRODUCTION

The world energy forum has predicted that fossil fuels will be exhausted in less than 10 decades. Fossil fuels account for over 79% of the primary energy consumed in the world and 57.7% of that amount is used in the transport sector and are diminishing rapidly [1]. The use of fossil fuels cause environment pollution also. Due to limited quantity and environment pollution of fossil fuels, it is necessary to replace fossil fuels by renewable energy resources to fulfill our energy demand. Renewable energy is defined as the energy i.e. derived from the nature directly. Renewable energy is the energy that are regenerative and do not deplete over time. There are various resources of renewable energy in nature : Solar Energy, Wind Energy, Tidal Energy, Hydro Energy, Geothermal Energy and Ocean Energy etc.

II. RENEWABLE ENERGY RESOURCES

A. Biomass Energy

Biomass Energy is the energy that extract from the bio product (organic matter) such as plants. Biomass energy refers to fuels made from plants and animal waste. Biomass has less sulphur than coal. Biomass products are corn, wheat, soybeans, wood and residues etc.

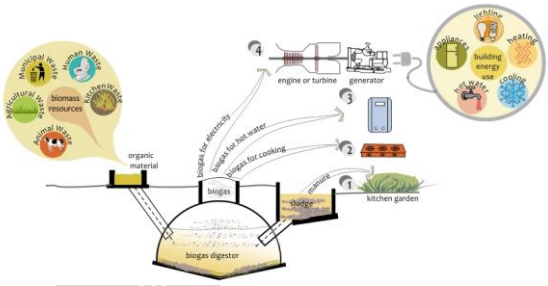

Fig. 2.1 Biomass Power Plant

B. Geothermal Energy

Geothermal energy is the use of earth ground temperature as heat. The use of earth as a heat source or as a heat sink is known as geothermal heat exchanger. The earth core temperature below 4000 miles can reach up to 4000˚C. This temperature is used as heat in geothermal energy.

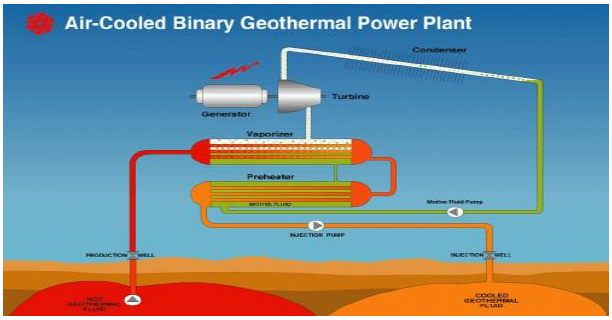

Fig. 2.2 Geothermal Power Plant

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C. *Tidal Energy*

Ocean cover two thirds of the earth's surface. The water of ocean is vast reservoir of renewable energy. India is naturally located in sea side and covered 3 sides by sea. In tidal energy the movement of water from low tide to high tide is used as electric energy. The major problem with tidal power that during cyclone and storms the plant is kept shutdown.

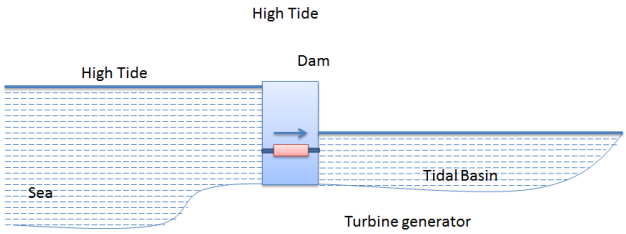

Fig. 2.3 Tidal Power Plant

D. *Solar Energy*

Sun is the most permanent source of energy on the earth. Solar energy is derived from the sun into two ways: direct form (Solar Radiation) and indirect form (wind, biomass, hydro and ocean).

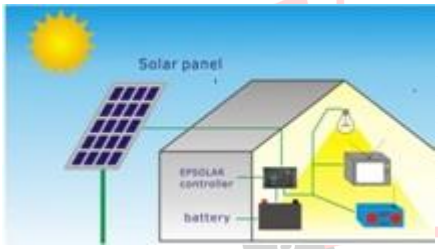

Fig. 2.4 Solar Power Plant

E. *Wind Energy*

Wind energy is derived from the atmospheric air. As sun heat the atmosphere due to which wind is produced. The major problem associated with wind turbine is location. The windmills are generally located at the top of tower to height 30 m approximately. Peoples are using windmills from hundreds of years. The mechanism of wind turbine technology is so simple. In wind power plant, wind rotates the wind turbine blades around a central hub.

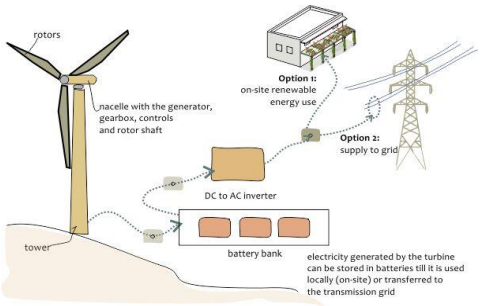

Fig. 2.5 Wind Energy Power Plant

III. Energy Scenario In India

A. *Coal & Lignite*

Mostly coal in India are derived from eastern and southern part of the country. The states of Jharakhand, Odisha, Chattisgarh, West Bengal, Madhya Pradesh, Telangana and Maharashtra account for 98.20% of the total coal reserves in the India [2]. The state of Jharkhand had the maximum share of 26.60% in the overall reserves of coal in the country as on 31st March 2017 [2].

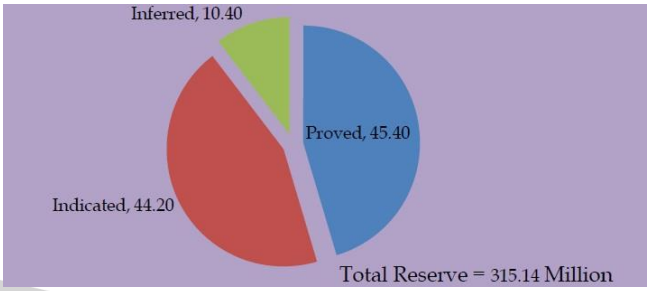

Fig. 3.1 Estimated Distribution of Reserves of Coal in India as on 31st March 2017 [2]

As on 31st March 2017, the estimated reserves of coal were 315.14 tonnes in India [2].

The estimated total reserves of lignite as on 31st March 2017 were 44.70 in India [2].

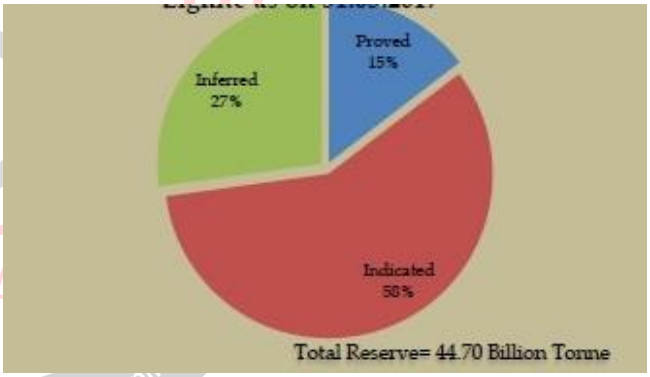

Fig. 3.2 Estimated Distribution of Reserves of Lignite in India as on 31st March 2017 [2]

B. *Petroleum & Natural Gases*

The estimated reserves of crude oil in India as on 31st March were 604.10 million tonnes [2].

The estimated reserves of natural gas in India as on 31st March 2017 were 1289.81 Billion Cubic Meters [2].

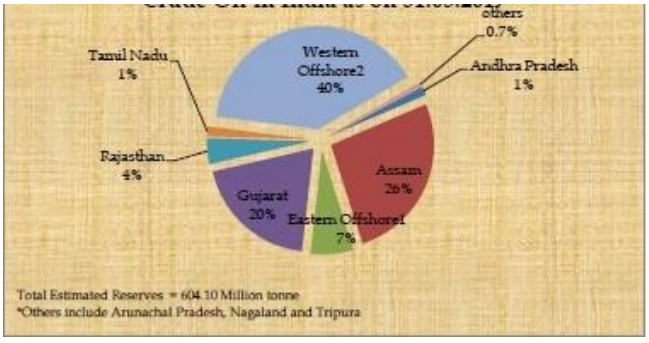

Fig. 3.3 Estimated Distribution of Reserves of Crude Oil in India as on 31st March 2017 [2]

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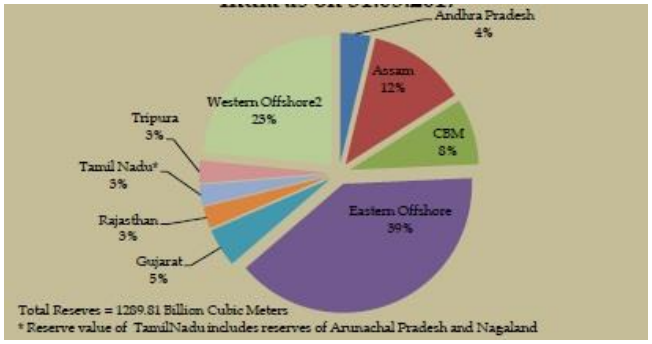

Fig. 3.4 Estimated Distribution of Reserves of Natural Gases in India as on 31st March 2017 []

C. Renewable Energy Resources

The total potential for renewable power generation in the India were 1001132 MW as on 31st March 2017 [2].

This contains solar power 649342 MW (64.86%), wind power 3022251 MW (30.19) at 100m hub height, small hydro power 21134 MW (2%) and biomass power 18601 MW (1.86%) [2].

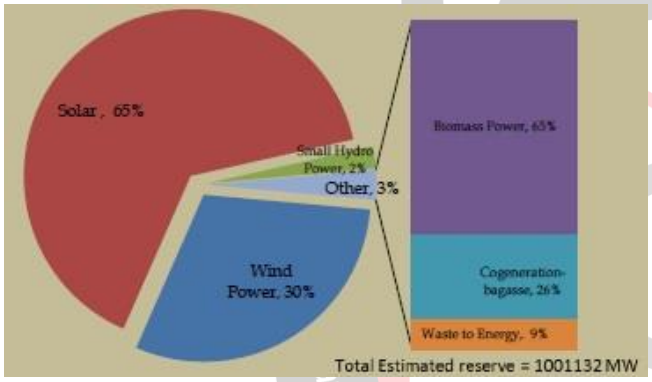

Fig. 3.5 Source wise Estimated Potential of Renewable Power in India as on 31st March 2017 [2]

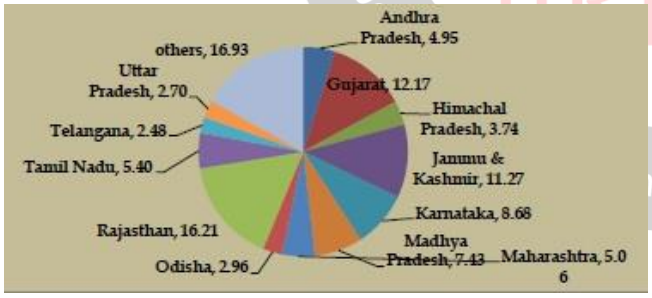

Fig. 3.6 State wise Estimated Potential of Renewable power in India as on 31st March 2017 [2]

IV. GOVERNMENT POLICIES

The Government of India has set an target to achieve 175 GW renewable energy capacity by 2022 as a part of its Paris Agreement [3]. This includes 100 GW of solar and 60 GW of wind [3]. 60 Solar cities will be developed in India as a part of Ministry of New and Renewable Energy's Solar Cities Program. More than 42 billion US dollar has been invested in India' Renewable Energy Sector since 2014 [3]. Renewable sources are expected to help meet 40% of India power needs by 2030 [3].

V. LITERATURE WORK

Most of work was carried out on various renewable resources during the past decades. Here pervious work done on hydropower, wind energy, solar power and geothermal energy is mentioned.

Lehner et al. (2005) applied a model to analyze posible impacts of climate change on Europe's hydropower potential at the country level. They analyzed both the gross hydropower potential and the developed potential of current plants in order to capture a realistic picture of present and future power generation. The results strongly indicated that the hydropower potential in Europe is influenced by climate change [4].

Kaldellis et al. (2010) introduced a methodology to measure the size of pumped hydro storage system to take advantage of excess wind energy generated by local wind farms, but that are rejected by local power grids due to electrical limitations. The result shows that the ability of pumped hydro storage system has significant contribution in the electrification of remote islands [5].

Monteiro et al. (2013) developed a forecasting model for power production using small hydro. The result shows that the power generation forecasts are required to operate small hydro power plants appropriately for preparing bif offers and maintenance schedule [6].

Meunier (2009) did life cycle analysis of 4.5 MW and 250 MW wind mill turbine. The results revels that the wind energy could be the best environment solution to mitigate climate change and supply electricity in off-grid areas [7].

Crawford (2009) did life cycle analysis emission analysis for wind turbine. The result shows that the size of wind turbine is not an important parameter to optimize life cycle energy performance [8].

Frankl et al. (1997) did life cycle analysis of PV systems in buildings [9].

Huo et al. (2011) applied the Granger causality relationship between PV market sales and manufacturing development in the US, Germany, China and Japan. The results shows that the growth market sale affects the innovation scale in the US, Germany and Japan [10].

Raugei and Frankl (2009) proposed three alternative scenario for the fututre development of PV systems [11].

Chamorro et al. (2012) did energy, environment and economic study of geothermal technology. Result shows that the dry steam model plant has the highest NPV and IRR factors [12].

Saner et al. (2010) did life cycle analysis on geothermal system. The results revels that the high investment cost and the risk of insufficient heat are the disadvantages of this technology [13].

Lund et al. (2005) reviewed worldwide applications of

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geothermal energy using data from 72 countries [14].

Frick et al. (2010) did life cycle analysis on geothermal power generation from an enhanced geothermal system with low temperature reservoir in order to quantify the effect of geological conditions on the environment [15].

VI. Conclusion

Renewable Energy Resources play important role in our life. The use of fossil fuels as energy is restricted due to limited quantity and Global Warming. The main sources of renewable energy are solar, wind, tidal, geothermal and biomass. In India the total potential of renewable power generation was 1001132 MW as on 31st march 2017. The renewable energy resources are coast effective and user friendly. By using renewable energy resources, we can eliminate air pollution, soil pollution and water pollution. By using renewable energy we can obtain energy by one time investment for many decades.

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