



Non-conventional energy sources in present power sector in India

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Abstract

Energy is an important input in development of any country. Day by day demand of energy increased in India due to rapid urbanization and industrial demand. Growing population is also responsible for power crisis. Crisis of petroleum and nuclear product forced India to think alternate non-conventional sources of energy. India is one of the nation which have separate ministry of non-conventional energy sources. Due to limited sources of fossil fuel in India as a fastest economy growing country developed a non-conventional power sources to reduces the power shortage. Non-conventional energy sources play a important role in development of india and reduces the power crises in present power sector in india.

Keywords: non-conventional energy, wind energy, solar energy, fossil fuel, environmental effect

1. Introduction

Since last few year, India has been growing rapidly, but the production of energy is far below to sustain our rapid growing economy. This enhance the demand for more energy production. Supply of oil and coal will fail to meet increasing demand. Nuclear energy require skilled technician and require more safety against radioactive waste. Nonconventional sources are the sources to be utilized in future India. The important feature of renewable energy is its unlimited supply. Renewable energy sources are hygienic sources of energy that have a much lesser negative environmental impact than other fossil power plant ^[1].

Consumption of oil, coal, nuclear product, fossil fuel has caused a damage to environment in various forms and crate a environment problem and finally ecological cycle will be affected. Burning of coal and other fossil fuel produced gases which increased pollution and affect the human health and plant growth. The drawback of oil, coal, natural gas are serious but cannot do anything till renewable energy sources become alternate of thermal, hydro, nuclear, diesel power plant. Non – conventional energy has the potential to reduce the pollution, reduce the global warming and create a new employment and start up the India toward cleaner and healthier energy future. The another advantage of renewable sources is that they are distributed over a wide geographically area, ensuring that developing regions have access to electricity generation at a stable cost for long term future ^[3]. The many types of energy sources like solar and wind are constantly demanded and have infinite sources. Renewable energy sources include both direct solar radiation by collector and indirect solar energy such as wind, hydropower, ocean energy. Wind created due to the sun light whose energy captured with wind turbine. Winds, solar, biomass, tidal, geothermal are the renewable energy sources available in India and contribute in present power sector.

2. Advantage of Renewable Energy Sources.

A. Environmental

Non-conventional energy sources are echo friendly and clean energy sources. Less impact on environmental in comparison with the conventional energy sources.

B. Infinite Sources

Non-conventional energy have sufficient and infinite source while other conventional sources are finite and someday be empty.

C. Employment and economy

Due to development of renewable energy plant like solar, wind etc. create a employment opportunity and also reduces the power crises and up economic growth of country.

D. Energy Security

Energy dependence increased due to renewable sources. Dependence of oil, coal, gas, nuclear product will decrease and energy security become high.

E. Stable energy cost

Renewable energy sources provide electricity easy way and stabilize energy cost in the future.

F. Reliable and resilient power

Non-conventional power plant like wind, solar etc are distributed and modular spread out in large area. So some of equipment will damage, the other part can continue to operate and provide reliable and constant power.

3. Opportunity of Renewable Energy Sources

India's electricity demand increased by 7.4% a during next year of century. India cannot deficit power demand by conventional

energy sources. So that Indian government take serious step to strengthen India in energy production. The sustainable nature of wind, solar, geothermal, tidal, highly encourage the energy supply company to utilize them^[1]. These sources are not dangerous to environment and produce no pollution. Total installed capacity of India is 329.30 GW (As on sep 2017). Power generation from different sources is given in chart 1.

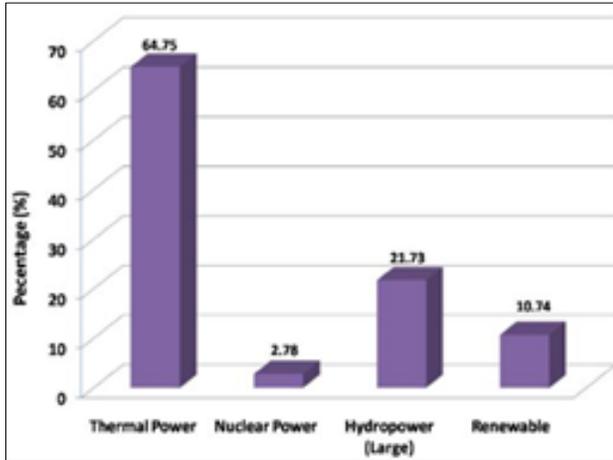


Chart 1: Contribution of power generation in India^[2].

Thermal and hydro power plant fulfill the power demand of India in conventional power sector. Third on is the renewable energy sources give the contribution in power generation. Renewable energy sources in India are discussed below.

3.1 Wind Energy

Wind power increase faster with the speed, so that energy conversion machine place in area where the wind are strong and persistent. Daily wind at given site is highly variably so that annually average speed of wind considered for the site selection. The most suitable site for wind turbine is the area where the average wind speed are to be moderately high.

Wind energy is the cleanest way for generation electricity without creating air pollution. Wind power is used to pump water in agriculture and other machine. Present time wind power plant generate at least 500 kW. An initial cost of approximately \$500,000 for 500 kW turbine, operating at 30% efficiency [4]. Wind turbine use more land and specially located in hilly and coastal zone. Wild life and birds are disturbed due to noise of wind blade and possibility of collisions with wind turbine. Noise of wind turbine also affect the human life near the plant. Sound level depend on the design of blade and wind speed.

The present wind power installed capacity in the India around 32.5GW which is approximately of total renewable power generation. In term of the wind power installed capacity India is globally at fourth position after China, USA and Germany. Government of India has set an ambition target of reaching 175GW of renewable power capacity in the country by 2022 of which 60 GW to come from wind. India has large cost line of 7600 km considering the development of offshore wind energy. Coastal area of India like Gujarat, Kerala, andhra pradesh, Karnataka, Tamilnadu are the popular site for the wind power plant. NIWE national institute of wind energy formally known as center for wind energy technology working at Chennai since

1998 which focus on technical point related to the wind energy technology. The government also promote wind energy sector in the country through Indian Renewable Energy Development Agency (IREDA).

3.2 Solar Energy

Solar energy generate clean, safe and reliable power. Sun is a tremendous source for generating clean electricity without creating pollution. Large area of land, water and hazardous material in manufacturing of solar power plant. Estimates for utility scale photovoltaic systems range from 3.5 to 10 acres/MW, while estimates for CSP facilities are between 4 and 16.5 acres/MW^[2]. Water is used for the cooling purpose in concentrating solar thermal plant (CSP) depending on the plant location, plant design and types of cooling system. In PV cell hazardous material like H₂SO₄, HNO₃ is used to clean the semiconductor surface. Quantity of this material depend upon the required area of cleaning and size of silicon wafer. Solar energy classified in two part (1) Passive solar and (2) Active solar. Thermal energy from the sun is direct or indirect used in passive solar system. It is possible only in building or roof tops shown in Fig 1.

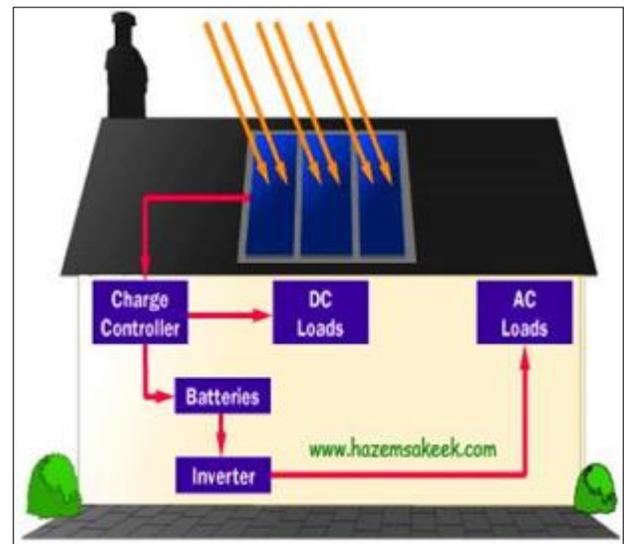


Fig 1: Solar energy mechanism at the unit^[3].

Electromagnetic radiation of sun is used for generating electrical energy in active solar energy. Silicon boron semiconductor is used which have low efficiency ratio and it is only used for small device like radio, torch, calculator etc. Applications of solar energy in India are energisation of pump for agriculture, drinking water supply, rural electrification, street light and small power load.

India's prime minister was launched national solar mission on the 11th January 2010. The target of the mission is to deploying 20000 MW of grid connected by solar energy by 2022. In 17th June 2015 Indian government further revised the target of grid connected from 20000 MW to 100,000 MW. The government also encourage the public for installing solar roof top project and providing subsidy for generating electricity for domestic, industrial as well as agriculture purpose.

In India Gujarat state have wide scope for solar power project.

Gujarat Power Corporation Ltd. (GPCL) is nodal agency for development of solar park in Gujarat. The biggest solar park having 590 MW capacity is located at village Charanka of dist Patan of Gujarat state. 5384 acre land is acquired for this solar project. Canal top solar plant also available at Chandrasan village of mehsana dist of Gujarat state. The advantage of this project is no land is required. Installation of solar panel over a 750 m length of irrigation canal.

3.3 Geothermal Energy

Electricity produced by using heat from the earth. It is clean and reliable. Geothermal energy sources divided in to three categories: hydrothermal, geopressured- geothermal and hot dry rock [4]. Hydrothermal method is simply and most commonly used for generation of electricity. Heat is directly transferred to working fluid which operate power cycle. In other hot water steam is used to operate the turbines directly. Water shortage, air pollution, noise, waste disposal are the drawback of geothermal energy sources. It also produce hydrogen sulfide a air pollutant and use for the industries after processing.

Scope of geothermal sources are little small in India. Puga Vally(J & K), Tatapani(Chattisgarh), Godavari basin (Himachal Pradesh), Bakreshwar (West Bengal), Tuwa (Gujrat), Jalgaon & Unai (Mharashtra).

3.4 Tidal Energy

Tides in the sea produces due to the gravitational force of sun and moon on the earth. This force create a periodic rise and fall in water level of sea is called tide. Electricity generated by this tide in tidal power plant. Geography inlet or bay is the suitable location for the tidal power plant where height of tide is sufficient to justify economy.

India develop a policy for tidal energy. India has a potential of 8000 MW of tidal energy. Most of tidal energy provide by Gujrat state including 7000 MW of Gulf of Cambay and 1200 MW in Gulf of Kutch. Sunderland delta in West Bengal is also a location of tidal power plant. Gujarat State government has approved 25 crore for the tidal project in Gulf of Kutch. In 2016 India collaborate with Israeli firm to set up tidal power plant in Goa.

3.5 Bio-mass Energy

The future application of bio-mass as an alternate of conventional energy in India is good. There is a three types of bio-mass resources: (1) traditional form (wood and agricultural residue) (2) non- traditional form (converted in to liquid fuels) (3) Wet bio-mass material can be converted in to usable energy with anaerobic microbes. It is process of photosynthesis in the presence of solar radiation. Municipal solids, animal dung, industrial waste, sewage wood, crop residue etc. are resources of bio-mass energy.

The current availability of bio- mass in India is estimated at about 500 million metric tones per year. The potential of bio mass energy is 18000 MW and 7000 MW additional power could be generated through the bio gas based cogeneration in the country's sugar mills. If sugar mill adopted technically and economically optimal level of cogeneration for encouraging bio mass energy plant. The total of approximate 500 bio mass power cogeneration project aggregating to 4760 MW capacity have been installed in the country for fiddling power to the grid and about around 350 MW of capacity are under various stage of implementation. The

leading state for bio mass power project are aandhrapradesh, utter Pradesh, Maharashtra, madhyredesh, Gujarat, Chhattisgarh and tamilnadu.

4. Hindering Problems in Implementing Renewable Energy System

Implementation of renewable energy project shows that there are number of obstacles for effective development of such system. Some of which are:

1. Inappropriate documentation and analysis of past work, lack of performance data and future perspectives.
2. Unavailability of institutions and policies to finance and upgrade renewable energy project.
3. Uncertain technical and economic aspect in many renewable energy system results in high economic and financial costs for such systems in comparison with other conventional sources.
4. Having an attitude of doubt towards the renewable energy system on the part of energy planners and less skilled personnel to design, manufacture, operate and maintain such systems
5. Insufficient coordination in renewable energy enhancing activity, with little or no information exchange on successful and unsuccessful projects.

5. Conclusion

Conventional energy sources are unreliable and create a environment problems. As a highly economically growth country, India find a alternate source of generation of electricity which is easily available from wind, solar, geothermal, tidal and biomass energy sources. The renewable energy sources are cost effective and echo friendly so that they are the alternate of fossil fuel.

By increasing awareness of non-conventional sources India have a wide scope of generating power through renewable energy sources. It will help to achieve economic goal and solving pollution problems. To increase the contribution of non-conventional energy sources in India, government should revise the power polices to make full use of renewable energy sources? By tacking such a steps to encourage the renewable sources the time is not far when the India will be reliable on renewable sources for power production.

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