



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 4, Issue 2)

Available online at: www.ijariit.com

Recent Trends in Renewable Energy Sources in India

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ABSTRACT

As India is in a league of the most rapid development taking place in the country, hence it has to produce more and more energy to meet the consumption of the people with increase in the population, as in India most of the power generation in India is carried out by conventional energy sources, coal and mineral oil-based power plants which contribute heavily to greenhouse gases emission. This focuses the solution of the energy crisis on judicious utilization of abundant renewable energy resources. This paper reviews the renewable energy scenario of India.

Keywords: Conventional Energy Sources, Greenhouse Gases, Renewable Energy, Conserve.

1. INTRODUCTION

Energy has become an important and one of the basic infrastructures for economic development of a country. Energy security is therefore, imperative for sustained growth of the economy. The oil Crisis of 1973 and concern for environment due to excessive use of fossil fuels have led to remarkable global efforts in harnessing alternative energy resources. The renewable energy resources such as sun, wind, biomass and geothermal heat are environment friendly and perennial in nature. These resources are also referred as non-conventional energy resource as, at present, their large-scale use is not common. Harnessing energy through these resources using efficient technologies is expected to play an important role in serving as clean energy sources for mankind.

2. RELATED SURVEY

Current status and trend of primary energy consumption India is blessed with abundant natural resources and renewable energy potential, but millions of people still lack access to energy, electricity and clean fuels. Specifically, 40261.16MW till august 2017 are currently powered by renewable energy sources. Focusing on clean energy and seeing its enormous potential, renewable energy is likely to become the foundation of India's energy sector

The key drivers for renewable energy are:

- 1) Large unexplored potential
- 2) Gap between demand and supply with increase in population
- 3) Environmental concerns.
- 4) Beef up India's energy security
- 5) Pressure from shareholders on high emission industry sectors
- 6) A practical solution for rural electrification

Also, with a commitment to rural electrification, the Ministry of Power has accelerated the Rural Electrification Program with a target of 100,000 villages. To better understand the current situation in India and the future of the renewable energy market, it is important to look at the trends in energy consumption, growth of the current grid, and the availability of transportation and equipment used.

3. DETAILS OF DIFFERENT KINDS OF RENEWABLE ENERGY

The actual scenario of installed capacity is more in wind power station. Also solar and others natural sources installed at various states in India. The various sources can be explained in details with following:

A. SOLAR ENERGY

Solar energy is the most abundant permanent energy resource on earth and it is available for use in its direct (solar radiation) and indirect (wind, biomass, hydro, ocean, etc.) forms. Solar energy, experienced by us as heat and light, can be used through two routes: the thermal route uses the heat for water heating, cooking, Drying, water purification, power generation, and other applications; the photovoltaic route converts the light in solar energy into electricity, which can then be used for a number of purposes such as lighting, pumping, communications, and power supply in electrified areas.

The total annual solar radiation falling on the earth is more than 7500 times the world’s total annual primary energy consumption of 450 EJ. The annual solar radiation reaching the earth’s surface, approximately 3,400,000 EJ, is an order of magnitude greater than all the estimated (discovered and undiscovered) non-renewable energy resources, including fossil fuels and nuclear. However, 80% of the present worldwide energy use is based on fossil fuels. Equivalent of more than 5000 trillion kWh/yr. Depending on the location, the daily incidence ranges from 4 to 7 kWh/m², with the hours of sunshine ranging from 2300 to 3200 per year. The MNRE, working in conjunction with the Indian Renewable Energy Development Agency (IREDA) to promote the utilization of all forms of solar power as well as to increase the share of renewable energy in the Indian market. This promotion is being

Achieved through R&D, demonstration projects, government subsidy programs, and also private sector projects.

Table 1. Cumulative Capacity of solar Energy (MW)

Year	Cumulative Capacity(MW)
2010	161
2011	461
2012	1205
2013	2319
2014	2632
2015	3744
2016	6763
2017	12289



Fig 1 Solar Energy Farm

B. WIND ENERGY

Winds are generated by complex mechanisms involving the rotation of the earth, heat energy from the sun, the cooling effects of the oceans, temperature gradients between land and sea and the physical effects of mountains and other obstacles. Wind is a widely distributed energy resource. Total India wind capacity at the end of 2016 was around 32,280MW. Wind energy is being developed in the industrialized world for environmental reasons and it has attractions in the developing world as it can be installed quickly in areas where electricity is urgently needed. In many instances it may be a cost-effective solution if fossil fuel sources are not readily available. In addition there are many applications for wind energy in remote regions, worldwide, either for supplementing diesel power (which tends to be expensive) or for supplying farms, homes and other installations on an individual basis Wind Energy is mostly convenient energy source which can be harnessed only in coastal areas in India such as Nasik in Maharashtra, Muppandal in Tamil Nadu, etc.

YEAR	CAPACITY(In MW)
2005	6,270
2006	7,850
2007	9,587
2008	10,925
2009	13,064
2010	16,084
2011	18,421
2012	20,149
2013	21,264
2014	23,354
2015	26,769
2016	32,280
2017	32,747 till November 2017

Table 2. Largest Farms in India

Wind Farm	Producer	State	Current Capacity(MW)
Muppandal wind park	Muppandal Wind	Tamil Nadu	1500
Jaisalmer Wind Park	Suzlon Energy	Rajasthan	1275
Brahmanvel Windfarm	Parakh Agro Industries	Maharashtra	528
Dhalgaon Windfarm	Gadre Marine Exports	Maharashtra	278
Chakala Windfarm	Suzlon Energy	Maharashtra	217
Vankunsawade Wind Park	Suzlon Energy	Maharashtra	189
Vaspeta Windfarm	Renew Power	Maharashtra	144



Fig 2. Muppandal Wind Farm in Tamil nadu

As now India is developing and becoming the centre of hub of investments we should install more and more windmill to generate more power so that we could distribute more and more electricity across the different states of India which are not getting enough electricity. So that they can live their livelihood more peacefully. Taking a step ahead which will boost our energy capacity.

C. BIOMASS ENERGY

Biomass includes solid biomass (organic, non-fossil material of biological origins), biogas (principally methane and carbon dioxide produced by anaerobic digestion of biomass and combusted to produce heat and/or power), liquid biofuels (bio-based liquid fuel from biomass transformation, mainly used in transportation applications), and municipal waste (wastes produced by the residential, commercial and public services sectors and incinerated in specific installations to produce heat and/or power). The most successful forms of biomass are sugar cane bagasse in agriculture, pulp and paper residues in forestry and manure in livestock residues. It is argued that biomass can directly substitute fossil fuels, as more effective in decreasing atmospheric CO₂ than carbon sequestration

in trees. The Kyoto Protocol encourages further use of biomass energy. Biomass may be used in a number of ways to produce energy.

The most common methods are:

- Combustion
- Gasification
- Fermentation
- Anaerobic digestion

India is very rich in biomass India has over 5,940 MW biomass based power plants comprising 4,946 MW grid connected and 994 MW off-grid power plants. Out of the total grid connected capacity, major share comes from bagasse cogeneration and around 115 MW is from waste to energy power plants. Whereas off-grid capacity comprises 652 MW non bagasse cogeneration, mainly as captive power plants, about 18 MW biomass gasifier systems being used for meeting electricity needs in rural areas, and 164 MW equivalent biomass gasifier systems deployed for thermal applications in industries. Following is a list of some States with most potential for biomass production:

- Andhra Pradesh
- Bihar
- Gujarat
- Telangana
- Uttar Pradesh
- Punjab

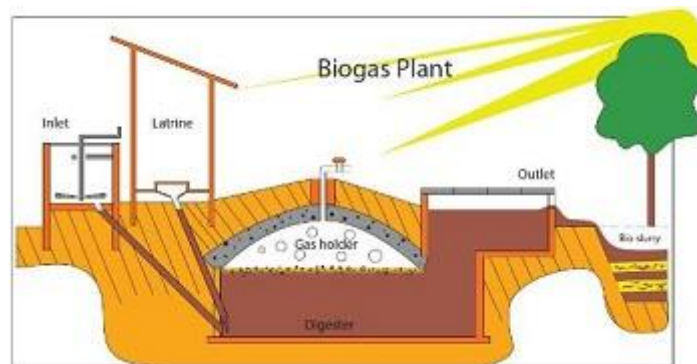


Fig 3, Biogas Plant Setup

D. SMALL HYDROPOWER

The hydroelectric power refers to the energy produced from water (rainfall flowing into rivers). Consequently, rainfall can be a good indicator to investors looking for a location to implement or build a new hydroelectric power plant in India. The dominant annual rainfall is located on the north/eastern part of India: Arunachal Pradesh, Assam, Nagaland, Manipur and Mizoram, and also on the west coast between Mumbai and Mahe. In India, small hydro is the most utilized renewable energy source for energy production. These are the following Advantages of Hydro power:

Some key figures concerning small hydro in India:

- Less than 25 MW is in the “small hydro” designation
- There is a potential of 20,000MW
- Technology is mature and reliable

Two types of technology are used:

I. High-head systems

ii. Low-head systems

- Ministry of Non-conventional Energy Sources is focused on:
- Nation-wide resource assessment
- Setting up of commercial projects
- Renovation and modernization
- Development and up-gradation of water mills
- Industry based research and development

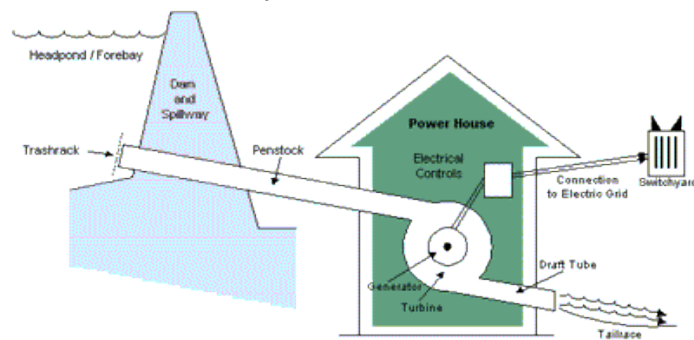


Fig 4: Setup Small hydropower plant

E. TIDAL ENERGY

Oceans cover 70 percent of the earth's surface and represent an enormous amount of energy in the form of wave, tidal, marine current and thermal gradient. The energy potential of our seas and oceans well exceeds our present energy needs. India has a long coastline with the estuaries and gulfs where tides are strong enough to move turbines for electrical power generation. A variety of different technologies are currently under development throughout the world to harness this energy in all its forms including waves (40,000 MW), tides (9000 MW) and thermal gradients (180,000 MW). Deployment is currently limited but the sector has the potential to grow, fuelling economic growth, reduction of carbon footprint and creating jobs not only along the coasts but also inland along its supply chains.

As Government of India steps up its effort to reach the objectives to contemplate its Renewable Energy and climate change objectives post 2022, it is opportune to explore all possible avenues to stimulate innovation, create economic growth and new jobs as well as to reduce our carbon footprint. Given the long-term energy need through this abundant source, action needs to be taken now on RDD&D front in order to ensure that the ocean energy sector can play a meaningful part in achieving our objectives in coming decades. MNRE looks over the horizon at a promising new technology and considers the various options available to support its development.

4. IMPACTS OF NOT USING RENEWABLE ENERGY AS FUTURE FUEL

As I have mentioned in my paper that renewable energy can support a developing country like India, it can benefit around 10cr people surviving here. Due to increase of population in India, the consumption of energy is increasing, which cannot be fulfilled by fossil fuels, which cause pollution by that global Warming is happening which is causing severe affects which we can see in many countries and we should also know that fossil fuel will not be more then 200yrs maximum. For that we should find an alternate option or alternate fuels to replace with the fossil fuels and will be very useful for future.

5. WHAT CAN BE DONE FOR THE FUTURE FUEL FOR INDIA

Well it would good if we say that India is developing country with growing population, as the population is growing the amount of energy consumption is also increasing. India need some good set of skills to develop our country so that in future if Non Renewable energy exhaust also we can rely on Renewable energy. We should have that man power or resources who can work on that scale of development. As being the developing nation we are not able to harness proper amount of Energy resources which can be used by fellow country mates. Now also many states in India are facing electricity problem.

And to satisfy the demand of the people we must use some new technologies, which are being newly created or we should create some new technologies and can take help from other countries as they are developing without any stoppage of work. And are successful in their country.

Renewable energy is the most powerful energy i.e. (Many KW or TW energy can be generated within hour) which can be further used for supply of electricity or in any other purpose such as running small industries or even some times big industries too.

6. CONCLUSION

The objective of this article is to review the recent trends in renewable energy sources for electric power generation in India and anticipate their future potential and success. For this purpose, this article has examined the current activities of renewable energy sources: hydroelectric, wind, biomass, Tidal, and small hydropower energy. This article has determined that wind and solar will be the mainstream renewable energy sources for the next several decades, especially in light of the high penetration of renewables.

The Integrated Energy Policy Report (IEPR), prepared by the planning commission of India, has recognized renewable energy sources remain important to Indian's energy sector. With a concerted push and a 40 fold increase in their contribution to the primary energy, renewables may account for only 5-6% of India's energy mix by 2031-32. The government planning for various innovative projects for natural resources. India have a huge potential of renewable energy sources and from past few years due to government involvement there is sudden growth in Renewable sectors. Prospect of renewable energy are steadily improving in India with better future. The strategy for achieving these enhanced goals will mainly depend on the active participants of all players i.e. from

government agencies of NGO's, from manufacture to R&D institution, from financial institution to developers and of course a new breed of energy entrepreneurs. To make sure we have plenty of energy in the future, it's up to all of us to use energy wisely.

We must all conserve energy and use it efficiently. It's also up to those who will create the new energy technologies of the future. All energy sources have an impact on the environment. Concerns about the greenhouse effect and global warming, air pollution, and energy security have led to increasing interest and more development in renewable energy sources such as solar, wind, geothermal, wave power and hydrogen. But we'll need to continue to use fossil fuels and nuclear energy until new, cleaner technologies can replace them.

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