



RENEWABLE ENERGY RESOURCES AND ITS SCOPE IN INDIA: A REVIEW

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Abstract- A large number of researchers are addressing the emergence and impact of renewable energy. The existing research has almost exclusively studied the emergence of various kinds of renewable sources. Till now, lot of countries depends on coal, natural gas and oil to fulfill their energy requirements. Such type of fuels characterize on resources which will diminish after some time. India has population of 1.2 billion which increasing day by day is one of the major and fastest growing demand centers of energy. So, it is must that India obtains energy security within time, means ensure substitute energy sources such as renewable energy source. Renewable energy is in form that contains small hydro, biomass, solar, urban waste, industrial waste and wind together which accounts for 14.8% of the total installed power generation capacity in India. In the present work, role played by Renewable Energy in Indian Power sector has been reviewed and the work to be done to bring forth further measures to stimulate future growth of Renewable energy.

Keywords: Renewable Energy, community energy cooperative, Biomass, Geo thermal, Solar, Wind Energy.

1. INTRODUCTION

Energy plays an important role in economic growth of any country. The global production of electricity is around 14,000 MW [1]. This demand is fulfilled by using of Fossil fuels. Renewable source are fastest growing energy source and providing around 14% of primary energy [2]. Rising concerns over climate change impacts, environmental sustainability and security of supply have exerted pressure towards the initiating reform in the energy sector during the past two decades. Global effort aims to switch towards sustainable energy provision and use in the industrial, transport, commercial and household sectors. This transition has resulted in application of new and reemergence of existing source of energy. During the past five decades to a certain extent sidelined [1-3], business models for production, distribution and trade of energy products including renewable energy cooperatives and other forms of local or community-based ownership/governance of renewable energy technologies. The European Union, in its Energy Union Package [4], motivates this path through a vision of an Energy Union with citizens at its core, where general public take ownership of energy transition, advantage from new technologies, and contribute actively in the market but what is it that is distinctive about community projects and technology installations that distinguishes them from other renewable energy (RE) projects? In broader terms as enterprises they belong to the Social Economy. Furthermore community energy projects have introduced new forms of socio-economic organization to the system of energy provision.

2. REVISITING THE CONCEPT OF COOPERATIVE ENTERPRISE

The cooperative enterprise is active across virtually all industries: management of supply chains, consumer retail management, agriculture, financial credit society's management and mutual funds and building societies. Workers cooperatives focus on social care as well as in energy production, distribution and trade. Cooperatives carry underlying social values and ethical principles. Around the globe, cooperatives operate according to the seven principles and values adopted by the International Co-operative Alliance. These principles are: Democratic member control system; voluntary and open membership system; economic contribution by members; autonomy and liberty; education training and information; cooperation in cooperatives and concerned the community. The economic fundamentals of cooperatives are embodied in its spotlight on the improvement of benefits of its entire community member rather than a small number of people that share the capital of an enterprise.

Traditional cooperatives are democratically controlled, with all members having an equal voice regardless of their equity share. In practice, a General Meeting composed of all cooperative members which elect the Board of Directors. A Board of Directors is made up by the elected co-operative members who are involved in day-to-day business operations, and who receive compensation for their role in accordance with the prevailing national cooperative laws.

3. AVENUES OF RESEARCH IN COMMUNITY ENERGY AND THE RENEWABLE ENERGY COOPERATIVES FIELDS

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The principles of democratic control of voluntary and open membership make cooperatives especially perfect for the societal possibility for multi-dimensional practicality objectives of renewable energy projects. Existing research has addressed energy cooperatives from various perspectives most commonly through application of theoretical models.

3.1. History, technology and industry value-chain profiles

From the technology perspective, solar PV and wind energy technologies have in the literature clearly been documented as the most extensively applied systems in cooperatives. Photovoltaics are attractive because of their simplicity, modularity, high reliability, low maintenance requirements and short lead times. These attributes meet the requirements of solar PV for a variety of applications such as decentralized energy supply for rural, solar home systems, solar parks, etc.

Numerous research papers and articles review the historical development of energy cooperatives, mostly focused on USA, Canada and Northern European countries (in particular Denmark and Germany), where a strong cooperative tradition was established since the middle of the 19th century, and where energy cooperatives played key roles in rural electrification during the first decades of the 20th century culminating with the emergence of modern RE cooperatives in the 21st century. It is in these countries where modern-day energy cooperatives have grown as renewable energy technologies for distributed generation have developed.

3.2. Institutional analysis and cooperative governance

Apart from the overviews of historical roots, applied technologies and cooperative profiles in the industry value chain, institutional conditions, organizational analysis and transaction cost economics are the most prominent topics within cooperative literature. In analysing the cooperative business model, followings are of key importance for its competitive market performance:

- Member value formation and appreciation within the cooperative;
- Financial arrangement and funding of the cooperative business model;
- Cooperative management and governance;
- Supply chain management and strategy within cooperatives;
- Cooperative enterprise as a mechanism for regional economic development and
- Strength of the business model.

3.3. Drivers and barriers for renewable energy cooperative enterprises

Based on those assumptions, the authors developed a questionnaire and interviewed two management level officials of a large electricity cooperative in Germany, in order to determine which of the identified factors were key drivers in decreasing ownership costs and facilitating the emergence of electricity cooperatives. They used a subjective scale of 1-7 for assigning weight to the factors. The results were of limited scope as the interviews were conducted in only one cooperative, and as the two interviewed officials did not concur as to which factors were key drivers.

The study concludes that cooperatives undertake the following marketing initiatives to mitigate renewable energy identified barriers:

- Information spreading through websites some very in-depth on the physics of renewable energy technologies;
- Free seminars, workshops and public lectures;
- Educational tours to renewable energy facilities;
- Visits to energy expos.

4. ELECTRICITY IN INDIA

The installed capacity of electricity in India had 330860.58 MW as of December 2017 and electricity generation from renewable source including wind energy, solar, biomass, small hydro and other is 70134.06MW as on November 2017[3].

Source-Wise All India Generation from Renewables	<i>All Figure in MU</i>			
	For the Month of		Cumulative value for the period	
	Nov, 2017	Nov, 2016	Nov, 2017	Nov, 2016
Wind	2435.88	1863.86	42375.01	37074.07
Solar	2112.58	1197.81	15086.13	8132.70
Biomass	268.76	335.15	2278.77	2742.56
Bagasse	1455.13	1177.57	3863.08	4384.67
Small Hydro	540.49	439.41	5949.32	6123.78
Others	81.22	16.07	582.07	121.59
Total	6894.06	5029.87	70134.38	58579.37

Table 4.1. All India generation of electricity from renewable sources

India at present suffer from an major lack of power capacity despite the fact that the extra requirement of energy in India is around 600 GW to 1200 GW for 2050[5].

5. VARIOUS SOURCE OF RENEWABLE ENERGY IN INDIA

5.1. Hydro power

Hydro power production is a spotless and sustainable power. Thinking about monetary, specialized and ecological advantages of hydro power production most nations need for its advancement. Creating hydro power production is huge significance to mitigate the power emergency and natural contamination coming about because of the quick financial development of country. Hydro power production is created by utilizing the mechanical power of streaming water by constraining it by penstock and through a generator to deliver power. Water control additionally comprises of tidal and wave power that are in the newborn child phase of research in which researchers endeavor to find how the power produced from the sea[5]. Hydro power production consists of few focal points over most different sources creating electrical power. These incorporate a high level of unwavering quality, demonstrated innovation, high productivity, low working and upkeep costs, and the capacity to easily adjust to stack changes. The most of hydro power production site are situated which coincidence with supplies for providing water, surge control, and diversion of water. Hydro power production does not create a waste product that causes corrosive rain, and ozone depleting substances.

Limitation of hydro power production is high initial costs, dependence on rain, changes in stream regimens (can affect fish, plants, and wildlife by changing stream levels, flow patterns and temperature), formation of reservoir for water and public of the reservoir area[6].

5.2 Solar Power

Sun oriented power production is conversion of sun light in to electrical energy by using of PV cell or direct. Sun light is most inexhaustible renewable source of energy. Despite this wealth, just a portion of energy is utilized by people comes specifically from sunlight based source by using photo voltaic cell. Natural materials used for photovoltaic cell is not only gathering the sun's energy more effectively but also the power production from natural photovoltaic materials will have significantly high cost as compared to other photovoltaic innovations[7]. The sunlight based power production utilizes the heat from the sun to create power. This likewise has low working expenses as well as great productivity and can generate a solid supply of energy by using of heat capacity [8]. The price of new photo voltaic has reducing quickly if the photovoltaic business keeps on developing innovatively time to time, then the cost will be practically identical to the price of usual power. Sun oriented energy is an inexhaustible asset. Solar energy is non-contaminating and it does not affect ozone layer[10]. Sun powered energy frameworks additionally have very little affect on the surrounding condition interestingly with other sustainable power sources for example wind power and hydro power. Sun oriented power production has no moving parts hence required almost no regular cleaning. It ought to likewise be noticed that photovoltaic power production are the main source considered with the possibility to fulfill existing interest of power production [11-12].

The fundamental issue of utilizing sun oriented power is the cost included. In spite of advances in innovation sunlight based energy remains costly if price of the energy is decreases, the framework required to accumulate energy for utilization be very expensive. Even if sunlight based power can be affected by the cloudy days. Indeed even a couple of shady days can large affect an energy framework especially once the way that sun oriented energy can't be gathered during the evening[13].

5.3 Wind Power

In wind power the wind turbine is used to convert the mechanical energy in to electrical energy. The Controlling of wind is an extremely straight forward process. Wind energy have numerous favorable circumstances like it has no ozone harming substance and in this power is produced by moving air hence there is no cost of fuel. If we encouraged to boost the advantages of this asset since it just help improve our reality a cleaner place. It will likewise encourage household development for different reasons. To start with the local materials used to build the wind turbines advance the residential economy. Second, the turbines are a productive speculation development in the innovation anticipates a high potential return and increments in venture increase the country gross domestic product (GDP). At the present time mechanics are attempting to build limit factors so that wind power can be put away for times when there is not much wind power. That task can be viewed as another economic prospect. Wind control is an alternative that reduce dependency of fossils fuels.

The limitation of wind power plant is Ecological obligation for example the availability of wind zones means the area where abundance wind is available for wind farm plant. Wind mills are produced lot of noise and obstruction with radio and TV signal [14].

5.4 Geothermal Power

Geo thermal power plants are used to produce electricity by the use of Earth's internal thermal energy. Geothermal energy got from heat originating from the earth inside has a wide range of employments. Other than these down to earth employments of geothermal energy there are numerous different things that make geothermal power an exceptionally significant power asset. Since the earth center produce heat due to the radioactive product such as potassium and uranium. Geothermal power is a non conventional, plentiful, and solid power source. A geothermal plant doesn't make utilization of fuel in this way it is both sustainable and alright for the earth. Geo thermal energy got heat originating from the earth inside hence it is environment friendly and not produce global warming [16]. Sustainable power sources additionally meet the developing power needs and permit the innovative improvements without any adverse effect on the earth [17]. The disadvantages of geothermal control

plants are to find out suitable site for plant location. The area must have hot shakes so that boring is easily done. The convergence of geo thermal to be found along plate boundaries, where volcanoes are concentrated and seismic tremors are generally visit. Every so often, geo thermal energy areas come up short on steam for two or three months, during this electricity cannot produce. At long last geothermal plant can likewise cause earthquakes [15].

5.5 Biomass

Biomass is term for getting energy by burning of organic matter. Including other wood is the biggest biomass energy source. These incorporate sustenance crops, lush and woody plants, residues from horticulture or ranger service, oil-rich green growth, and the natural part of city and modern wastes are the other source of biomass. The other principle sources of biomass are paper process buildup, amble process scrap, and metropolitan waste. For biomass energizes, the most well-known feed stocks used today are corn grain for making ethanol and soybeans for making biodiesel. Advantage of biomass is its ability to convert it into scope of the profitable fills, chemicals, materials, and items such as:

1. Bio fuel – Converting biomass into fluid energizes for transportation;
2. Bio power - Burning biomass straightforwardly, or changing over it into vaporous or fluid fills that consume more efficiently;
3. Bio products - Converting biomass for making chemical which help in making plastics. Biomass are utilize in earthbound carbon cycle—the adjusted cycling of carbon from the climate into plants and after that into soils and then in to plant [19]. Along all the advantages there are likewise a few drawbacks to it. In bio mass there is a probability of global warming which are related with developing and gathering biomass and transporting them to the power plant, and gasifying them[20-21].

5.6 Ocean Thermal Energy

The Ocean Thermal Energy Conversion is the process of transformation of the sunlight based energy caught by the sea into electrical energy. OTEC framework is utilizing the difference of temperature in sea surface and inside the sea to produce electrical energy [22].

6. CONCLUSION

It is essential that we play it safe while conveying and expending the earth's resources. The way we have been consuming petroleum derivatives is exceptionally alarming the way that in coming decades the utilization of non-renewable energy sources grow rapidly. The reservoirs of fossil fuel in the earth are decreasing and energy production as of now depends too exceptionally on this fossil fuel. This release of contaminations into the environment have critical results as well as Earth-wide temperature boost along these lines it is necessary to secure planet earth by consolidating inexhaustible. Other than making national level awareness regarding effective sustainable power source alternatives, endeavors are required for advancing innovative work in the advances and assets. In any case it is an opportunity as well for Indian organizations for the creation of Indian occupations for renewable energies. Since a large portion of India's energy plants presently can't seem to be constructed India can lead the world to a lower carbon, sustainable power source.

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