



RECENT DEVELOPMENTS IN NON- CONVENTIONAL ENERGY SOURCES IN INDIA

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Abstract : Power is the most paramount ingredient of infrastructure for growth in economics and welfare of a nation. Pure and environmentally friendly energy is of significant interest these days. Development for sustaining the growth of the Indian economy in the existing infrastructure is crucial. The power sector of India is one of the largest expanded power sectors in the world. This work seeks broad insights into the Indian renewable energy framework, policy, approach, and socio-economic challenges. For maintaining the ratio of generation and demand of power, moving from conventional sources to non-conventional sources is not only an option, it is a necessity. The importance of using solar as an energy source in India's perspectives in not only to increase power generation, but also to expand energy reliability with considering the environmental, social, independent and financial beneficial properties. Although alternative energy maturation and expansion, improvements can be sought to increase the use of solar energy for conventional energy sources in India.

Keyword- Solar Energy, Non-Conventional Energy, Sustainable Development Goals, Solar Panels, power generation.

1. INTRODUCTION

The conventional sources of energy are generally nonrenewable sources of energy, which are being used since a long time. These sources of energy are being used extensively in such a way that their known reserves have been depleted to a great extent. The sources of energy which are being produced continuously in nature and are in exhaustible are called nonconventional energy (or) renewable sources of energy. Figure 1 provides the pictorial views of different forms of non-conventional energy sources and renewable energy sources options, respectively.

The Indian Renewable power generation Sector is the most attractive renewable energy market in the world. By 2020, India will rank fourth in wind power, fifth in solar energy, and fourth in renewable energy efficiency. -3% barren land, bioenergy - 3%, small hydro - 2.2% [2] India is very close to an "energy revolution" where critical sectors of the Economy are increasing their technology to reduce carbon emissions while driving sustainable growth. [5] India has big potential for solar energy, which is undoubtedly the largest renewable energy supply among Asian countries. As the third-largest energy consumer globally, India wants a healthy mix of all industrial energy sources. [5] The Government of India has since then taken multiple initiatives to promote generation and adoption of RE to fuel the country's growth and development. India has also set for itself, the world's largest RE expansion plan – achieving 175 GW by 2022 and 450 GW by 2030 in installed capacity. The RE installed capacity has already seen a 226 percent increase in the last 5 years.

The installed renewable energy generation capacity has been booming over the years, with the CAGR being 17.33 percent between FY16-20. With increasing government support and a better economy, the world is more attracted to investors' perspectives. Renewable energy will play an essential role as India, which is expected to achieve 15,820 TWH by 2040, begins to meet its energy demand on its own. According to the Paris Agreement, the Government of India is reaching its one hundred and seventy-five GW target by 2022 to reach 227 GW of renewable energy capacity (including 114 GW of solar capacity & 67 GW of wind generation capacity). The government plans to set a renewable energy capacity of 523 GW (including hydro to seventy GW) by 2030. [4] India is home to 1.3 billion people and is projected to surpass China's population by 2025 and become the most populous globally. Is meeting the growing energy demand of an increasing population. India's total primary energy consumption doubled from 326.77 million tones of oil equivalent (MTOE) in 2002 to 753.3 MTOE in 2017. [4] Over the past decade, India has increased its renewable energy capacity, especially from solar and wind. There is a significant increase in this regard, representing a significant portion of the renewable product in the country. [3] Energy demand in India is growing rapidly, and by 2030, India's total energy demand will more than double, but electricity demand will almost triple compared to today. In addition,

current specific resources have a climate and limited potential. Therefore, another kind of pure and unlimited generation is inevitable.

To promote tremendous economic growth, it is necessary to switch to renewable cleaners, more cost-effective, and sustainable forms of energy from solar, wind, and nuclear sources. In fact, in recent years, we have seen a more drastic shift in government priority from promoting fossil fuel-based energy to solar and wind power through our various policies, programs, and incentives. Thus renewable energy is also at the forefront of empowering people at the grassroots level. The technology to implement alternative energy systems is widely available in India and needs to be brought in to meet the country's needs. [1]

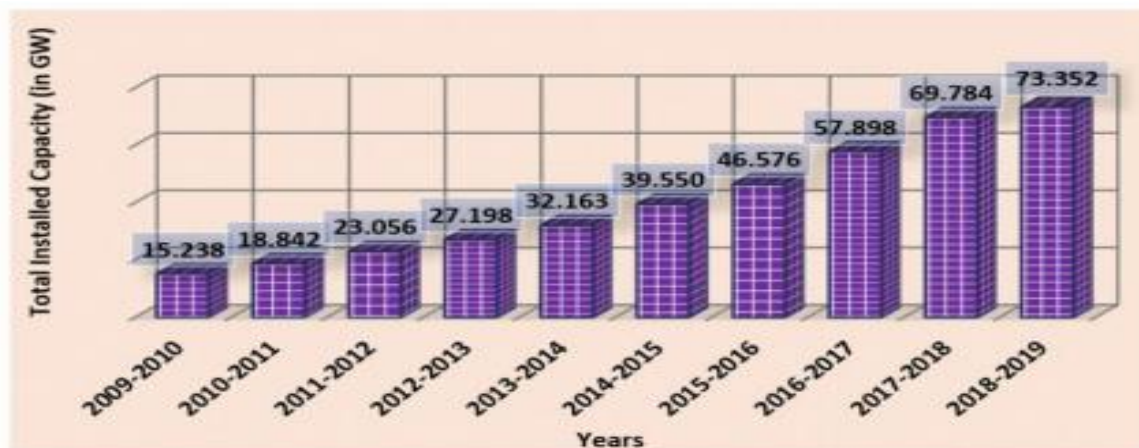


Figure1: Growth of renewable energy past decade in India

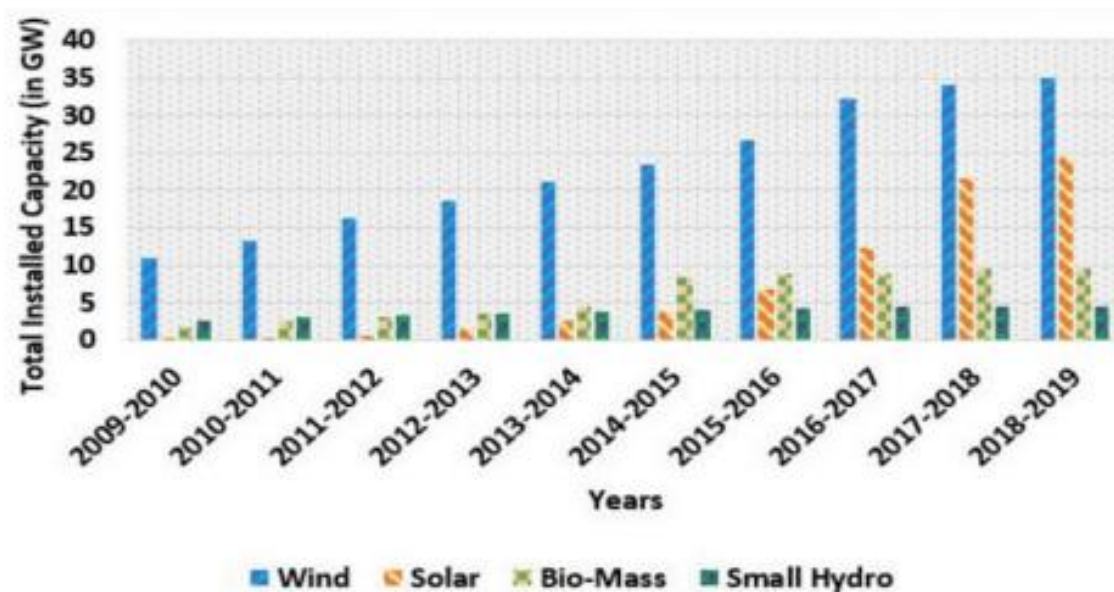


Figure2: RE Installed capacity of various source in Recent year

2. DIFFERENT NON-CONVENTIONAL SOURCES AS FOLLOWS :**Figure 3:** Type of Non conventional Energy**2.1 SOLAR ENERGY**

Solar energy is the most readily available and free source of energy since prehistoric times. It is estimated that solar energy equivalent to over 15,000 times the world's annual commercial energy consumption reaches the earth every year. Solar energy can be utilized through two different routes, as solar thermal route and solar electric (solar photovoltaic) routes. Solar thermal route uses the sun's heat to produce hot water or air, cook food, drying materials etc. Solar photovoltaic uses sun's heat to produce electricity for lighting home and building, running motors, pumps, electric appliances, and lighting.[3] In solar thermal route, solar energy can be converted into thermal energy with the help of solar collectors and receivers known as solar thermal devices.

2.2 WIND ENERGY

Wind energy is basically harnessing of wind power to produce electricity. The kinetic energy of the wind is converted to electrical energy. When solar radiation enters the earth's atmosphere, different regions of the atmosphere are heated to different degrees because of earth curvature.[5] This heating is higher at the equator and lowest at the poles. Since air tends to flow from warmer to cooler regions, this causes what we call winds, and it is these airflows that are harnessed in windmills and wind turbines to produce power. Now wind power is harnessed to generate electricity in a larger scale with better technology.

2.3 BIO ENERGY

Bio-energy, in the form of biogas, which is derived from biomass, is expected to become one of the key energy resources for global sustainable development. Biomass is a renewable energy resource derived from the carbonaceous waste of various human and natural activities. Biomass does not add carbon dioxide to the atmosphere as it absorbs the same amount of carbon in growing as it releases when consumed as a fuel. Its advantage is that it can be used to generate electricity with the same equipment that is now being used for burning fossil fuels. Bio energy is being used for cooking, mechanical applications, pumping, power generation etc.

2.4 HYDRO ENERGY

The potential energy of falling water, captured and converted to mechanical energy by waterwheels, powered the start of the industrial revolution. Wherever sufficient head, or change in elevation, could be found, rivers and streams were dammed and mills were built.[2] Water under pressure flows through a turbine and causes it to spin. The Turbine is connected to a generator, which produces electricity.

2.5 OCEAN ENERGY

The ocean contains two types of energy: thermal energy from the sun's heat, and mechanical energy from the tides and waves. Ocean thermal energy is used for many applications, including electricity generation. There are three types of electricity conversion systems: closed-cycle, open cycle, and hybrid. Closed cycle systems use the ocean's warm surface water to vaporize a working fluid, which has a low boiling point, such as ammonia. The vapor expands and turns a turbine. The turbine then activates a generator to produce electricity. Open-cycle systems actually boil the seawater by operating at low pressures. This produces steam that passes through a turbine / generator.[1]The hybrid systems combine both closed-cycle and open-cycle systems. Ocean mechanical energy is quite different from ocean thermal energy. Even though the sun affects all ocean activity, tides are driven primarily by the gravitational pull of the moon, and waves are driven primarily by the winds. A barrage (dam) is typically used to convert tidal energy into electricity by forcing the water through turbines, activating a generator.

2.6 ENERGY FROM WASTES

An estimated 50 million tons of solid waste and approximately 6,000 million cubic meters of liquid waste are generated annually in the urban areas of India. In India, there is a great potentiality of generating approximately 2,600 MW of power from urban and municipal wastes and approximately, 1,300 MW from industrial wastes, respectively. A total of 48 projects with aggregate capacity of about 69.62 MW ex. have been installed in the country thereby utilizing only 1.8% of the potential that exists.[1]

3. PRESENT WORK OF NON-CONVENTIONAL ENERGY

- National Thermal Power Corporation Renewable Energy Limited (NTPC REL), a wholly-owned subsidiary of NTPC, has launched a tender for domestic manufacturers to build India's first green hydrogen filling station in Ladakh.[6]
- Adani Green Energy Limited (AGEL) has signed share purchase agreements with Softbank Group (SBG) and Bharti Group, planning to acquire a hundred percent stake in SB Energy India. India has a renewable energy portfolio of 4,954 MW, spread across four states.
 - Tata Power Solar Contract Rs. Rs 686 crore NTPC for the construction of 210 MW projects in Gujarat.
 - NTPC plans to commission India's largest floating solar power plant in Ramagundam in Telangana from May to June 2022. The total installed capacity is 447 MW.[6]
 - Adani Green Energy announced plans to purchase a 250 MW solar power project in the northern state of Rajasthan (on behalf of Hero Future Energy). The estimated value of the deal is \$ 10 billion (\$ 136.20 million).
 - Chennai Railway Station is the first Indian railway station to reach the target of 100 percent daily energy demand through solar panels installed at the station platform shelters
 - Reliance Industries has Rs. 750.00 crore of green energy. [5]
 - 1 MW Rooftop Solar at Katra Railway Stations [5]
 - 3 MW Solar Land-Based Project at Modern Coach Factory in Rae Bareli [5]

4. ADVANTAGE OF NON-CONVENTIONAL ENERGY

- Non-conventional/renewable energy is indigenous source available in considerable quantities to developing nations and capable, in principle of having a significant local, regional or national economic impact.
- There is a great scope of research and development in non-conventional sectors regarding its future development and scientific utilization.
 - The power plants based on renewable do not have any fuel cost and hence negligible running cost.
 - Renewable have low energy density and more/ less there is no pollution or ecological balance problem. Provide energy in environmentally benign manner.
 - The use of non-conventional/renewable energy could help to conserve foreign exchange and generate local employment if conservation technologies are designed, manufactured, assembled and installed locally.
 - Short gestation period and low investment.

5. CONCLUSION

Concerning the finite and limited reserves of conventional energy sources and their impact on environment, a great emphasis should be given to the development of non-conventional energy sectors and their proper utilization for the benefit and betterment of mankind. Such initiatives would also be helpful to create many employment opportunities at all levels

- In the Union Budget 2022-23, the allocation for the Solar Energy Corporation of India (SECI), which is currently responsible for the development of the entire renewable energy sector, stood at Rs. 1,000 crores (US\$ 132 million).
- In the Budget, the government allocated Rs. 19,500 crore (US\$ 2.57 billion) for a PLI scheme to boost manufacturing of high-efficiency solar modules.
- In February 2022, Nepal and India agreed to form a Joint Hydro Development Committee to explore the possibility of viable hydropower projects.
- In November 2021, at the COP-26 Summit in Glasgow, Prime Minister Mr. Narendra Modi made a promise to increase India's renewable energy generation capacity to 500 GW, and meet 50% of India's energy needs through renewable means by the year 2030.
 - In October 2021, the Ministry of Power announced a new set of rules aimed at reducing financial stress for stakeholders and safeguarding timely cost recovery in electricity generation.
 - In August 2021, the Indian government proposed new rules for the purchase and consumption of green energy. The latest rules are a part of government measures to encourage large-scale energy consumers, including industries, to leverage renewable energy sources for regular operations.
 - In July 2021, to encourage rooftop solar (RTS) throughout the country, notably in rural regions, the Ministry of New and Renewable Energy plans to undertake Rooftop Solar Programme Phase II, which aims to install RTS capacity of 4,000 MW in the residential sector by 2022 with a provision of subsidy.
 - In July 2021, the Ministry of New and Renewable Energy (MNRE) gave the go ahead to NTPC Renewable Energy Ltd., a 100% subsidiary of NTPC, to build a 4,750 MW renewable energy park at the Rann of Kutch in Khavada, Gujarat. This will be India's largest solar park to be developed by the country's leading power producer.
 - In June 2021, India launched the Mission Innovation CleanTech Exchange, a global initiative that will create a whole network of incubators across member countries to accelerate clean energy innovation

- In June 2021, Indian Renewable Energy Development Agency Ltd. (IREDA) invited bids from solar module manufacturers for setting up solar manufacturing units under the central government's Rs. 4,500 crore (US\$ 616.76 million) Production Linked Incentive (PLI) scheme.
- In April 2021, the Central Electricity Authority (CEA) and CEEW's Centre for Energy Finance (CEEW-CEF) jointly launched the India Renewables Dashboard that provides detailed operational information on renewable energy (RE) projects in India.
- In April 2021, the Ministry of Power (MoP) released the draft National Electricity Policy (NEP) 2021 and has invited suggestions from all stakeholders such as Central Public Sector Undertakings, Solar Energy Corporation of India, power transmission companies, financial institutions like Reserve Bank of India, Indian Renewable Energy Development Agency, HDFC Bank, ICICI Bank, industrial, solar, and wind associations, and state governments.
- The Government of India has announced plans to implement a US\$ 238 million National Mission on advanced ultra-supercritical technologies for cleaner coal utilisation.
- Indian Railways is taking increased efforts through sustained energy efficient measures and maximum use of clean fuel to cut down emission level by 33% by 2030.
- The government has spent US\$ 4.63 billion on hydroelectric projects to provide electricity to villages in Jammu and Kashmir from 2018-21

In India, there is great scope for the development of non-conventional and renewable energy sectors. India is the only country that has an exclusive Ministry for New and Non-Conventional Energy Sources. India possesses the largest decentralized solar energy program, the second largest biogas and improved stove program, and the fifth largest wind power program in the world.

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