

A STUDY ON NON-CONVENTIONAL POWER RESOURCES IN INDIA

Dr. Poonam Rani*

ABSTRACT

Non-Conventional power is power that is accumulated from non-conventional resources which are naturally refilled on a human timescale, Non-Conventional power resources are those not yet been utilized for commercial purposes. Non-Conventional power resources are renewable and include solar, wind, tidal and geo-thermal resources of energy. A large range of energy generating technologies and equipment have been came about over time to take benefit of these natural resources. Due to this, usable energy can be generated in the form of electricity, industrial heat, thermal energy for space and water conditioning and transportation fuels. India has a prosperity of non-conventional resources that can be used to generate power. This paper aims to study and highlight the non-conventional power resources in India.

KEYWORDS: *Non-Conventional Power Resources in India.*

Introduction

Non-conventional power resources are really limitless in duration but insubstantial in the quantity of energy that is available per unit of time. About 30 percent of the global's electricity comes from non-conventional including solar, wind and hydro power among others and about 60 percent of the global's electricity comes from burning fossil fuels including coal, gas and oil. In India, non-conventional power has share of 26.53 percent in the total installed generation capacity.

Iceland and other Nordics countries with population of around 366, 000 has a surplus of non-conventional power resources including hydo power and geothermal power. On the other handcountries as Benin, Afgahanistan and chud each exhaustible than 30 KWh per capita. According to Global power review 2021, In India, power requirement is estimated to increase by 4.5 percent, supported by recovering economic activity and fastly development in large growing economic such as China. India has been targeting to add large-scale non-conventional power capacities, as substitutes were very expensive. The solar and wind power becoming economically usable in comparison to marginal conventional sources especially imported nuclear and coil based generation. The Government of India has fixed a target of installing 175 GW of non-conventional power capacity by the year 2022, which involves 100 GW from solar power, 60 GWfrom wind power, 10 CW from bio-power and 5 GW from small hydro-power.

According to India is intended Nationally Determined contribution (INDC) goals to base 40 percent of the total installed power generation capacity on non-fossil fuel resources by 2030 with international help on mechanization transfer and financing. According to a report of Ministry of new & renewable power, India has 4th ranks in overall installed non-conventional power capacity in global.

* Associate Professor, Commerce Department, A.S. (P.G) College, Mawana, Meerut, U.P., India.

In November 1st 2021 PM Narendra Modi announced in Glasgow Climate Summit that India's, non fossil power capacity will estimate 500 GW by 2030, 50% of the India's power demand by then. India will decrease its total projected carbon discharges by one billion tonnes in 2030, decrease the carbon intensity of its economy by 45 percent in 2030, over 2005 levels and reach net-zero emissions in 2070.

Solar Power

Solar Power is a significant source of power that can be utilized to heat, cool and light, domestics, trade and industry use solar technologies to multiplicity their power sources, grow efficiency and save money.

The origin development of solar technologies beginning in the 1860s was driven by an expectation that coal would quickly become scarce, such as investigations by Augustin Mouchot.

Solar PV Electricity Production (2019 Data)

Producers	Twh	% of World Total
China	224	32.9
United States	94	13.0
Japan	69	10.1
India	51	7.4
Germany	46	6.8
Italy	24	3.5
Australia	15	2.2
Korea	13	1.9
United Kingdom	13	1.9
France	12	1.8
Rest of the world	120	17.7
World	681	100.0

Source: IEA World Energy Statistics 2021

United States has Richest solar resources in the world. There are around 121 GW of solar installed in the US enough to power 23.3 million homes. India's ranks 5th after China, United States, Japan and Germany in respectof installed solar power capacity.

India's solar sector has growth at CAGR of around 59% from 0.5 GW in 2011to 55 GW in 2021. National Solar Mission (JIVISM) started in January 2010, signed the first time the Indian Government Concentrated on encouraging and developing solar power in India. Under this Mission in January 2010 the total installed capacity goal was set at 20 G.W by 2022. In 2015, the goal was revised to 100 GW and in August 2021, the Indian government set a solar goal of 300 GW by 2030.

In India, Solar power is a rapidly developing sector as part of the conventional power in India. The India's solar installed capacity was 53.99 GW as 31 March 2022.

Electricity Generation

Year	Solar Power Generation (TWh)
2017-18	25.87
2018-19	39.27
2019-20	50.13
2020-21	60.14

Source : International Energy Agency

Wind Power

Wind power is an important source of Conventional power in India.Wind power is conventional, Low cost energy and clean energy. The first wind power plant in India began in the 1990s in Tamil Nadu. The largest wind power generating state is Tamil Nadu accounting for around 28% of installed capacity, followed in decreasing order by Gujarat, Maharashtra, Karnatak and Rajasthan.

Wind electricity Production (2019) Data

Net installed Capacity	GW
China	210.3
United States	103.7
Germany	60.9
India	37.7
Spain	25.5
United Kingdom	24.0
France	16.3
Brazil	15.4
Canada	13.4
Holy	10.7

Source: IEA Renewable information 2021.

India has the fourth largest installed wind power capacity in the world. Highest operational onshore wind Plants are set up in China, UK and India. India aims to generate a total 60 GW of wind power capacity in 2022.

The power installed by a wind turbine is proportional to the cube of wind speed. If the average wind speed rise from 6 to 7 m/s it will result in 60% more power from the same turbine. The use of wind for power generation is possible in the location of the country where the velocity of wind is above 6.5m/s.

According to the Indian meteorological Department, wind speed over 6.5-8 m/s is prevalent over several parts of peninsular India, along the coast lines Gujarat, the western Ghats and some parts of Central India.

Wind power decreases the environmental impact of electricity generation, as it demands no fuel and does not cause air pollution. Recently the government had the National wind power policy but later on bottom the onshore and offshore wind policies were came into existence. The aims are to develop offshore wind power in Indian Exclusive Economic Zone (EEZ) along the coastline. In may 2018, A solar and wind Hybrid policy was issued, the main aims of the policy is to provide help in declining the variability in conventional power generation and giving better unchangeability.

Biomass Power

Biomass is the most common source of non-conventional power. Biomass is full that is made from organic matter from living organisms, a non-conventional and sustainable resource of energy used to create power. Biomass energy is power generated from non-conventional organic waste includes bagasse, rice husk, straw, cotton stalk, coconut shells, soya husk, de-oiled cakes, coffee waste, Jute wastes, groundnut shells, sawdust, etc. currently availability of biomass in India is estimated at about 750 million metric tonnes per year. India has reached the target of 10 gigawatts of biomass power before 2022, with the present installed capacity of 10.17 GW of biomass power. According to the union ministry of new and renewable energy (MNRE), biomass has been always an important power resource for the country as it is renewable generally available, Greenenergy and has the possible to provide outstanding employment in the village area.

Tidal Power

Tidal Power is a type of non-conventional power possessed by the rise and fall of water during high tides and low tides. Power can be extracted from tides in many ways. In first way, a reservoir is created behind a barrier or barrage and tidal waters are allowed to pass through turbines in the barrier to produce electricity. In second way, the tidal wave system harvests power from surface waves or from pressure fluctuations below the ocean surface. The Indian Institute of Technology Madras expected the annual wave power potential along the country coast is 5 to 15 MW/metre, advising a large capacity for power harvesting along India's 7500 Kilometre coastline of about 40 GW. India set its first surface power harvesting system plant in Vizhinjam, not far from (Thiruvananthapuram). Third way, to harvesting tidal power is sea thermal power technology. India's National Institute of Ocean Technology tried to set up and install a 1MW plant with Saga university of Japan but not successful in 2003. After this in 2005 a plant was scheduled for reorganization and again development in the Lakshadweep Islands.

According to Aditya Venkeish, Executive Director, Urga Global Ltd, India has no plan on tidal power. A clear plan is very important for players to have clarity on tariff and business development of tidal power in the India. India's tidal power future constrained by high costs and environmental risks.

Geo-thermal Power

Geo-thermal power has a likely to provide clean and reliable energy for power generation. Geo-thermal energy can be used for both powergeneration and direct heat use. In world, total generated capacity for Geo-thermal power is around 13.5 GW. India reorganized promising geo-thermal sites for power generation are Tattapani in Chattisgarh, Puga Valley in Jammu &Kashmir, Cambay in Gujarat, Manikaran in H.P, Khammaun in Telangana &Rattagiri in Maharashtra.

In India, geo-thermal power generated capacity is experimental and economically use is not good. According to some expects India has 10600 MW of geo-thermal power available

Conclusion

India is the world's third largest power consuming country, power use has doubled since 2000 year, moved unwards by a growing population soon to be world's largest and period of fastly economic growth, with over 80% of India's power requirement are met by coal, oil and solid biomass.

IEEFA and JMK Research have suggested short term and long-term plans to quick-track progress in the sector. Thesetake in equal policies to use nationally for at least the next years, appropriate rulers for net metering and banking facilities to start nationally, limitation on banking revoked at least untill rooftop aims have been reached exacting compulsory of the renewable purchase obligation (RPO) by states, a capital discount for better energy storage system (BESS), among others.

India purposes a large opportunity for investment in non-conventional power sector, \$ 196.98 bn worth of projects underway. Due to not proper transmission network and poor grid discipline, the generated non-conventional power may remain unconsumed. The Ministry of New and Renewable Energy has suggested the development of a National Smart Grid scheme & Green power corridor for transmission & distribution network.

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