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A Geographical Study of Contemporary Potential Status of Renewable Energy in India

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Abstract:

India with a population of 1.3 billion is one of the biggest and fastest rising economies in the world. There is always a very high demand for energy, for the fulfillment of the energy they used non-renewable resources, but the resources are very harmful for environment due to the country switch non renewable resource and start use of renewable energy. Wind, Solar, Hydro, Bio energy is the most crucial alternative resource of the world and has a large potential of green energy. India has a massive potential for generating green electricity from the renewable energy sources

Renewable energy plays a vital role in the long-term energy supply security, diversification of energy mix, energy access, environmental security and sustainability. In this paper analyze and discuss the cotemporary status and potential of renewable energy in India.

Introduction:

In the today's world the fastest growing thing is the energy requirement by world, with the reduction in the conventional resource. Renewable energy has been an important component of India's energy planning. The importance of renewable energy sources in the transition to a sustainable energy base was recognized in the early 1970s. Modern renewable energy is being used increasingly in four distinct markets: power generation, heating and cooling, transport, and rural/off-grid energy services. The Ministry of New and Renewable Energy (MNRE) in India has been facilitating the implementation of broad spectrum programs including harnessing renewable power, renewable energy for rural areas for lighting, cooking and motive power, use of renewable energy in urban, industrial and commercial applications and development of alternate fuels and applications. In addition, it supports research, design and development of new and renewable energy technologies, products and services.

India has renewable energy potential such as wind, solar, biomass, small hydro etc. As per (MNRE) estimates, India has a wind potential of more than 102788 MW, 100meter, solar potential of 748990 MW and small hydro potential of 21133.62MW. The bio energy potential has been estimated at 25090MW. Further, there exists significant potential from decentralized distributed applications for meeting hot water requirement for residential, commercial and industrial sector through solar energy and also meeting cooking energy needs in the rural areas through biogas. Renewable energy has great capacity to usher in universal energy access. In a decentralized or standalone way renewable energy is quite appropriate, scalable and viable solution for providing power to un-electrified or power deficient villages and hamlets.

Keywords. - Solar, Wind, Biomass, Electricity, Renewable energy, Potential

Electricity Production growth in India:-

Now India has developing country, its energy market is still in a rising stage. The electricity sector in India had an installed capacity of 346,048 MW as of 31st October 2018 Captive power plants generate an additional 34.60 GW. Non Renewable Power Plants constitute 82.70% of the installed capacity, and Renewable Power Plants constitute the remaining 17.30% of total installed Capacity. India currently suffers from a major shortage of electricity generation capacity, even though it is the worlds.

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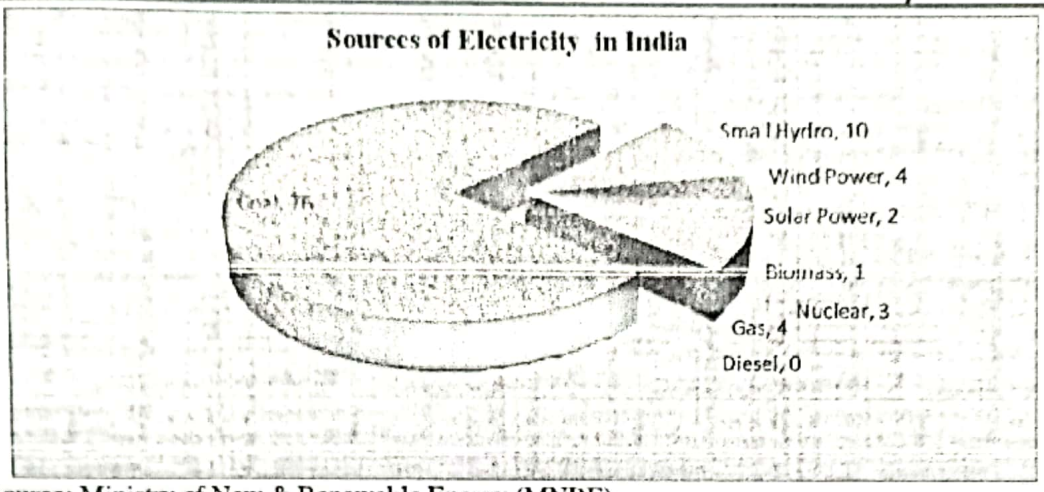


Source: Ministry of New & Renewable Energy (MNRE)

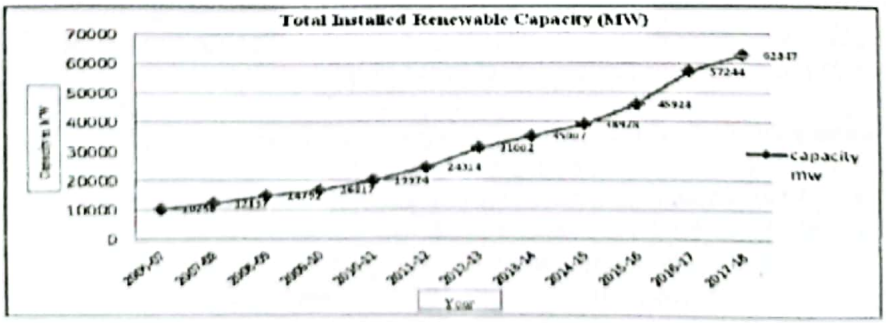
Achievement in grid connected renewable power-

Renewable energy has started playing an increasingly vital role for augmentation of grid power, providing energy access, reducing consumption of fossil fuels and helping India pursue its low carbon developmental pathway. During 2017-18, a total 5602.65 MW capacity has been added till 31.12.2017and total cumulative achievement up to 31.12.2017 is 62846.86MW. Recently the government of India has announced and revised target of renewable energy up to17500MW it is double of renewable capacity is expected to increase up to 2022.

Table 4.1 Achievement in grid connected renewable power

Renewable Power	Achievement (MW) (April - December, 2017)	Cumulative Achievements (MW) (as on 31.12.2017)
Wind Power	568.71	32848.46
Solar Power - Ground Mounted	4492.05	16070.07
Solar Power - Roof Top	271.49	982.30
Small Hydro Power	38.30	4418.15
Bio Power (Biomass & Gasification and Bagasse Cogeneration)	232.10	8413.80
Waste to Power	0.00	114.08
Total	5602.65	62846.86

Source: Ministry of New & Renewable Energy (MNRE)



Source: Ministry of New & Renewable Energy (MNRE)

Renewable energy sources and its potential in India:-

As Presently India has enormous renewable energy potential through solar, wind, biomass, small hydro etc. The potential is concerted in certain parts of country. The solar and wind potential is mainly highest in the southern and western States viz. Andhra Pradesh, Himachal Pradesh, Assam, Tamil Nadu, Karnataka, Maharashtra, Madhya Pradesh, Jammu Kashmir, Gujarat and Rajasthan.

State-wise details of estimated renewable energy cumulative installed capacity and its potential in the country are given in Table –4.1 and Table – 5.1 respectively:

Wind Energy:

Now India is the fourth largest wind power producer in the world, after China, USA and Germany. The main technology associated with harnessing wind energy is the wind turbine, the wind turns the blades of the wind turbine, and the rotating blades turn the shaft attached to the blades. The moving shaft can either power a pump or turn a generator, which can generate electricity.

A total capacity of 32848.46 MW has been established up to31stDecember, 2017.Wind power capacity is mainly spread across the South, West and North regions. Coastal state has higher potential for wind energy. The total available potential of wind energy is 102788MW.The Andhra Pradesh, Tamil Nadu, Gujarat, Madhya Pradesh, Jammu and Kashmir, Karnataka and Maharashtra state has high potential of wind power.

Small Hydro Project:

The first Small Hydro Power plant established in 1897. Small Hydro Project has the oldest renewable energy technology which used to generate electricity in India. According to Government of India the production capacity of hydropower in the plants up to 25 MW these are the small hydro power plants. The cumulative 1089 small hydro power projects have been set up in various state of the country. In addition, 136 projects are in under the construction its capacity is 754.16

Ministry of New and Renewable Energy has created a database of potential sites of small hydro and 7133 potential sites with an aggregate capacity of 21133.62 MW out of which the total installed capacity as of 31st December 2017 was 4418.15MWin various state of the country. India has an estimated small hydropower potential of about 21.13GW, of which about 4.4GW has been developed.

Biomass & Biogas Energy:

Wood and cow dung these are traditional biomass have played an important role in India's energy supply, and most rural Indian people they still used biogas for cooking.

India has a probable biomass power potential of around 17536 MW, bagasse cogeneration power potential of about 5,000 MW and including both off-grid and grid connected power plants out of which the total installed capacity as of 31st December 2017was 8413.80 MW. In an agricultural economy like India Biomass has huge potential. Biomass is one of the most significant source of renewable energy derived from numerous sources, including the by-products from the firewood, timber industry, agricultural residues such as bagasse, animal dung, crop straw, and wastes generated from agro-based industries and the carbonaceous waste of various human and natural activities.

In year 2017-18, a total of 15 nos. of new projects with a total cumulative power generation capacity of 178 kW corresponding to biogas generation capacity of 1595 m3. A total 19 nos. of biogas projects with cumulative power generation capacity of 773 kW with corresponding to biogas generation capacity of 7205 m3/day have been completed during the year up to 31.12.2017. A total of 409 biogas based power generation (Off-grid) projects with

power generation capacity of about 7.04 MW have been set up to 31st December 2017 in our country under the Biogas Power (Off-grid) programme.

Solar Energy:

Now India has 6th rank in solar power utilization at global level. India has an expected solar power potential of about 748,990 MW out of which the total installed capacity as of 31st December 2017 was 16070.07MW. Solar energy potential is the highest in the country among all the different renewable energy resources.

The most of area of the Indian country have received clear solar insolation. Generally in a year 300 days are clearly sunny days. In per square meter per day averagely4-7 KWh (kilowatt-hour) energy receives from solar radiation. The north eastern part of India has received lowest annual solar radiation, whereas the Rajasthan receive the highest, because of its come under desert zone. If only a little amount of this form of energy could be used, it will be one of the most important supplies of energy specially when other sources in the country have depleted, energy comes to the earth from the sun.

The Earth receives 174 Petawatts (PW) of incoming solar radiation (insolation) at the upper atmosphere. The solar power where sun hits atmosphere is 174 PW. The 30% energy absorbed and scattered by atmosphere remaining 70% solar energy reach on the surface of earth. The total global level power demand of all needs of society is 22000TW. Therefore, the sun gives us 1000 times more power than our need. As compared to this, the present level of generation of electricity in 2017-18 from all resources was 17052.37MWh. The National Solar Mission targeting 20,000 MW grid solar Power, 2,000 MW of off-grid capacity including 20 million solar lighting systems and 20 million square meters solar thermal collector area by 2022 is under implementation.

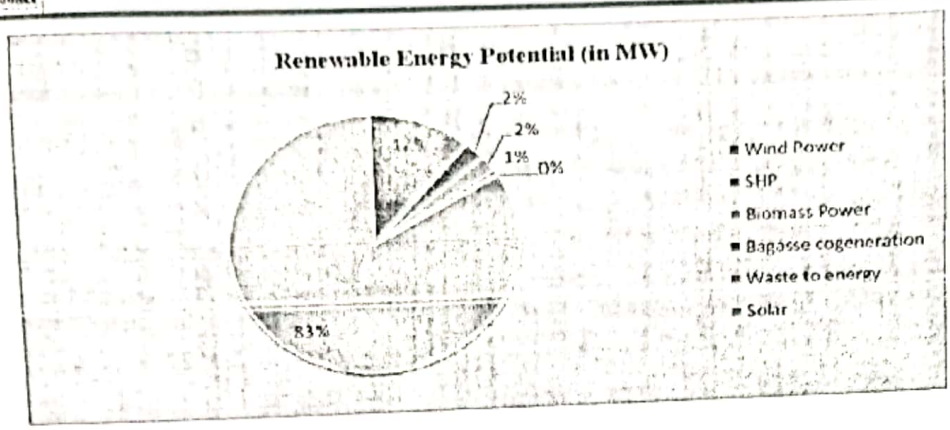
India's Currents Renewable Energy Potential:

Table 5.1 State wise Renewable Energy Potential (in MW)

Sl. No.	States/ UTs	Wind Power	Small Hydro Power	Bio-Energy			Solar	Total
				Biomass Power	Bagasse cogeneration	Waste to energy		
1	Andhra Pradesh	14497	409.32	578	300	123	38440	54347.32
2	Arunachal Pradesh	236	2064.92	08	-	-	8650	10958.92
3	Assam	112	201.99	212	-	8	13760	14293.99
4	Bihar	144	526.98	619	300	73	11200	12862.98
5	Chhattisgarh	314	1098.2	236	-	24	18270	19942.20
6	Goa	-	4.7	26	-	-	880	910.7
7	Gujarat	35071	201.97	1221	350	12	35770	72625.97
8	Haryana	93	107.4	1333	350	24	4560	6467.4
9	Himachal Pradesh	64	3460.34	142	-	2	33840	37508.34
10	Jammu Kashmir	5685	1707.45	43	-	-	111050	118485.45
11	Jharkhand	91	227.96	90	-	10	18180	18598.96

12	Karnataka	13593	3726.49	1131	450	-	24700	43600.49
13	Kerala	837	647.15	1044	-	36	6110	8674.15
14	Madhya Pradesh	2931	820.44	1364	-	78	61660	66853.44
15	Maharashtra	5961	786.46	1887	1250	287	64320	74491.46
16	Manipur	56	99.95	13	-	2	10630	10800.95
17	Meghalaya	82	230.05	11	-	2	5860	6185.05
18	Mizoram	-	168.9	1	-	2	9090	9261.9
19	Nagaland	16	182.18	10	-	-	7290	7498.18
20	Orissa	1384	286.22	246	-	22	25780	27718.22
21	Punjab	-	578.28	3172	300	45	2810	6905.28
22	Rajasthan	5050	51.67	1039	-	62	142310	148512.67
23	Sikkim	98	266.64	2	-	-	4940	5306.64
24	Tamil Nadu	14152	604.46	1070	450	151	17670	34097.46
25	Telangana	-	102.25	-	-	-	20410	20512.25
26	Tripura	-	46.86	3	-	2	2080	2131.86
27	Uttar Pradesh	1260	460.75	1617	1250	176	22830	27573.75
28	Uttarakhand	534	1664.31	24	-	5	16800	19027.31
29	West Bengal	22	392.06	396	-	148	6260	29196.06
30	Andaman & Nicobar	365	7.27	-	-	-	-	372.27
31	Chandigarh	-	-	-	-	6	-	06
32	Dadra & Nagar Haveli	-	-	-	-	-	-	-
33	Daman & Diu	04	-	-	-	-	-	04
34	Delhi	-	-	-	-	131	2050	2181
35	Lakshadweep	16	-	-	-	-	-	16
36	Pondicherry	120	-	-	-	3	-	123
37	Others	-	-	-	-	1022	790	1812
	Total	102788	21133.62	17536	5000	2554	748990	919863

Source: Ministry of New & Renewable Energy (MNRE)



Source: Ministry of New & Renewable Energy (MNRE)

Conclusion:

In this paper, we have discussed about the contemporary status and potential of renewable energy in India. The geographical location and topography of the Indian Region are the main aspects for high potential of renewable resource. India has very much unbalanced in electricity power production. Consumption is very high and the Production of energy is low. Solar and wind power energy is very good option in India to increase power production.

The Ministry of renewable energy resources, government of India announced to increases the power capacity up to 175GW by 2022, in which capacity of 62.84 GW has been set up by December 2017and this constitutes 18 percent of the total installed capacity.

This is best option for our economic development and environment protection. Renewable energy is unlimited source of energy and our country also provide suitable climate for this energy but we need some better idea to increase efficiency and decrease production cost.

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