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Present Status and Future Scope of Renewable Energies in India

R V Patel
Assistant Professor,
Department of Mechanical Engineering
Sherwood College of Engineering Research and Technology, Barabanki. UP, India.

Adesh Srivastava
B. Tech Student,
Department of Mechanical Engineering
Sherwood College of Engineering Research and Technology, Barabanki. UP, India.

***Abstract*—Natural resource depletion is a crucial environmental problem that the country is facing nowadays. Fossil fuel consumption ends up in the emission of greenhouse gases during power generation, which is responsible for global warming and climate change. The energy demands in India are increasing relatively at a high rate due to increasing population, living standard and economic development. The consumption of energy is relatively more than the generation of energy. India has limited resources like fossil fuels, which will soon be exhausted. All over the world, people are making efforts to shift to renewable sources of energy like solar, wind, biogas and geothermal energy. To satisfy the endless energy demands, India too is making efforts to move towards an alternate source of energy, that is, the renewable energy. Our country has the adequate potential for developing solar power, wind power, hydropower, biomass, and biogas energy. This paper reviews the renewable energy scenario of India, availability of fossil fuels and also the different renewable energy potential of India state wise. There is also an insight into the production of energy from all these renewable resources with respect to their potential and also the government and public sector support towards renewable energy.**

Keywords*—Renewable energy; solar energy; wind energy; energy resources in India.

I. INTRODUCTION

Majority of the power generation in India is carried out by conventional energy sources like coal and fossil fuels, which contribute heavily to greenhouse gas emission and global warming. The consumption of energy is relatively more than the generation of energy. India has limited reserves of fossil fuels, which will be exhausted very soon due to increased industrialization and life standards of the people. We all can witness the drastic degradation of these conventional energy sources. The need for an hour is to switch to renewable energy like wind energy, solar energy, small hydropower, tidal energy, geothermal energy, biomass and biogas energy [1] [2] [3].

A. Availability of Fossil Fuels

a. Coal and Lignite: Coal deposits are primarily confined to the eastern and south central parts of India. Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Telangana and Maharashtra accounts for 98.20% of the total coal reserves in India. Jharkhand had the maximum share of 26.16% in the overall reserves of coal in the country as on 31st March 2017 followed by Odisha with the share of 24.52% (Table I) [4].

As on 31.03.17, the approximate reserves of coal were 315.14 billion tonnes, an addition of 6.34 billion tonnes over the last year (Table I). There has been a rise of 2.05% in the estimated coal reserves during the year 2016-17 with Maharashtra accounting for the maximum increase of 7.15% [2].

The approximate total reserves of lignite as on 31.03.17 was 44.70 billion Tonnes against 44.59 billion tonnes on 31.03.16 (Table II).

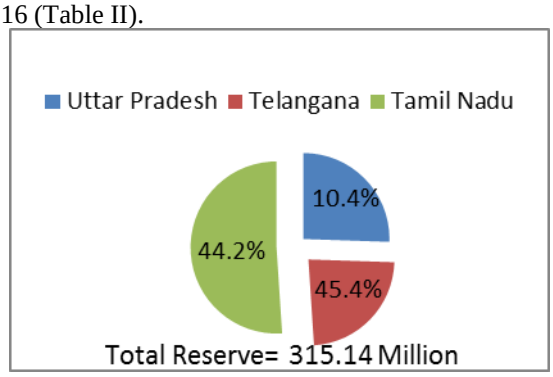

Fig. 1. Estimated Distribution of Reserves of Coal in India as on 31.03.2017

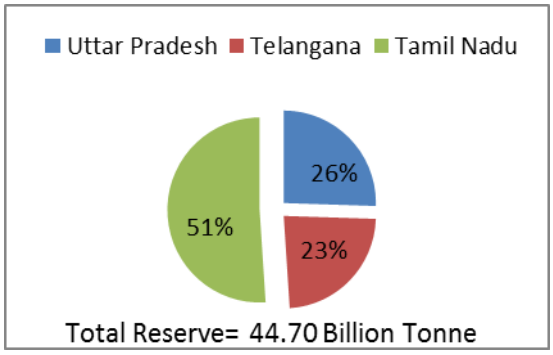

Fig. 2. Estimated distribution of Reserves of Lignite as on 31.03.2017

b. Petroleum and Natural gas: The approximate reserves of crude oil in India as on 31.03.2017 stood at 604.10 million tonnes (Table III) against 621.28 million tonnes on 31.03.2016.

Geographical distribution of Crude oil indicates that the maximum reserves are within the Western Offshore (39.60%) followed by Assam (26.48%), and that of Natural Gases are in the Eastern Offshore (39.37%) followed by Western offshore (23.44%) (Table III).

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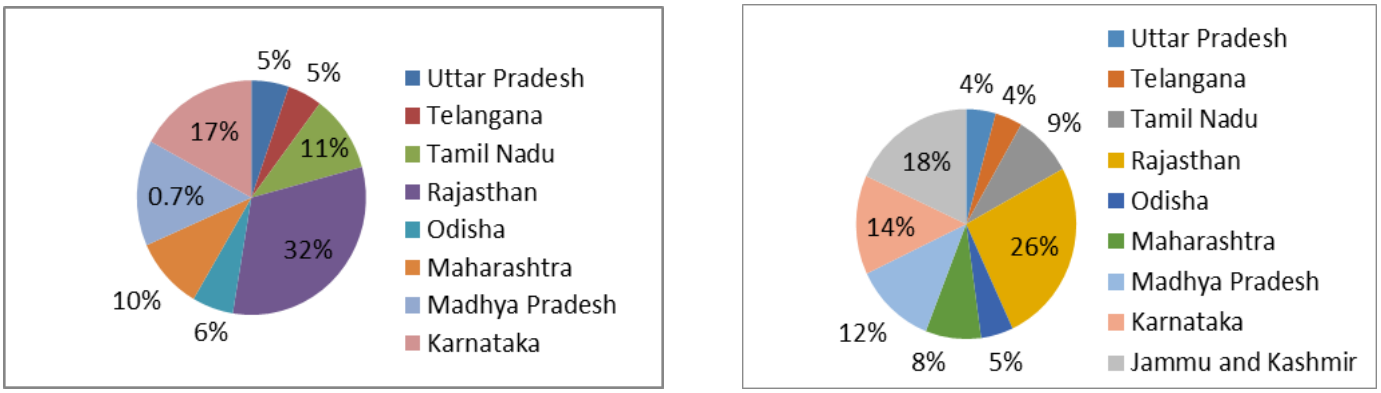

Fig. 3. Estimated Distribution of Reserves of Crude Oil in India as on 31.03.2017 and Estimated Reserves of Natural Gas in India as on 31.03.2017 (Right Side)

There was a decrease of 2.76% in the estimated reserve of crude oil of the country during 2016-17 as compared to the previous year. During the same period, estimated reserves of crude oil in Andhra Pradesh, Rajasthan, Arunachal Pradesh, Western Offshore, Gujarat and Assam reduced by 25.19, 22.60, 12.48, 3.21, 2.11 and 0.51% respectively, whereas in Eastern Offshore and Tamil Nadu, it increased by 11.75% and 0.04% respectively [2].

The estimated reserves of Natural Gas in India as on 31.03.2017 stood at 1289.81 Billion Cubic Meters (BCM) and 1227.40 BCM as on 31.03.2016 (Table III).

The estimated reserves of Natural Gas has increased by 5.08% over the last year. The contribution to this increase has been from Tripura (27.65), followed by Andhra Pradesh (14.95).

TABLE I. STATEWISE ESTIMATED RESERVES OF COAL IN INDIA AS ON 31.03.2016 AND 31.03.2017 [4][5]

(In Billion Tonne)

States/ UTs	Proved		Indicated		Inferred		Total		Distribution (%)	
	31.03.2016	31.03.2017	31.03.2016	31.03.2017	31.03.2016	31.03.2017	31.03.2016	31.03.2017	31.03.2016	31.03.2017
Andhra Pradesh	0	0	1.15	1.15	0.43	0.43	1.58	1.58	0.51	0.5
Arunachal Pradesh	0.03	0.03	0.04	0.04	0.02	0.02	0.09	0.09	0.03	0.03
Assam	0.47	0.47	0.04	0.04	0	0	0.52	0.51	0.17	0.16
Bihar	0	0	0	0	0.16	1.35	0.16	1.35	0.05	0.43
Chhattisgarh	19.14	20	34.61	34.46	2.29	2.2	56.04	56.66	18.15	17.98
Jharkhand	42.32	44.34	32.3	31.88	6.55	6.22	81.17	82.44	26.29	26.16
Madhya Pradesh	10.92	11.27	12.7	12.76	3.29	3.65	26.91	27.67	8.71	8.78
Maharashtra	6.21	7.04	3.15	3.16	2.08	2.06	11.44	12.26	3.7	3.89
Meghalaya	0.09	0.09	0.02	0.02	0.47	0.47	0.58	0.58	0.19	0.18
Nagaland	0.01	0.01	0	0	0.31	0.4	0.32	0.41	0.1	0.13
Odisha	34.29	34.81	33.28	34.06	8.32	8.42	75.9	77.29	24.58	24.52
Sikkim	0	0	0.06	0.06	0.04	0.04	0.1	0.1	0.03	0.03
Uttar Pradesh	0.88	0.88	0.18	0.18	0	0	1.06	1.06	0.34	0.34
West Bengal	13.6	13.72	13.02	12.95	4.91	4.99	31.53	31.67	10.21	10.05
Telangana	10.13	10.4	8.59	8.54	2.7	2.52	21.41	21.46	6.93	6.81
All India Total	138.09	143.06	139.15	139.3	31.56	32.78	308.8	315.14	100	100
Distribution (%)	44.72	45.4	45.06	44.2	10.22	10.4	100	102.05		

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TABLE II. STATEWISE ESTIMATED RESERVES OF LIGNITE IN INDIA AS ON 31.03.2016 AND 31.03.2017 [4] [5]

States/ UTs	Proved		Indicated		Inferred		Total		Distribution (%)	
	31.03.2016	31.03.2017	31.03.2016	31.03.2017	31.03.2016	31.03.2017	31.03.2016	31.03.2017	31.03.2016	31.03.2017
Gujarat	1.28	1.28	0.28	0.28	1.16	1.16	2.72	2.72	6.09	6.1
Jammu & Kashmir	0	0	0.02	0.02	0.01	0.01	0.03	0.03	0.06	0.06
Kerala	0	0	0	0	0.01	0.01	0.01	0.01	0.02	0.02
Pondicherry	0	0	0.41	0.41	0.01	0.01	0.42	0.42	0.93	0.93
Rajasthan	1.17	1.17	2.67	2.67	1.9	1.9	5.74	5.74	12.83	12.86
Tamil Nadu	3.74	4.09	22.99	22.63	8.95	9.06	35.68	35.78	80.05	80.01
West Bengal	0	0	0	0	0	0	0	0	0.01	0.01
All India	6.18	6.54	26.37	26.01	12.04	12.14	44.59	44.7	100	100
Distribution (%)	13.86	14.63	59.14	58.34	27	27.23	100	100.24		

TABLE III. STATEWISE ESTIMATED RESERVES OF CRUDE OIL AND NATURAL GAS IN INDIA AS ON IN 31.03.2016 AND 31.03.2017 [4] [5]

States/ UTs/ Region	Crude Petroleum (million tonnes)				Natural Gas (billion cubic meters)			
	31.03.2016		31.03.2017		31.03.2016		31.03.2017	
	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)
Arunachal Pradesh	1.73	0.28	1.52	0.25	0.95	0.08	0.93	0.07
Andhra Pradesh	10.9	1.75	8.15	1.35	42.03	3.42	48.31	3.75
Assam	160.78	25.88	159.96	26.48	153.76	12.53	158.57	12.29
Cold Bed Methane (CBM)	0	0	0	0	126.48	10.31	106.58	8.26
Eastern Offshore[1]	36.39	5.86	40.67	6.73	451.46	36.78	507.76	39.37
Gujarat	121.16	19.5	118.61	19.63	63.06	5.14	62.28	4.83
Nagaland	2.38	0.38	2.38	0.39	0.09	0.01	0.09	0.01
Rajasthan	31.72	5.11	24.55	4.06	35.66	2.91	34.86	2.7
Tamil Nadu	8.99	1.45	9	1.49	31.68	2.58	31.98	2.48
Tripura	0.07	0.01	0.07	0.01	28.28	2.3	36.1	2.8
Western Offshore [2]	247.13	39.78	239.2	39.6	293.96	23.95	302.35	23.44
Total	621.28	100	604.1	100	1227.4	100	1289.81	100

Note:

1. *Proved and indicated Balance Recoverable Reserves.*
2. *Western offshore includes Gujarat offshore.*

B. The Need for Renewable Energy

For thousands of years, we have relied on burning fossil fuels to get energy, however in today's world using oil, gas and coal for our needs is turning into a problem. Global climate change is one among the environmental challenges that we have ever faced for so long, and the main cause behind it is our dependence on fossil fuels. Burning coal, petroleum and fossil fuels helps in producing electricity. However it conjointly ends up in significant concentrations of pollutants in our air and water [1].

Another problem with using fossil fuels to generate energy is that there is limited quantity available. Since past few years, we are relying more and more on the world's supply of fossil fuels, and that supply is rapidly running out. As the demand for fossil fuels has increased, the cost of using them has also increased due to which each year we find ourselves with larger energy bills [3].

The answer to all of these problems is shifting to Renewable energy. Energies like solar energy, wind energy and water power are generated from natural energy sources and in contrast to fossil fuels, these sources of energy never run out. With a way lower impact on the surroundings, using renewable energy helps to protect our planet by considerably reducing the quantity of carbon emissions that we produce. By using renewable energy sources, we also reduce our dependence on fuel gas and oil reserves, which implies that we can avoid the rising value of energy bills and improve our energy security [1].

In order to preserve our planet, our wallets and our energy sources we all need to be compelled in switching to renewable energy sources and making our homes more energy efficient.

C. Present status of Renewable energy sources in India

India is one amongst the countries with the largest production of energy from renewable sources. In the electricity sector, renewable energy accounted for 20% of the total installed power capacity (71.325 GW) as of 30 June 2018.

There is a high potential for generation of renewable energy from various sources- wind, solar, biomass, small hydro and biogas. The overall potential for renewable power generation in the country as on 31.03.17 is approximately 10, 01,132MW (Table 1.3). This comprises the solar power potential of 649342 MW (64.86%).wind power potential of 3,02,251 MW (30.19%) at 100 m hub height, SHP (small-hydro power) potential of 21,134 MW (2%), Biomass power of 18,601 MW (1.86%), 7,260 MW (0.73%) from biogas-based cogeneration in sugar mills, 2554 MW (0.26%) from waste to energy [6].

The geographic distribution of the estimated potential of renewable power as on 31.03.2016 reveals that Rajasthan has

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the best share of about 14% (167276 MW), followed by Gujarat with 13% share (157158 MW) and Maharashtra with 10% share (119893MW), mainly on account of solar energy potential [7].

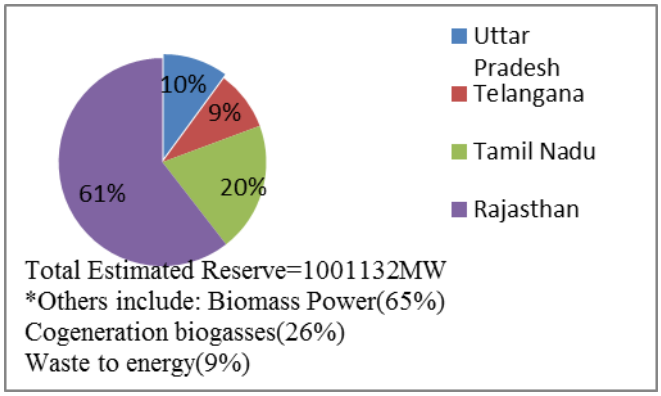

Fig. 4. Source wise Estimated Potential of Renewable Power in India as on 31.03.2017

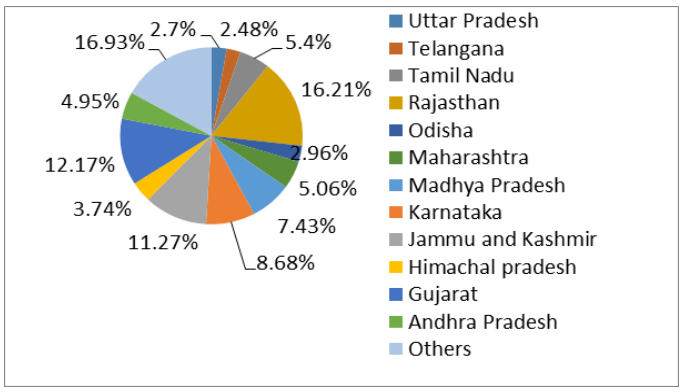

Fig. 5. State wise Estimated Potential of Renewable Power in India as on 31.03.2017

II. SOLAR ENERGY IN INDIA

A. *Overview*

Solar energy is the free and non-depleting power resource of energy. The solar radiation received outside the earth's atmosphere is 1367 W/m2. However, on an average, the radiation received by the planet is 800 W/m2. The planet receives billions of MW solar power daily that is way enough to fulfill the energy demand of the country. The average intensity of radiation received in India is about 200 MW/km with a geographic region of 3.287 million kilometer sq. This accounts to 657.4 million MW of solar power. However (85%) of the land is used for the agriculture and forests, (6.7%) land used for housing, (5.8%) land is either barren, snow bounded or typically inhabitable. Therefore about (12.8%) of surface area mounting to 4.413 million sq. can be used for solar power plant installations [7].

Most parts of India get ample days of sunshine a year. About 5,000 trillion kWh annually energy is incident over Indian land with most area receiving 4-7 kWh per sq. meter per day. Hence, both solar thermal and solar photovoltaics can effectively offer an enormous capability for solar power in India. Solar power additionally provides the flexibility to generate power on a distributed basis. It can be observed that the best annual global radiation is received in Rajasthan and northern Gujarat [2] [6].

B. *Status of Solar Energy in India*

Solar power in India is a quickly developing industry. The country's solar installed capacity reached 23 GW as on 30 June 2018. India expanded its solar-generation capacity 8 times from 2,650 MW as on 26 May 2014 to over 20 GW as on 31 January 2018. The 20 GW capacities were initially targeted for 2022 however the government achieved the target four years sooner than scheduled. The country added 3 GW of solar capacity in 2015-2016, 5 GW in 2016-2017 and over 10 GW in 2017-2018, with the average current value of solar electricity dropping to 18% below the average value of its coal-fired counterpart [2].

Also, solar products have helped to meet rural needs; by the end of 2015, just fewer than one million solar lanterns were sold out in the country, reducing the requirement for kerosene. That year, 118,700 solar home lighting systems were installed and 46,655 solar street lighting installations were provided underneath a national program; just over 1.4 million solar cookers were distributed in India [6].

C. *State wise Estimated Solar Energy Potential and Installed Capacity*

The state-wise details of estimated potential and the cumulative installed capacity (as on 31.01.2018) as furnished by the Ministry are given as follows:

TABLE IV. STATE WISE ESTIMATED SOLAR ENERGY POTENTIAL AND INSTALLED CAPACITY [7]

S.No.	State	Solar Power Potential (in Gwp)	Total Cumulative Solar Capacity installed (in MW)
1	Andhra Pradesh	38.44	2170.32
2	Arunachal Pradesh	8.65	4.39
3	Assam	13.76	12.45
4	Bihar	11.2	142.45
5	Chhattisgarh	18.27	185.03
6	Delhi	2.05	69.52
7	Goa	0.88	0.91
8	Gujarat	35.77	1585.85
9	Haryana	4.56	215.85
10	Himachal Pradesh	33.84	2.23
11	Jammu & Kashmir	111.05	2.36
12	Jharkhand	18.18	25.6
13	Karnataka	24.7	2788.62
14	Kerala	6.11	107.93
15	Madhya Pradesh	61.66	1237.41
16	Maharashtra	64.32	772.33
17	Manipur	10.63	1.33
18	Meghalaya	5.86	0.06
19	Mizoram	9.09	0.2
20	Nagaland	7.29	0.5
21	Odisha	25.78	79.57
22	Punjab	2.81	913.16
23	Rajasthan	142.31	2311.81
24	Sikkim	4.94	0.01
25	Tamil Nadu	17.67	1822.57
26	Telangana	20.41	3048.41
27	Tripura	2.08	5.09
28	Uttar Pradesh	22.83	551.15
29	Uttarakhand	16.8	294.08
30	West Bengal	6.26	48.52
31	UTs	0.79	55.26
	Total	**748.99**	**18454.97**

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D. Barriers & challenges on solar energy in India

Various barriers and challenges on solar energy in India are pointed below:

- The main challenge of solar energy is its unavailability. The weather conditions are major issue on availability of solar radiation. So we can't predict that for a specific time the solar energy will be available to us or not.
- Land availability is also low. Large land area is required, which typically is not feasible. The amount of land needed for utility-scale solar power plants is presently about 1km^2 for every 20–60 MW generation.
- 100 GW of solar would mean about 10.5% share for solar energy in total generation of power in India. Such huge shares of intermittent sources need huge investments in the power grid infrastructure for transmission smart supply and demand management.
- To achieve a capacity of 60 GW for utility-scale projects by 2022, there would be a demand of about $40 billion. The government presently expects an enormous share of this to come from international sources. However an international fund for solar projects in India is very less.
- The Storage problem is also a very serious problem. Suppose if the demand for power is not so high then the electricity produced by the solar plant will have to be stored somewhere to supply once demanded. This increases the price of the project.

E. Government Support

The government has launched numerous schemes to attain the target with the details as given below:

- Solar Park Scheme for setting up of more than 50 Solar Parks and Ultra Mega Solar Power Projects targeting over 40000 MW of solar power projects.
- Scheme for setting up 1000 MW of Grid-Connected Solar PV Power Projects by Central Public Sector Undertakings (CPSUs) and Government of India organizations with Viability Gap Funding (VGF).
- Scheme for setting up 300 MW of Grid-Connected Solar PV Power Projects by Defense Establishments and Para Military Forces with VGF.
- Pilot-cum-demonstration projects for the development of grid-connected solar PV power plants on canal banks and canal tops.
- Bundling Scheme - 15000 MW grid-connected solar PV power plants through National Thermal Power Corporation (NTPC) Ltd. /National Vidyut Vyapar Nigam (NVVN).
- VGF Schemes for setting up of Grid Connected Solar PV Power Projects through Solar Energy Corporation of India (SECI).
- Installation of grid-connected Solar Rooftop Power Plants.

Jawaharlal Nehru National Solar Mission (JNNSM) was launched on 11 January 2010 with the target for Grid Connected Solar Projects of 20,000 MW by 2022. The Mission had adopted a three-phase approach. Initial four years (2009-13) had marked as Phase-I. The remaining four years of the Twelfth Plan (2013–17) had been marked as Phase-II and the thirteenth Plan (2017–22) will be Phase-III of the project. The aim of this project was to add 1,000 MW of grid solar power by the year 2013, and 3,000 MW by the year 2017 [8].

But in June 2015 The Union Cabinet of India gave approval for stepping up of India's solar power capacity goal beneath the Jawaharlal Nehru National Solar Mission (JNNSM) by five times, reaching 100 GW by 2022. The target will comprise of 40 GW rooftop and 57 GW through big and medium scale grid-connected solar power plants. By this step of government, India will become one of the greatest countries of the world in solar energy power generation. That new solar target of 100 GW is expected to reduce over 170 million tons of CO2 over its life cycle. The entire investment will be around Rs.600000 crore for 100 GW power generation. The table below shows the targets of power generation in different years [8].

The Government of India is providing Rs. 15,050 crore subsidy to encourage solar capacity addition in the country. This subsidy will be provided for solar projects in many cities and towns. Solar power projects with an investment of about Rs. 90,000 cr. would be developed using the bundling method with thermal power. Further, investment will come from various Public Sector Undertakings (PSU) and Independent Power Producers (IPPs). Many State Governments have also come out with state solar policies to promote solar energy technology.

TABLE V. TARGET OF POWER GENERATION IN JNNSM BY 2022 [8]

Year	Rooftop type solar power project (MW)	Ground mounted type solar power project (MW)	Total (MW)
2015-2016	200	1800	2000
2016-2017	4800	7200	12000
2017-2018	5000	10000	15000
2018-2019	6000	10000	16000
2019-2020	7000	10000	17000
2020-2021	8000	9500	17500
2021-2022	9000	8500	17500
Total	**40000**	**57000**	**97000**

III. WIND ENERGY IN INDIA

A. Overview

Wind energy is the free and non-depleting power resource of energy. It has no adverse emission on the atmosphere. For developing the electric power from the wind the wind turbine is used and the mechanical power can be developed by using the windmills from the wind. Windpumps are used for water pumping.

Nowadays it has been recognized that wind energy is one of the fastest developing renewable energy source technology because of the energy demand, environmental issues and an escalation in fossil fuel costs. The above reason is driving the

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development of alternative renewable energy in a country such as wind power.

Wind power has contributed to the daily demand of energy across the world and the wind energy technology has grown rapidly since last 20 years. Wind energy primarily depends on the velocity and density of air. India has a coastline of 7517 km along with adequate sunshine [2].

B. Status of Wind Energy in India

In India, the development of wind power began in the 1990s. But since the last few years, it has significantly increased. Today, India is the fourth largest wind power producer in the world, after China, the USA and Germany.

As of 30 June 2018 the installed capacity of wind power in India was 34,293 MW, chiefly spread across Tamil Nadu (7,269.50 MW), Maharashtra (4,100.40 MW), Gujarat (3,454.30 MW), Rajasthan (2,784.90 MW), Karnataka (2,318.20 MW), Andhra Pradesh (746.20 MW) and Madhya Pradesh (423.40 MW). Wind power generation accounts for 10% of India's total installed power capacity. India has set an ambitious target to generate 60,000 MW of electricity from wind by 2022 [7] [9].

The Indian Government's Ministry of New and Renewable Energy proclaimed a new wind-solar hybrid policy in May 2018. This suggests that the same piece of land will be used to house both wind farms and solar panels.

C. State wise Estimated Wind Energy Potential and Installed Capacity

The State-wise wind power potential as analyzed by National Institute of Wind Energy (NIWE) at 100 meters above ground level:

TABLE VI. THE STATE-WISE WIND POWER POTENTIAL AS ANALYZED BY NATIONAL INSTITUTE OF WIND ENERGY (NIWE) AT 100 METER [10]

State	Total (MW)
Andaman & Nicobar	8
Andhra Pradesh	44229
Chhattisgarh	77
Goa	1
Gujarat	84431
Karnataka	55857
Kerala	1700
Lakshadweep	8
Madhya Pradesh	10484
Maharashtra	45394
Odisha	3093
Puducherry	153
Rajasthan	18770
Tamil Nadu	33800
Telangana	4244
West Bengal	2
Total in MW	**302251**
Total in GW	**302**

Given below are the State-wise installed Wind Power Capacity as on 31.12.2017, as analyzed by the Ministry:

TABLE VII. STATE-WISE INSTALLED WIND POWER CAPACITY AS ON 31.12.2017, AS ANALYZED BY THE MINISTRY [10]

State	Cumulative Capacity
Andhra Pradesh	3834.75
Gujarat	5537.37
Karnataka	3793.1
Kerala	51.5
Madhya Pradesh	2497.79
Maharashtra	4777.63
Rajasthan	4281.72
Tamil Nadu	7969.5
Telangana	100.8
Others	4.3
Total	**32848.46**

D. Wind power capacity addition targets and achievements and the fund utilization vis-à-vis allocation

Wind power capacity addition targets and achievements for the last three years i.e. 2015-16, 2016-17, and 2017-18:

TABLE VIII. WIND POWER CAPACITY ADDITION TARGETS AND ACHIEVEMENTS [11]

Year	Target	Achievements
2015-16	2400	3423
2016-17	4000	5502
2017-18	4000	597.91 (Jan 2018)
Total	**10400**	**9522.91**

The fund utilization *vis-à-vis* allocation during the years 2014 to 2018:

TABLE IX. FUND UTILIZATION ALLOCATION DURING THE YEARS 2014 TO 2018 [11]

Year	Budgetary allocation (Rs. In crore)	Utilization
2014-15	566	100%
2015-16	314	100%
2016-17	488.95	100%
2017-18	400	100%
Total	**1768.95**	**100%**

E. Government Support

On being asked about the major activities and projects proposed to be undertaken by the Ministry during 2018-19, the Ministry stated: "A cumulative bid size of about 10000 MW of wind power is likely to be invited during the financial year 2018-19."

The Government is promoting wind power projects through private sector investment by providing fiscal and financial incentives such as Accelerated Depreciation benefit; concessional customs duty exemption on certain components of wind electric generators etc. In addition, Generation Based Incentive (GBI) Scheme is available for the projects commissioned before 31st March 2017 and not availing Accelerated Depreciation benefit, under which Rs.0.50/unit is being provided to eligible wind power generators, with a ceiling of Rs. 1.00 crore per MW [10].

Regarding Manufacturing Base in Wind Energy Sector, it is stated that there are 21 manufactures in Wind Energy and models up to a capacity of 3 MW single turbine, are being manufactured. The current annual production capacity of 28 domestic wind turbine industries is around 10,000 MW. The

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indigenization of wind turbine manufacturing has reached up to 70% and the cost of Indian wind turbines is among the lowest in the world [9] [10].

IV. CONCLUSION

The power demand in India is continuously increasing at a high rate and India have limited power production for fulfilling the demand therefore, Research, development, production and demonstration have been carried out enthusiastically in India to seek out a possible answer to the perennial problem of power shortage for the past three decades. India has obtained the application of a variety of renewable energy technologies to be used in different sectors too. There are enough opportunities with favorable geology and geography with the huge customer base and widening gap between demand and supply. Technological advancement, suitable regulatory policies, tax rebates, efficiency improvement in consequence to R&D efforts are the few pathways to energy and environment conservation and it will make sure that these massive, clean resource bases are exploited as quickly and cost-effectively as possible. This paper offers an outline of the potential renewable energy resources in Indian context while evaluating the present status, the energy demand of the country and forecast consumption and production, with the target to evaluate and assess whether or not India can sustain its growth and its society with renewable resources.

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