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Renewable Energy: Potential, Status, Targets and Challenges in Rajasthan

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Abstract. India has a population of 1.3 billion people and one of largest growing economies in the world. Therefore, there is a strong demand of energy. Till date, the main source of energy is coal which is non renewable and harmful to the environment. Therefore, it is important and necessary to find an alternative source of energy. This indirectly drives us to focus on Renewable Energy Source, which has several advantages. The Ministry of National Renewable Energy (MNRE) has launched many schemes to encourage the domestic and commercial sector to use renewable energy sources. In India the state of Rajasthan is occupying 5th position in the production of electric power generation from Renewable Energy Sources like Solar, Wind and Biomass etc. Therefore this paper discusses the potential and opportunities of electric power generation through renewable energy in the state of Rajasthan.

Key word: Solar, Biomass, Wind, Renewable Energy, Electricity, coal

1. Introduction

In Recent times the Renewable Energy Source is playing a great role for full- fill our desire. Renewable energy has a very great scope in India. India has already installed 82GW of Energy and still working on it.

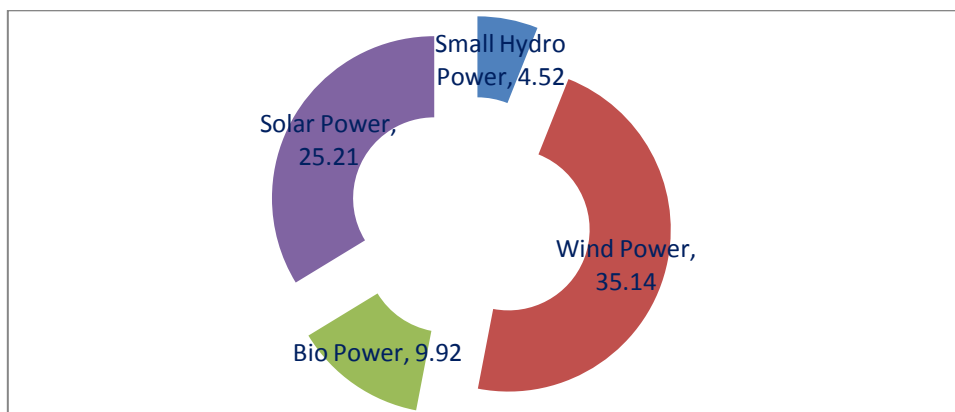


Figure 1 Installed Capacity (GW) of Renewable energy of India [3]



As we know that India has population about 1.3 Billion and it's increasing at annual rate of 1.58 and for all these people Electricity is required & all this demand can't be full-fill by conventional resources. The Renewable source is many but solar cell, Biomass & also wind are major in them. And the Electricity generate by Renewable source is at very low price as compare to conventional source. A lot of Method has been developed to be work on Renewable source by creating solar cell, wind turbine & especially of Biomass. In the solar cell mainly the use of Solar Radiation which is coming from sun is used to develop Electricity with the help of solar cell. Earth receive Radiation from the sun is approximate 1,20,000 terawatt And this is too-Much energy that can be utilised[1-4]. In this paper we are Mainly Focusing on Renewable Energy production with their Installed capacity with different projects. We collected the data of Rajasthan state in the sector of solar Energy, wind energy & Biomass energy & studying regarding how much renewable Energy project is going on in the state.

2. Availability of Solar Energy in Rajasthan

In India there are many states but Rajasthan is the largest state of India that cover an area of 3, 42,239 square kilometres or 10% of Total area [5]. Talking about Power Generation by conventional Source Rajasthan has to face a lot of challenges. Rajasthan has not any big River due to which there is less Hydro- power plant in Rajasthan and talking about the thermal power plant coal has to be transported from other state. This covers almost 50% cost of Total power generation cost.

Talking about the Geo – graphical area of Rajasthan .It has a very large desert around 208,110 sq.km. And Almost 89% days are Sunny in a year and with solar radiation actually near about 6-7 kWh/sq-m/Day [6]. So it has a very great scope of solar energy.

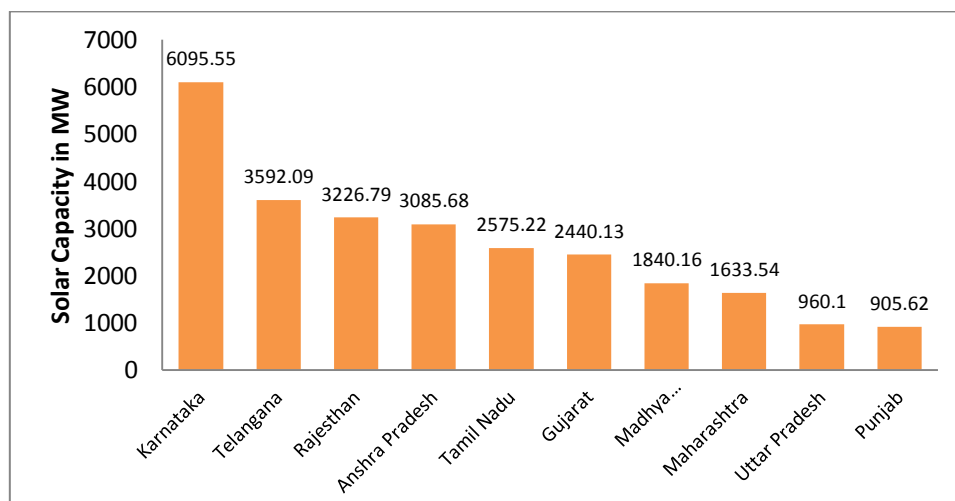


Figure2 State-wise installed capacity of solar energy in MW till March 2019

In Rajasthan the western part has very large amount of solar radiation. The western part includes – Barmer, Jodhpur, Bikaner, Jaisalmer. These are the main region of solar Energy. The Jodhpur city is also called as Sun City of India because of maximum solar radiation Absorption. According to US department of energy Rajasthan is the 2nd position in the world for receiving largest Amount of solar radiation.

Figure 2 has been shown in state wise installed capacity of solar energy (MW). It is observed that Karnataka State has 1st position for solar energy installation and the Rajasthan has the 3rd rank of solar energy production [7].

2.1. Status and Projects of Solar in Rajasthan

In India the Rajasthan is a leader in matter of solar Energy generation. There are Many project that has been completed these are shown below in the table 1 Rajasthan government has taken many steps to promoting the solar energy in state.

Table 1: Projects of solar in Rajasthan state up to 2018

S.No	Name of solar power producer	Capacity MW	Tech	Location	Date of commissioned
1	Jai Mangal infrapowers Projects (P) Limited	5	PV	Sarah Kishnayat, Dist-Bikaner	28.09.2013
2	Suncity Strips & Tubes (P) Limited	1	PV	Birmani, Dist-Pali	30.09.2013
3	Suncity Sheets (P) Limited	1	PV	Birmani, Dist-pali	30.09.2013
4	Associated Soapstone Distributing Company Private Limited	1	PV	Sarah Kisnayat, Dist-Bikaner	08.09.2016
5	M/s Kanchan India Limited	1	PV	Nanakpura, Dist-Bhilwara	25.03.2017
6	M/s Hindustan Zinc Limited- 2nd Project	12	PV	Debari , Dist-Udaipur	25.03.2017
7	M/s Hindustan Zinc Limited- 3rd Project	4	PV	Dariba ,dist-Rajsamand	26.03.2017
8	M/s Wonder Cement Limited	2	PV	Rasoolpura, Dist-Chittorgarh	27.03.2017
9	M/s Sangam India Limited	1	PV	Soniyana, Dist-Chittorgarh	28.03.2017
10	M/s RSWM Limited(1st project)	1.80	PV	Kanyakheri, Dist-Bhilwara	28.03.2017
11	M/s Rajasthan PatrikaPvt.Ltd	4.00	PV	Sarah Bhiyanimani, Dist-Bikaner	31.03.2017
12	M/s Mangalalaxmi Industries Private Limited	1.00	PV	Maval, Dist- Sirohi	31.03.2017
13	M/s Hotel Hilltop Palace	0.50	PV	Deh , Dist-Bikaner	06.04.2017.
14	M/s Technocrats & Managers Society of Advanced Learning & Gramothan	0.50	PV	Deh, Dist-Bikaner	06.04.2017.
15	M/s Meel Hotels (P) Ltd	0.50	PV	Deh, Dist-Bikaner	06.04.2017.
16	M/s Radhamohan Builders Pvt. Limited	1.0	PV	Deh, Dist- Bikaner	1MW out of 1.3 MW commissioned on 12.05.2017.
17	M/s RSWM Limited(2nd project)	1.50	PV	Mandapam, Dist-Bhilwara	12.07.2017
18	M/s Jaquar & Co.(P) Ltd.	2.6	PV	Bhiwadi, Dist-Alwar	06.10.2017
19	M/s Radhamohan Builders Pvt. Limited(Part commissioned).	0.30	PV	Deh, Dist- Bikaner	0.3 MW part commissioned out of 1.3 MW on 02.12.2017.
20	Aditya Birla Reneable SPV 1 Ltd.	5.00	PV	kharia khangar, Dist-Jodhpur	02.02.2018

The government has developed many solar parks which are working very well and producing various MW of energy. Some of the solar parks are listed below:

1. Bhadla solar Park – Total capacity (Phase 1/2/3/4) -- 2255 MWp

- 2. Phalodi – Pokaran Solar Park
- 3. Fatehgarh Solar Park
- 4. Nokh Solar Park

In these table1 shown that how many projects of solar power have been done and on – going in the Rajasthan state. Bikaner district of Rajasthan state is most solar energy producer with total capacity of 10.8 MW [6-8].

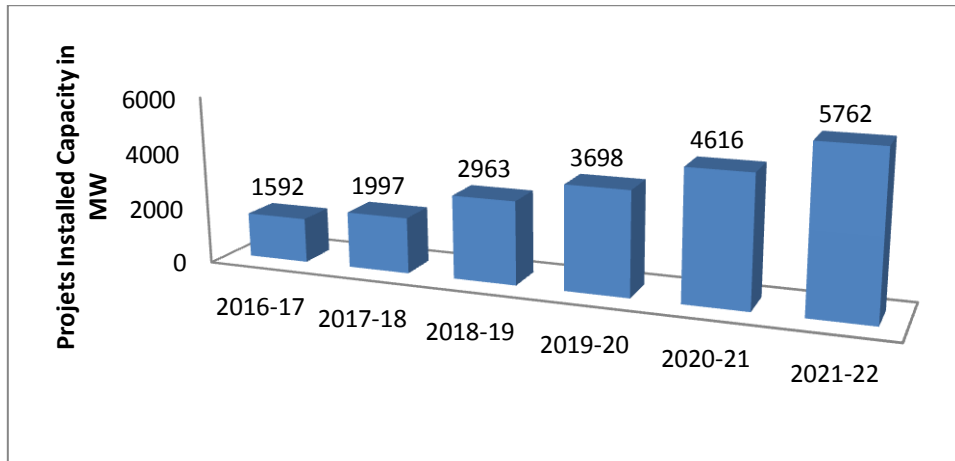


Figure 3 Yearly Solar Projects installed capacity (MW) Rajasthan

This figure3 shows the increase in generating electricity day by day with the solar cell in Rajasthan state. The generation of Electricity in 2016-17 is 1592 MW and planning of government is to increase the generating it to 5762 MW till 2021-22 [9].

3. Availability of Wind Energy in Rajasthan

India in great future in producing Electricity through wind power .India is in 4th position in among all the countries in term of wind source. Asia biggest and tallest wind turbine was built in India in 2004. That shows the capacity of India in power generation through wind. Although Tamilnadu has highest source of wind energy but Rajasthan state is also in 5th position in terms of wind energy across India. According to data Rajasthan have total installed capacity of 21.833 MW at the end of 2018 and it covers about 20% of wind sector in India.

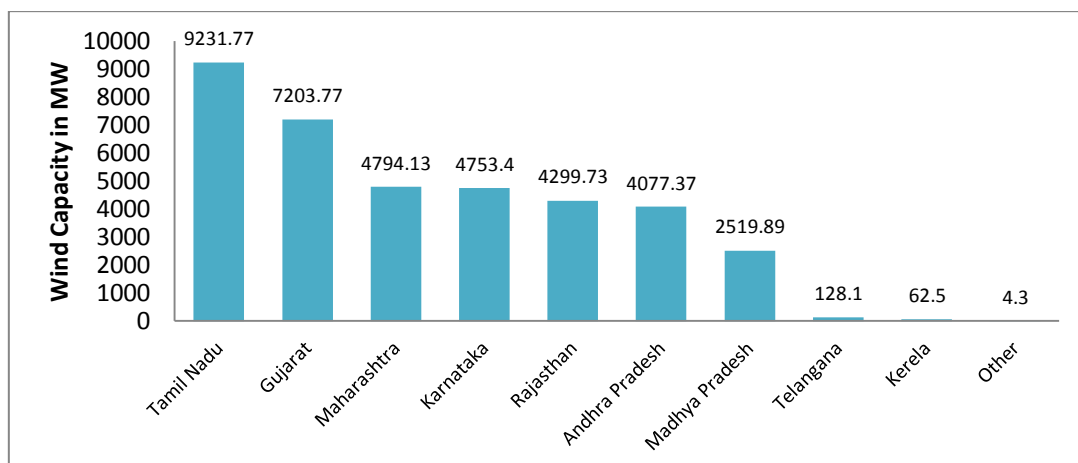


Figure 4 State wise Wind Power Capacity in MW

Currently the wind power generation capacity of Rajasthan is 4315 and talking about Total wind energy potential which is near to 21,833 MW.The wind energy covers about 17.6% of total energy production of the state . The Rajasthan government taken many step with MNRE to promote wind

energy and Identified location of wind power Devghar (chittorghar) , Harshnath (sikar) , Jaisalmer khodal (Barmer) , phtodi (jaipur) .The western part of Rajasthan has large amount of wind energy . The Thar Desert is one a good location for wind farm in western part. There is very little rainfall. There are various wind parks in Rajasthan but jaisalmer wind parks is one of most important wind park. Jaisalmer wind park in India is 2nd largest on shore farm. This project is in Jaisalmer district of Rajasthan. It has Name plate capacity of 10,64 MW that makes it one of largest on shore wind farm[10-12].

3.1. Status and Projects of Wind in Rajasthan

There are many project that owned by Rajasthan state in Wind Energy. Some of them are below in table:

Table 2: Status of wind power project commissioned (Developer wise) as on 30/4/2017

S.NO	Name of Manufacture	Dec 1998 to Nov 2003 (MW)	Dec 2003 to Nov 2008 (MW)	Dec 2008 to Nov 2013 (MW)	Dec 2013 to Nov 2018 (MW)	Total
1	RREC	6.35	35.20	10.20	-2	49.750
2	Suzlon	63.85	262.05	1076.25	517.5	1919.650
3	Enercon	40.67	229.70	524.00	222.4	1016.770
4	RRB	0	16.20	3.00	6.60	25.800
5	NEPC	0	0.675	0	0	0.675
6	Veer	0	0	59.5	17.0	76.500
7	Regen	0	0	138.00	73.50	211.500
8	Inox	0	0	264.00	290	554.00
9	Gamesa	0	0	0	40.00	40
10	Tanot	0	0	0	120.00	120.000
11	Welspum	0	0	0	126.00	126.000
12	Nidhi	0	0	0	62.90	62.900
13	Rajghar	0	0	0	74.00	74.000
14	Shaktikrupa	0	0	0	7.50	7.500
15	Sampada	0	0	0	7.50	7.500
	Total	110.870	543.825	2074.95	1562.90	4292.545

This table shows how many projects have been developed in the Rajasthan state with different-Different capacity. In these yearly wise shown in 1198- 2003 almost 110.870 MW is generating and in 2013 to 2018 year a total of 1562.90 MW is generating [12].

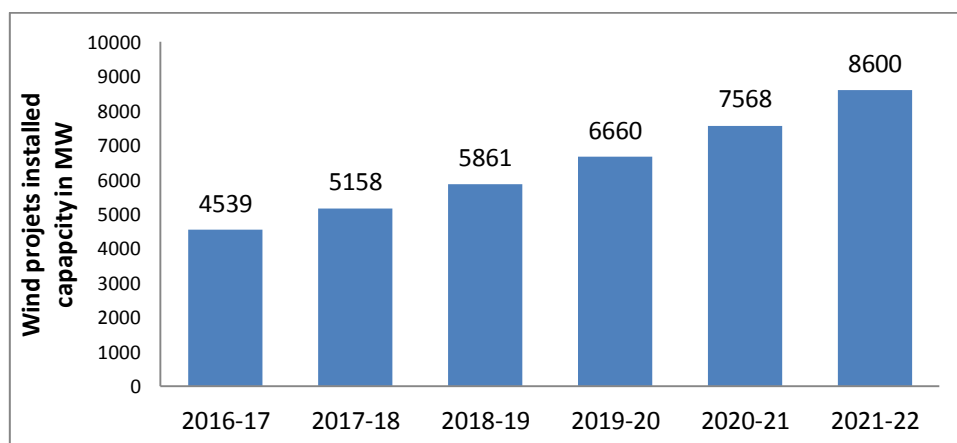


Figure 5 Yearly Wind Energy generation by Rajasthan

Figure 5 has been shown the yearly increment of Wind energy in the Rajasthan state. It is observed that in 2016-17 the state is generating approximately 4539 MW Electricity and there plan of future is to increase the generation to 8600 MW till 2022 [9].

4. Biomass Energy in Rajasthan

According to a survey India produce almost (450-500 MPY) bio energy and at 7th position in the world. The government of Rajasthan issued a policy for generation of Electricity by the use of Biomass, 2010(policy 2010). It was found that the Biomass Generates Electricity from the agricultural, approximate 92.5% goes for brick, kinley and rest 7.5% is used for Different purpose or send to other nearly state. Surplus of Mustard stalks and husk is approximate 11.62.679 ton /year and these can be for power generation. The mainly material which has surplus is Husk, soyabean, Mustard stalks [13]. The first Biomass plant is set up by Kalpataru power transmission limited (kptl) in the gangagar district of Rajasthan, having 7.8MW padampur power plant. The later there two other plant was stabilized in the mid of 2006 at place uniyora and kothputli and one at kota Surya Chambal.

Table3: Details of commissioned Biomass power project up to 2017

S. No	Name of power producer	Capacity (MW)	Location	Date of commission	Type of biomass	Types of The Techniques
1	Kalpha Taru power transmission lmt.	7.8	Vill- padampur, Sri ganganagar	15/7/03	Mustard husk	Water cooled
2	Kalpha Taru power transmission lmt.	8	Khatoli- uniara, Tonk	10/11/06	Mustard Husk	Water cooled
3	Surya chambal power lmt.	7.5	Rangphuladpura, kota	31/3/06	Mustard Husk	Water cooled
4	Amrit Environment tech (p) ltd.	8	Kotputli, jaipur	1/10/06	Mustard husk	Water cooled
5	Birla corporation lmt.(capitive)	15	Chandaria, chittorghar	24/12/05	Mustard husk	Water cooled
6	SM Environmental tech Pvt ltd.	8	Pachhar-chippa barad, Baran	19/2/10	Mustard husk	Water cooled
7	Sambhav energy ltd	20	Rampur,sirohi	19/2/10	Prosopis Juliflora	Air cooled
8	Transtech green power ltd.	12	Kachela bagsari sancher, Jalore	28/7/10	Prosopis Juliflora	Air cooled
9	Sathyam power pvt ltd.	10	Punjiyas, Nagaur	31/3/11	Mustard husk	Air cooled
10	Sanjog sugar & eco power pvt ltd.	10	Sangaria, Hanumanagar	7/10/11	Mustard husk	Air cooled
11	Orient green power pvt ltd.	8	Bhanwaghar, Baren	6/10/13	Mustard husk	Air cooled
12	The Rajasthan state ganganagar sugar mill ltd.	4.95	Kaminpura, sri ganganagar	9/5/16	Bagasse	Water cooled
13	M/S Rajasthan state ganganagar sugar mill ltd.	1.2	Chok 23 F kaminpura, Sri ganganagar	19/11/16	Biomass	Water cooled
Total		120.45				

In these above table3 the Biomass power project are described with their different capacity and also with their location and commissioned time. In above its shown that a total of 120.45 MW capacity biomass power plants are formed [14-15].

5. Challenges of Renewable Energy in Rajasthan

There are various types of challenges that Rajasthan faces in Renewable Energy Generation. They are different – different for Solar, Wind and Biomass. Some of them are as follows:

For Solar Energy:

1. It's clear that Rajasthan has 325 sunny days, but due to high temperature there is lot of loss in photovoltaic Energy.
2. Open access, wheeling charges and grid availability are major problems for solar projects in Rajasthan.
3. Cleaning of solar panel in large solar farm is wastage of lots of water.

For Wind Energy:

1. The main problem is the stability of grid and also conductivity of wind projects to the grids. Due to high penetration level of Wind generated electricity it's not possible for grid to absorb electricity.
2. There is also a challenge of Initial Investment on the projects of Wind. There is lot of risk in it.
3. The undetermined requirement of load affected the quality of supply. This is also a major problem.

For Biomass Energy:

1. The Biomass Energy is not available for the whole year it only available mostly after the Harvesting Period.
2. There is another major challenge that is Transportation cost. Transportation has significant portion of the cost associated with the Establishment and running of Biomass plant.

6. Conclusion

After all these studies we can conclude that how Renewable sources are important for us and for environment also. There are lot of advantages in Renewable energy as compare to conventional sources. As we can say that there is lot of work has been done and still ongoing in the Rajasthan state in the sector of Renewable Energy. Most of work is done in the sector of Renewable Energy Specifically in solar and wind power. There are various schemes and policy has been developed by Rajasthan state and Ministry of new and Renewable energy sources (MNRE) to promote the Renewable energy projects in different – different cities of Rajasthan. The state has set a target of 22000MW energy in the year of 2022 by solar and wind. But to achieve these targets there are some challenges also regarding Solar and wind. Some of challenges are high temperature, high penetration level of wind and lack of waste material according to solar, wind and Biomass Energy. So there is demand to speed up the generation of electricity from the Renewable Energy sources to get the target.

7. References

- [1] Govt. of India Ministry of power center electricity authority New Delhi report Jan, 2020, Available: www.cea.nic.in/reports/monthly/executivesummary/2020/exe_summary-01.pdf
- [2] India Renewable Energy Development, Annual Report 2019, Available: mnre.gov.in/file-manager/annual-report/2018-2019/EN/.../chapter_1.htm
- [3] Ministry of New and Renewable Energy (MNRE), Annual Reports, Available: mnre.gov.in/mission-and-vision-2/publications/annual-report-2.
- [4] Dinesh kumar Sharma ,Anil Pratap Singh, versa Verma (2014). A Review of solar Energy : potential ,status ,Target and Challenges in Rajasthan” ISSN- 2278-0181 vol -3 Issue 3, March 2014.

- [5] Sharma N.k ,P.k Tiwari and Y.R sood (2012).”solar energy in India: strategies , policy, perspective &future potential.” Renewable & sustainable energy review 16(1) 933-941.
- [6] Rajasthan Renewable Energy Corporation limited, <http://www.rrecl.com/solar.aspx>.
- [7] Annual report 2018-2019, “Overview of the Renewable Energy” by Ministry of renewable energy (MNRE), Available: <https://mnre.gov.in/img/documents/uploads/Oce0bba7b9f24b32aed4d89265d6b067.pdf>
- [8] <http://www.solar power in Rajasthan.com/.aspx>
- [9] NITI Aayog Government of India, “state renewable energy capacity addition roadmap” . Action plan 2022 and vision 2030 : Summary of finding
- [10] Akash chopra, Anirudh Sharma,” wind energy potential in Rajasthan” vol. 01, Issue -2 July 2011
- [11] Sharma, A; Srivastava ,J ; Kar , S.K ; Kuma . “A wind energy status in India: A short Review renewable sustainable energy”. Rev-2012, 16, 1157- 1164.
- [12] Rajasthan Renewable Energy corporation limited, <http://www.rrecl.com/wind.aspx>
- [13] Garima Jain .” Biomass power generation: A frame work And study of current problem and future scope with specific reference to kota region of Rajasthan” vol no -5 ,Issue No-04 April 2016
- [14] “Biomass India”, A quarterly Magazine on biomass energy, Ministry of new and renewable energy government of India ; Inaugural Issue (2009)
- [15] Rajasthan Renewable Energy corporation limited, <http://www.rrecl.com/Biomass.aspx>