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RENEWABLE ENERGY SOURCES IN INDIA: AN OVERVIEW ON ITS CONTRIBUTION IN CURRENT ENERGY SCENARIO OF INDIA

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ABSTARCT

The present study focused on Renewable Energy in India: An Overview and discuss the Cumulative Installed Capacity under RES in India. India has one of the highest rates of growth for renewable energy in the world. As per Global Trends in Renewable Energy Investment 2023 report, during the period 2014-2023, renewable energy programmes and projects in India attracted an investment of US$ 64.2 billion (Rs 4.7 lakh crore). The study found that the engaged in promotion of various Renewable Energy sources such as Wind, Solar, Bio Energy and Small Hydro Power. Out of the total installed capacity under this sector, capacity installation under Solar Power sector registered the most dramatic increase, from 3.99 GW of 2014-15 to 81.81 GW by 2023-24, with a growth of 1950.38% during the period. 81.88 % of the installation under Solar Power constitutes ground mounted installations. Capacity installation under Wind power recorded growth of 95.78%.

Keywords: Renewable, Energy, Investment, Capacity, Sustanability

INTRODUCTION

Renewable energy plays an important role in the long-term energy supply security, diversification of energy mix, energy access, environmental security and sustainability. Renewable energy is bound to play an increasing role in future energy systems. The concept of 'Green Growth' in the policy discourse has its origins in the Asia and Pacific Region where it was adopted by 52governments and other stakeholders at the Ministerial Conference on Environment and Development in Asia and the Pacific (MCED)held in 2005. Globally, the term 'green economy' was revived by the United Nations Environmental Programme (UNEP) along with the idea of 'green stimulus packages', which identified specific areas where large-scale public investment could kick-start a green economy. In October 2008, UNEP launched its Green Economy Initiative (GEI) with an objective to provide analysis and policy support for investment in green sectors and for greening environmentally sustainable sectors.

According to OECD (2012), green growth is recognized to have the potential to reinforce the agenda to promote inclusive development while at the same time ensuring economic growth and environmental resilience of societies. It makes sense to have inclusive green growth. The goal of inclusive green growth is to reduce poverty, promote equity, and create opportunities without irreparably harming the environment. Green growth can be seen as a tool to achieve sustainable development and not as a competing paradigm. In different global and international settings, green growth has been defined differently; though the central emphasis on environment sustainability and economic growth can be viewed as common.

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) defines green growth as, "growth that emphasizes environmentally sustainable economic progress to foster low-carbon, socially inclusive development". To be able to move to a global green economy, there is a need to create a system change and build on country initiatives to gather regional and international cooperation. The present study Renewable

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Energy in India: An Overview and Cumulative Installed Capacity under RES in India during 2014-15 to 2023-24.

OBJECTIVES AND METHODOLGY

1. To study the review of Renewable Energy in India: An Overview
2. To discuss the Cumulative Installed Capacity under RES in India

The present study will be made on basis of the secondary data. The secondary data will be collected from Government of India and Karnataka, World Bank reports, The Ministry of New and Renewable Energy, various reports of Karnataka Renewable Energy Development Limited and pamphlets, the articles published in the learned journals and books. For analyzing the data collected from secondary sources will be analyzed with help of simple quantitative techniques like AGR and CGR.

RENEWABLE ENERGY IN INDIA: AN OVERVIEW

Renewable Energy (RE) developments gaining momentum in India. It has emerged as a viable option to achieve the goal of sustainable development. India has now the world's largest capacity for development of RE precuts and systems. RE sector in the country has emerged as a significant performer in the grid connected power generation capacity. India is one of the countries with the biggest production of energy from RE.India has successfully formed a positive position need to support investment in, demand for and supply of renewable energy. In addition to grid power, decentralized distributed electrification using renewable energy technologies provides economical options for convention lighting, cooking and productive energy necessary in rural areas. The RE has to play a much deeper role in achieving Energy Security and Sustainable Development in the years ahead and to be an important part of the energy planning process.

The Government of India has set ambitious targets for renewable energy a doubling of existing renewable energy capacity to 55,000 MW by 2017. The spread of various RE technologies in the country has been supported by a variety of incentives and policy measures. Power generation from non-conventional renewable sources has assumed significance in the context of environmental hazards posed by the excessive use of conventional fossil fuels. RE technologies has been proved viable for power generation not so much as a substitute but as supplement to conventional power generation in the country. Increasing environment development and depleting fossil fuels have triggered the essential for renewable energy/ power to plays a crucial role in the security of country's energy as well as State.

During 2015-16, the Central Government published a targeted for about 175 GW renewable energy installed capacity by 2022. A capacity of 62.84 GW has been created in 2017 and this constitutes 18 per cent of the total installed capacity. Nowadays, India has 4th and 6thglobal position in wind and solar power consumption respectively. Renewable energy is playing an important role in expansion of grid power, providing energy access, reducing consumption of the fossil fuels and helping country pursue its low carbon developmental pathway. During the 2017-18, the total renewable energy capacity stood at 70 GW.

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Table-1: Cumulative Installed Capacity under RES in India during 2014-15 to 2023-24 (in GW)

Year	Small Hydro Power	Wind Power	Bio-Power		Solar Power	Total RES Capicity
			BM Power/Cogeneration	Waste to Energey		
2014-15	4.06	23.44	8.31	0.24	3.99	40.04
2015-16	4.27	26.78	8.67	0.25	7.12	47.09
2016-17	4.38	32.28	8.84	0.28	12.78	58.56
2017-18	4.49	34.15	9.36	0.31	22.35	70.65
2018-19	4.59	35.63	9.78	0.32	29.10	79.41
2019-20	4.68	37.74	9.88	0.35	35.60	88.26
2020-21	4.79	39.25	10.15	0.39	41.24	95.80
2021-22	4.85	40.36	10.21	0.48	54.00	109.89
2023-24	5.00	45.89	10.36	0.59	81.81	143.64
Gr (2014-15 to 2023-24)	**23.15%**	**95.78%**	**24.67%**	**145.83%**	**1950.38%**	**258.74%**
CAGR (2014-15 to 2023-24	**2.34%**	**7.75%**	**2.48%**	**10.51%**	**39.88%**	**15.25%**

Source: Government of India (2023-24), Annual Reports of Ministry of New Renewable Energy Department

Table 1 shows the Ministry of New and Renewable energy (MNRE), as per its mandate is engaged in promotion of various Renewable Energy sources such as Wind, Solar, Bio Energy and Small Hydro Power. Out of the total installed capacity under this sector, capacity installation under Solar Power sector registered the most dramatic increase, from 3.99 GW of 2014-15 to 81.81 GW by 2023-24, with a growth of 1950.38% during the period. 81.88 % of the installation under Solar Power constitutes ground mounted installations. Capacity installation under Wind power recorded growth of 95.78%.

The installed RE capacity of India has increased by two-and-half times, and in the same period, the installed solar energy capacity has increased 15 times. Globally, today India stands 4th in RE power capacity, 4th in Wind power, and 5th in Solar Power capacity.

Table-2 State-wise Renewable Energy cumulative installed capacity since 2023-24

States /UTs	Small Hydro Power	Wind Power	Bio Power	Solar Power	Large Hydro	Total Capacity
Andhra Pradesh	163.31	4096.65	574.39	4584.98	1610.00	11029.33
Arunachal Pradesh	133.11		0.00	11.79	1115.00	1259.90
Assam	34.11		2.00	156.18	350.00	542.29
Bihar	70.70		140.22	239.23		450.15
Chhattisgarh	76.00		275.00	1212.39	120.00	1683.39
Goa	0.05		1.94	43.48		45.47
Gujarat	91.64	11722.72	112.48	13544.88	1990.00	27461.72
Haryana	73.50		283.70	1475.72		1832.92
Himachal Pradesh	969.71		10.20	95.23	10281.02	11356.16
Jammu & Kashmir	169.93		0.00	65.44	3360.00	3595.37
Jharkhand	4.05		19.10	162.40	210.00	395.55
Karnataka	**1280.73**	**6019.61**	**1907.72**	**8544.68**	**3689.20**	**21441.94**
Kerala	276.52	63.50	2.50	1022.79	1864.15	3229.46
Ladakh	42.99		0.00	7.80	89.00	139.79
Madhya Pradesh	123.71	2844.29	134.94	3995.43	2235.00	9333.37
Maharashtra	382.28	5207.98	2643.19	6249.67	3047.00	17530.12
Manipur	5.45		0.00	13.04	105.00	123.49

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Meghalaya	55.03		13.80	4.24	322.00	395.07
Mizoram	45.47		0.00	30.31	60.00	135.78
Nagaland	32.67		0.00	3.17	75.00	110.84
Odisha	115.63		59.22	495.63	2154.55	2825.03
Punjab	176.10		567.25	1324.27	1096.30	3163.92
Rajasthan	23.85	5195.82	125.64	21347.58	411.00	27103.89
Sikkim	55.11		0.00	7.04	2282.00	2344.15
Tamil Nadu	123.05	10603.54	1045.45	8211.38	2178.20	22161.62
Telangana	90.87	128.10	221.67	4758.16	2405.60	7604.40
Tripura	16.01		0.00	18.46		34.47
Uttar Pradesh	49.10		2226.14	2920.33	501.60	5697.17
Uttarakhand	218.82		142.24	575.53	4035.35	4971.94
West Bengal	98.50		348.36	194.07	1341.20	1982.13
Andaman & Nicobar	5.25		0.00	29.91		35.16
Chandigarh			0.00	65.52		65.52
Dadar & Nagar Haveli/ Daman & Diu			0.00	46.47		46.47
Delhi			84.00	256.51		340.51
Lakshadweep			0.00	4.97		4.97
Puducherry			0.00	49.91		49.91
Others		4.30	0.00	45.01		49.31
Total	**5003.25**	**45886.51**	**10941.15**	**81813.60**	**46928.17**	**190572.68**

Source: Government of India (2023-24), Annual Reports of Ministry of New Renewable Energy Department

As per the table 2, Gujarat, Rajasthan, Tamil Nadu, Karnataka and Maharashtra were the top five states in total renewable energy installed capacity. These top five states contributed significantly to the renewable energy sector, representing around 61% of total installed capacity of the country. In solar energy sector, Rajasthan, Gujarat, Karnataka, Tamil Nadu, and Maharashtra were the top five states contributing 70.76% of the country's solar power installation. For wind power, Gujarat, Tamil Nadu, Karnataka, Maharashtra, Rajasthan, and Andhra Pradesh, were the leading states, contributing approximately 93.37% of the country's wind energy installation. Bioenergy sector had also experienced substantial growth, with Maharashtra, Uttar Pradesh, Karnataka and Tamil Nadu together contributes about 71.49% of the total renewable energy installed capacity. In the case of large hydro, Himachal Pradesh, Uttarakhand, Karnataka, Jammu and Kashmir, Maharashtra and Telangana contributed 57.15% of the total installed capacity in the country.

CONCLUSION

The study examines the renewable energy in India. The study found that state-wise Renewable Energy cumulative installed capacity; Gujarat, Rajasthan, Tamil Nadu, Karnataka and Maharashtra were the top five states in total renewable energy installed capacity. These top five states contributed significantly to the renewable energy sector, representing around 61% of total installed capacity of the country. In solar energy sector, Rajasthan, Gujarat, Karnataka, Tamil Nadu, and Maharashtra were the top five states contributing 70.76% of the country's solar power installation. For wind power, Gujarat, Tamil Nadu, Karnataka, Maharashtra, Rajasthan, and Andhra Pradesh, were the leading states, contributing approximately 93.37% of the country's wind energy installation. Bioenergy sector had also experienced substantial growth, with Maharashtra, Uttar Pradesh, Karnataka and Tamil Nadu together contributes about 71.49% of the total renewable energy installed capacity. In the case of large hydro, Himachal Pradesh, Uttarakhand, Karnataka, Jammu and Kashmir, Maharashtra and Telangana contributed 57.15% of the total installed capacity in the India.

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