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Wind Energy: Scope in India

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ABSTRACT

Renewable Energy Sources (RESs) is the most significant way as far as the global demand of electricity is concerned. This paper depicts the current situation and future perspective of utilization of wind energy. In this paper, efforts have been made to summarize the analysis of consumption, current status, and future capability, barriers to implementation and major achievements of solar energy in different states of India.

KEYWORDS - Renewable Energy Sources (RESs), wind energy, sustainable development.

I. INTRODUCTION

At the present time renewable energy is one of the most important topics in world. It is important because the fossil fuel reserves in the world are reducing rapidly and no reserves will be found in the future. In inclusion to that, energy generation from fossil fuel may cause so many environmental problems like global warming and acid rains, etc. In Today's modern world Renewable energy plays a major role. Renewable energy is that the energy that's collected from renewable sources, which are naturally replenished on a person's timescale, like Wind, Sunlight, Rain, Tides, Waves, Geothermal heat etc. Normally renewable energy provides energy for four different areas. They are electricity generation, transportation etc. As an example, Iceland and Norway already generate their electricity by using renewable sources of energy like wind, sun rays, tides, etc. India has also set up a goal to reach 100% renewable energy in the future. Many other countries like Denmark has decided to switch the total energy supply (electricity, heating/cooling) to 100% renewable energy by 2050. Wind energy has been identified as a promising renewable option because it's a way smaller impact on the environment compared to burning of fossil fuels. Many nations in the world identified, and they have formulated policies to ensure that wind power has a growing role in energy resources and energy generation.

II. HISTORICAL BACKGROUND OF ENERGY IN INDIA

Commercial energy consumption of India has been growing fast in recent years keeping pace with high economic growth rate. Table 1 shows the expansion in commercial energy consumption of India and a couple of other selected countries and regions during the amount 1995–2005. India had the second highest percentage growth in energy consumption among the listed countries after China, during this era . India depends heavily on coal and oil for meeting its energy demand. The shares of different sources in primary conventional energy consumption in 2005 were: coal – 55.0%; oil – 29.9%; natural gas – 8.5%; hydroelectricity – 5.6%; and Nuclear energy – 1.0% . This pattern of energy consumption is very problematic for the country. Coal is a polluting fuel and is the biggest source of national greenhouse gas emissions; its use needs to be curtailed for reducing emissions of both greenhouse gases and local air pollut- ants. India depends heavily on imports for meeting its domestic oil requirements; imports accounted for 72% of India's total oil consumption in 2004–2005[1].

Table 1 Scenario at Global Level

Country /region	Growth during 1995-2005
Brazil	36.6
China	69.6
India	52.2
Japan	6.2
Germany	-2.7
Mexico	31.8
UK	6
USA	10.2

III. METHODS OF UTILIZING WIND ENERGY

There are many methods of utilizing wind energy but most common method is using wind turbine usually consisting of propellers. The turbine are often connected to a generator to get electricity, or the wind used as mechanical power to perform tasks like pumping water or grinding grain. As the wind passes the turbine it moves the blades, which spins the shafts. Around 1910, the primary wind turbines were inbuilt Europe. Later, the event of wind generation in India began within the 1986 with first wind farms being found out in coastal areas of Maharashtra, Gujarat and Tamil Nadu with 55kW Vestas wind turbines. The capacity has significantly increased in the last few years. India has the fourth largest installed wind generation capacity within the world following Denmark and US. In 2009-10 India had the very best rate of growth amongst all four top countries. [3]

IV. CURRENT SCENARIO OF WIND ENERGY IN INDIA

Over the years, there has been considerable increase amount of energy produced by wind-driven turbines thanks to recent advancement within the turbine technologies. Although India may be a relative newcomer to the wind industry compared with Denmark or the US, domestic policy support for wind generation has led India to become the country with the fourth largest installed wind generation capacity within the world. As of 30 June 2018, the installed capacity of wind generation in India was 34,293 MW. Wind power accounts for 10% of India's total installed power capacity. India has set an ambitious target to get 60,000 MW of electricity from wind generation by 2022. MNRE announced a replacement wind-solar hybrid policy in May 2018 which suggests that an equivalent piece of land are going to be wont to house both wind farms and solar panels.[5]

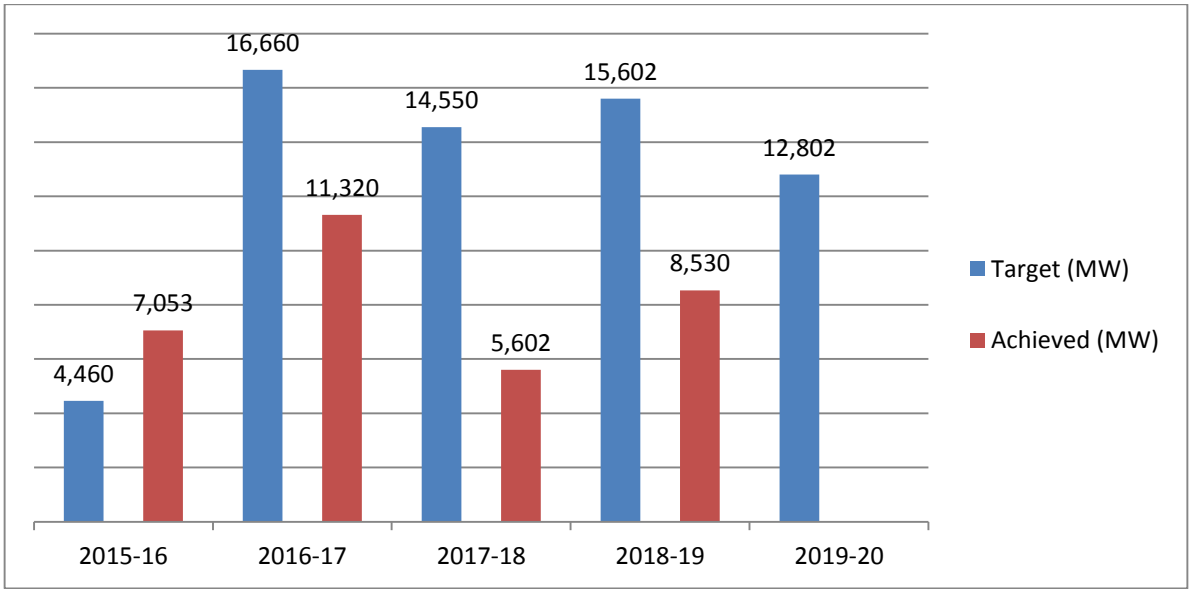

Fig.1. Wind energy targets and Achievements in India [4] [*Source : mnre,gov.in*]

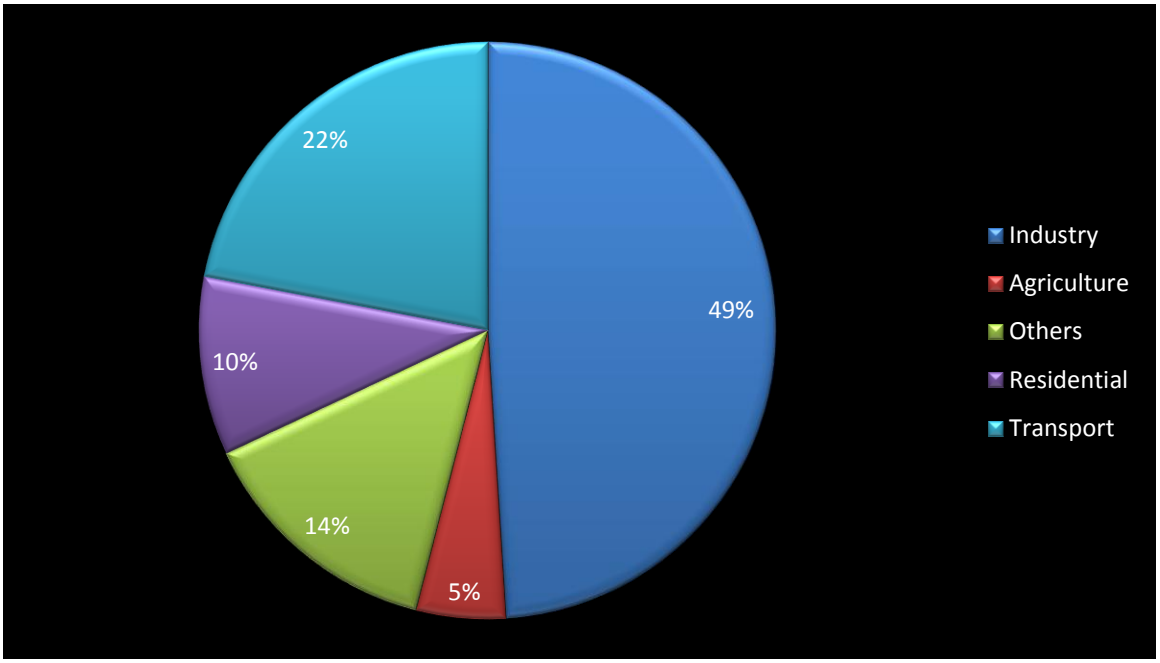

Fig.2. Sector wise energy consumption in India [5]

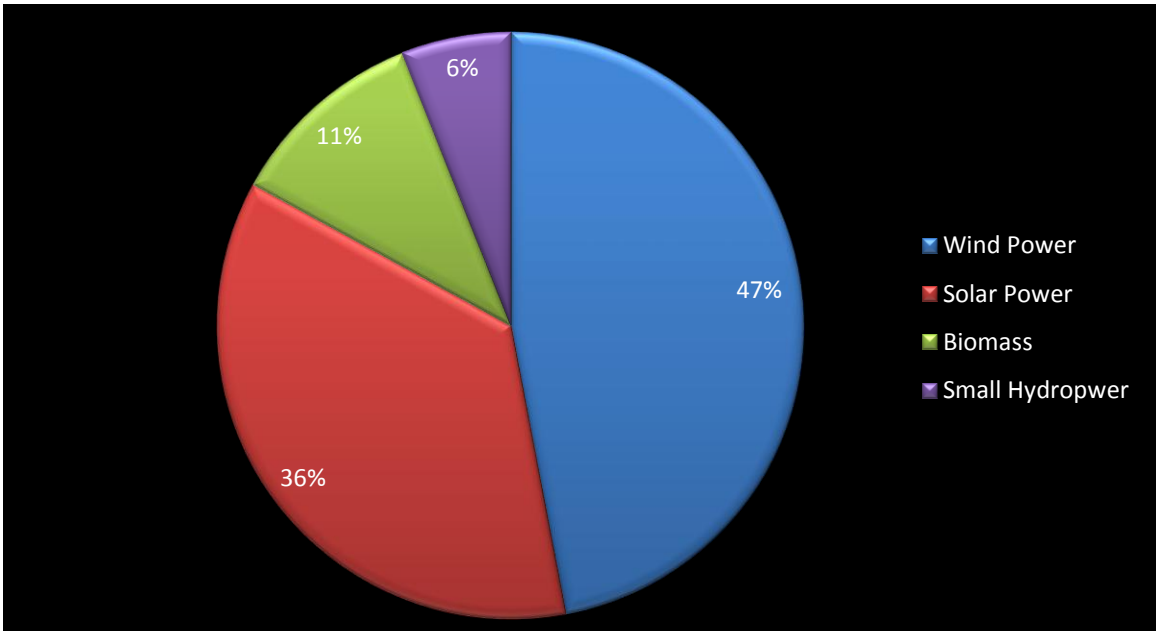

Fig. 3. Renewable energy production in India [*Source : mnre,gov.in*]

Table 2 Showing Wind Power distribution India

States /UT's	**Wind power distribution in India**
Andaman and Nicobar Island	2
Andhra Pradesh	5394
Arunachal Pradesh	201
Assam	53
Bihar	0

Chandigarh	0
Chhattisgarh	23
Dadra and Nagar Haveli	0
Daman and Diu	0
Delhi	0
Goa	0
Gujarat	10609
Haryana	0
Himachal Pradesh	20
Jammu and Kashmir	5311
Jharkhand	0
Karnataka	8591
Kerala	790
Lakshadweep	16
Madhya Pradesh	920
Maharashtra	5439
Manipur	7
Meghalaya	44
Mizoram	0
Nagaland	3
Odessa	910
Pondicherry	0
Punjab	0
Rajasthan	5005
Sikkim	98
Tamil Nadu	5374
Telangana	0
Tripura	0
Uttarakhand	137
Uttar Pradesh	137
West Bengal	22

Table 3 Showing wind power production in India

Rank	Power Plant	Producer	Location	State	MWe
1	Muppandal Wind Farm	Muppandal Wind	Kanyakumari	Tamil Nadu	1500
2	Jaisalmer Wind Park	Suzlon Energy	Jaisalmer	Rajasthan	1064
3	Brahmanvel	Parakh Agro Industries	Dhule	Maharashtra	528
4	Dhalgaon Wind Farm	Gadre Marine Exports	Sangli	Maharashtra	278
5	Vankusawade Wind Park	Suzlon Energy Ltd	Satara District	Maharashtra	259
6	Vaspet	ReNew Power	Vaspet	Maharashtra	144
7	Tuljapur	Siemens Gamesa, ReNew Power	Osmanabad	Maharashtra	126
8	Beluguppa Wind Park	Orange Renewable	Beluguppa	AndhraPradesh	100.8
9	Mamatkheda Wind Park	Orange Renewable	Mamatkheda	Madhypradesh	100.5
10	Anantpur Wind Park	Orange Renewable	Nimbagulla	AndhraPradesh	100
11	Damanjodi Wind Power	Suzlon Energy Ltd.	Damanjodi	Odisha	99
12	Jath	ReNew Power	Jath	Maharashtra	84
13	Welturi	ReNew Power	Welturi	Maharashtra	75

14	Acciona Tuppadahali	Tuppadahalli Energy India Ltd.	Chitrdurga District	Karnataka	56.1
15	Dangiri Wind Farm	Oil Ltd.	Jaisemer	Rajasthan	54
16	Bercha Wind Park	Orange Renewable	Ratlam	M.P	50
17	Cape Comorin	Aban Loyd Chiles Offshore Ltd	Kanyakumari	Tamil Nadu	33
18	Kayathar Subhash	Subahsh Ltd.	Kayathar	Tamil Nadu	30
19	Jasdan ReNew Power	ReNew Power	Jasdan	Gujrat	25.5
20	Ramakkalmedu	Subhash Ltd.	Ramakkalmedu	Kerela	25
21	Gudimangalam	Gudimangalam Wind Farm	Gudimangalam	Tamilnadu	21
22	Shalivahan Wind	Shaivahan Green energy Ltd.	Tirpur	Tamil Nadu	20.4
23	Puthlur RCI	Wescare (India) Ltd.	Puthlur	Andhra Pradesh	20
24	Lamda Danida	Danida India Ltd.	Lamba	Gujrat	15
25	Chennai Mohan	Mohan Breweries and Distilleries	Chennai	Tamil Nadu	15
26	Shah Gajendragarh	MMTCL	Gadag	Karnataka	15
27	Jamgudrani MP	MP Windfarms Ltd.	Deaws	Madhya Prdesh	14
28	Jogmatti BSES	BSES Ltd.	Chitradurga District	Karnataka	14
29	Perungudi Newan	Newam Power Comp. Ltd.	Perungudi	Tamil Nadu	12
30	Kethanur Wind Farm	Kethanur Wind Farm	Kethanur	Tamil Nadu	11
31	Shah Gajendragarh	Sanjay D. Ghodawat	Gadag	Karnataka	10.8
32	Hydrabad TSRTC	Telengana SRTC	Hyderabad	Telangana	10
33	Muppandal Madras	Madras Cements Ltd.	Muppandal	Tamil Nadu	10
34	Poolavadi Chettinad	Chettinad Cement Corp. Ltd.	Poolavadi	Tamil Nadu	10

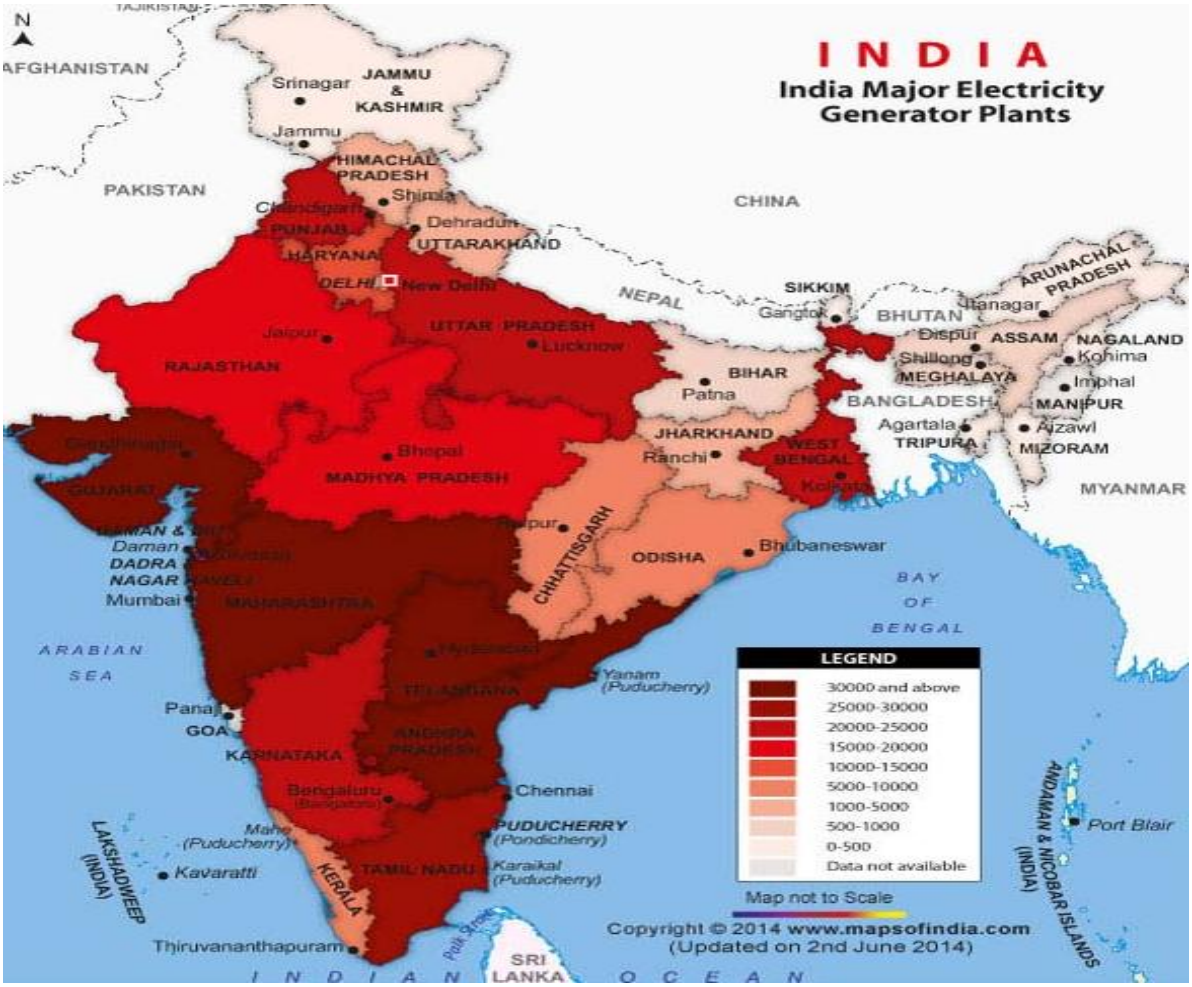

Fig.4. Major wind energy producers in India

V. UTILIZATION OF WIND ENERGY IN MADHYA PRADESH

Madhya Pradesh is one among the most important States of India. From 544 kWh in FY 11 to 739 kWh in FY 15, the per capita consumption of electricity within the State has been growing at a CAGR of seven .95%. However, it remains well below the national average of 1010 kWh per capita in FY 15. The major reason for low per capita consumption is large tribal region within the State.

Table 3 Available generation capacity as on August, 2015

Sources	Capacity Available (MW)
MP Genco Thermal and Hydro	5,237 MW
NHDC & Other hydel	2427 MW
Central Sector share	3230 MW
DVC Thermal	500 MW
IPPs Thermal	2986 MW
Renewable sources	1020 MW
Total	15,400 MW

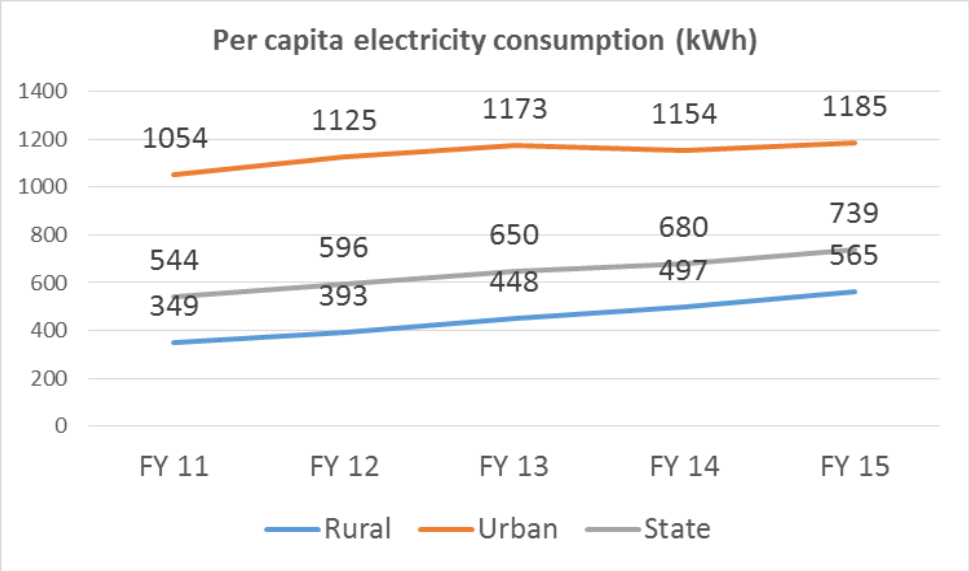

Fig. 5. Per-Capita Consumption of Electricity (kWh per person) in recent years

- Per capita electricity consumption of Madhya Pradesh based on energy demand for the state in FY 2014-15 was registered at 739 kWh (India 1010 kWh)

- The reason for lower per capita electricity consumption is large number of BPL consumers and tribal regions.
- Other major reason for lower per capita consumption is lower industrial (25.05%) & commercial (7.07%) consumption and higher agricultural consumption (38.74%)

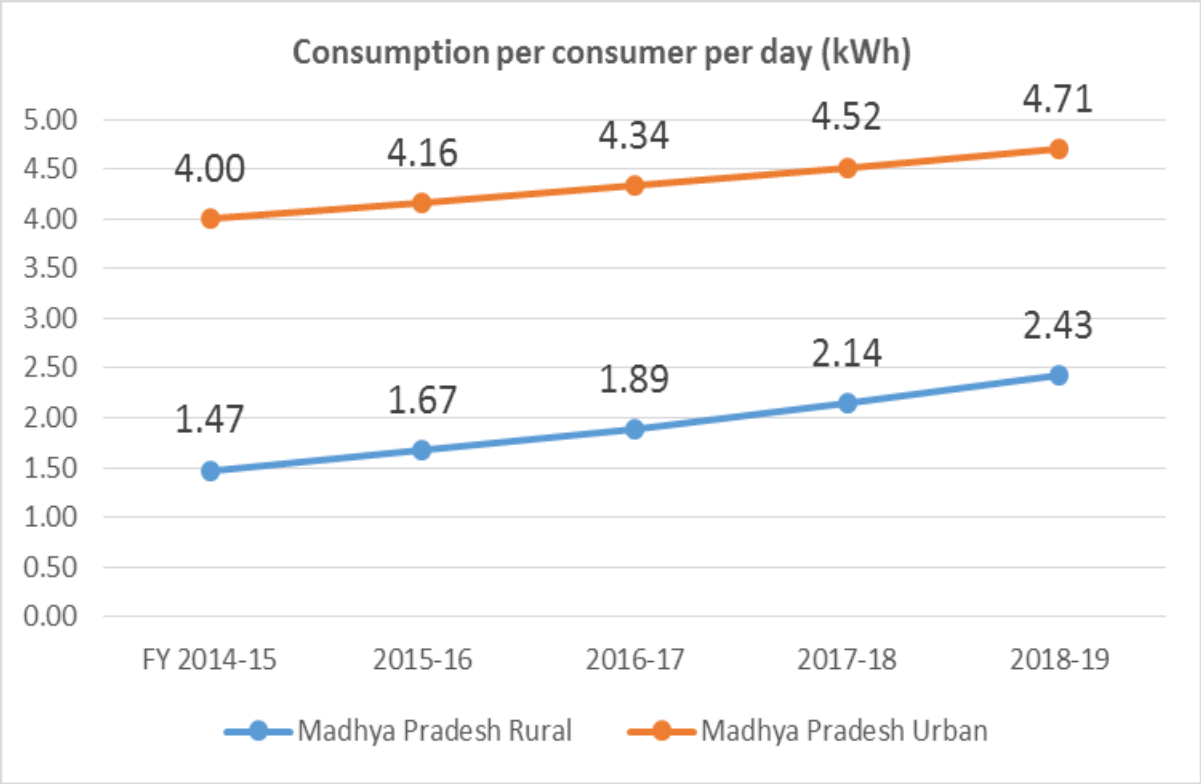

Fig. 6. Projected household consumption

Table 4 Category-wise consumption (In MU)

Categories	FY 16	FY 17	FY 18	FY 19
Domestic	11,349	13,206	15,802	19,354
Non Domestic	2,471	2,752	3,049	3,363
Public Lighting	431	466	497	526
Public Water works LT	719	800	864	926
Irrigation LT	18,462	20,796	22,,626	24,459
Lift Irrigation HT	55	56	63	66
Industrial LT	1,125	1,219	1,320	1,424
Industrial HT	8,411	9,213	10,037	10,916
Railway Traction	1,994	2,106	2,225	2,341
Non - industrial HT	1,029	1,092	1,161	1,231
Total	46,045	51,708	57,644	64,606

As seen from above, the consumption share of industries and railway (combined) would be around 22.51% whereas the share of irrigation sales will be around 37.61% in FY 19. Figure 6 shows the resulting wind capacity expansion necessary to reach 20% electricity generation by

2030. This trajectory was designed to supply an aggressive annual rate of growth that reached a sustainable level of producing by accounting for both demand growth and therefore the repowering of aging wind plants. Based on the assumptions used in this study, the wind industry would need to grow from an annual installation rate of 5 GW/yr in 2007 to a sustained rate of about 15 GW/yr by 2018, which is a threefold growth over the next decade.

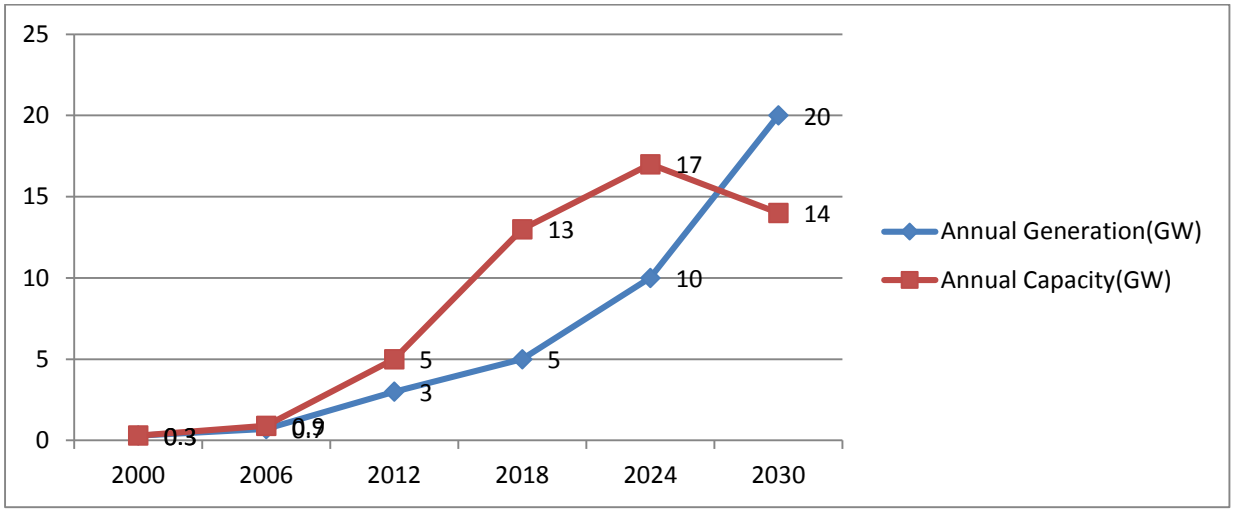

Fig. 7. Prescribed annual wind energy generation and corresponding annual wind capacity additions through 2030.

VI. FUTURE INVESTMENT PLAN FOR WIND ENERGY IN INDIA

The ministry has so far spent around 53 per cent or Rs 2,788.44 crore of its total budget allocation for the current financial year. Recently, the minister for power and renewable energy R K Singh told parliament the govt has estimated an investment of about Rs 4 lakh crore over the course of next three years to meet the country's 175 gig watt (GW) renewable energy target by 2022.The minister added that most of the grids connected RE projects in the country are being implemented by private sector developers selected through transparent bidding process.

VII. CHALLENGES OF WIND POWER

a) Wind power must still compete with conventional generation sources on a cost basis. Depending on how energetic a wind site is, the wind farm might not be cost competitive. Even though the cost of wind power has decreased dramatically in the past 10 years, the technology requires a higher initial investment than fossil-fueled generators.b) Good wind sites are often located in remote locations, far from cities where the electricity is needed. Transmission lines must be built to bring the electricity from the wind farm to the city. However, building just a few already-proposed transmission lines could significantly reduce the costs of expanding wind energy) Wind resource development might not be the most profitable use of the land. Land suitable for wind-turbine installation must compete with alternative uses for the land, which might be more highly valued than electricity generation. Turbines might cause noise and aesthetic pollution.d) Wind power plants have relatively little impact on the environment compared to conventional power plants; concern exists over the noise produced by the turbine blades and visual impacts to the landscape.e) Turbine blades could damage local wildlife. Birds have been killed by flying into spinning turbine blades. Most of these problems have been resolved or greatly reduced through technological development or by properly sitting wind plants.

VIII. CONCLUSION

Wind energy: a sustainable solution. It is evident that the use of wind energy as a permanent solution to the current global energy concerns could be sustainable. Even so, conditions to sustainability have been evaluated. As a result, even if the resource in its current state of technology is valuable enough to be able to support various developments in the business, achievements of vast technological opportunities could end up making the resource unlimited. At the monetary level, wind energy has proven to be not only environmentally but also socially profitable to financially reinforce wind industry while ceasing to cost competitive. Various governments are of the view that the wind industry is prepared to take up the opened business, with a green certificate market taking up all the favour. Nonetheless, in regards to a small market, there should be maintenance of a fixed price system. Socially,

the actuality that the wind industry is participating to local development encourages for its sustainability. Additionally, its checked authentic influence on the native inhabitants could help in incapacitating the public unwillingness. Finally, it is important to push for further research concerning potential environmental research. It is, therefore, advisable to first reconsider results of studies and environmental impact evaluation when thinking of putting up a new wind farm or reconsidering an old one.

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