



WIND ENERGY:CURRENT STATUS AND PROSPECTS IN INDIAN CONTEXT

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ABSTRACT

Wind energy is that source of energy which is renewed by nature and whose supply is not affected by the rate of consumption. In developing countries, wind power can play a useful role for water supply and irrigation (wind pumps) and electrical generation (wind generators).

Electricity demand in India is increasing at the rate of 7% per annum. This is the result of increased rate of industrialization, urbanization and agricultural activities. At present the energy and peaking shortages are about 8% and 19% respectively. Wind energy is a clean, eco-friendly, renewable resource and is nonpolluting. The gross wind power potential is estimated at around 48,561 MW in the country. The total installed capacity in India till 30th September 2015 is 24,376 MW. Which places India in the fifth position globally. This paper discusses the ways in which India has already supported the growth of wind energy technologies, current status, major achievements and future aspects. In India the installed capacity of wind power generation is almost 7% and about 2% of total energy is from wind.

Keywords: Renewable Energy, Wind Energy, Wind Power.

I. INTRODUCTION

Windmills used to ground grain and drove water pumps for irrigation and drainage purposes in ancient time all over the world. Worldwide survey of 132 nations indicated that, the nations ranked high on sustainable development, tend to have higher usage of the renewable energy. Energy is essential for economic and social development of a region or a country. However, consumption of fossil fuels is the major cause of air pollution and climate change. Improving energy efficiency and de-linking economic development from energy consumption (particularly of fossil fuels) is essential for sustainable development.

Top Countries with Installed Renewable Electricity using Wind Technology (2014) are

1. China.
2. U. S. A.
3. Germany
4. Spain.
5. India.

World Renewable Energy 2014

SN	Category	Capacity GW
1	Hydropower capacity	1055
2	Bio-power capacity	93
3	Bio-power generation	433
4	Geothermal power capacity	12.8
5	Solar PV capacity	177
6	Concentrating solar thermal power	4.4
7	Wind power capacity	370
	Total	1712

The central idea presented in this paper is review and study of wind energy and current sustainable development in Indian context. Total number of countries using wind power commercially is more than 80 now. There is significant growth in wind energy sector as awareness and demand is increasingly rapidly.

II. GLOBAL SCENARIO OF ENERGY CONSUMPTION

In 2008, total worldwide energy consumption was 474 exajoules (474×1018J) with 80 to 90 percent derived from the combustion of fossil fuels. This is equivalent to an average annual power consumption rate of 15 terawatts (1.504×1013W). Not all of the world's economies track their energy consumption with the same rigor, and the exact energy content of a barrel of oil or a ton of coal will vary with quality. Fig. 1 shows the World Energy Consumption Million tons of oil equivalent from 2002 to expected consumption till 2030.

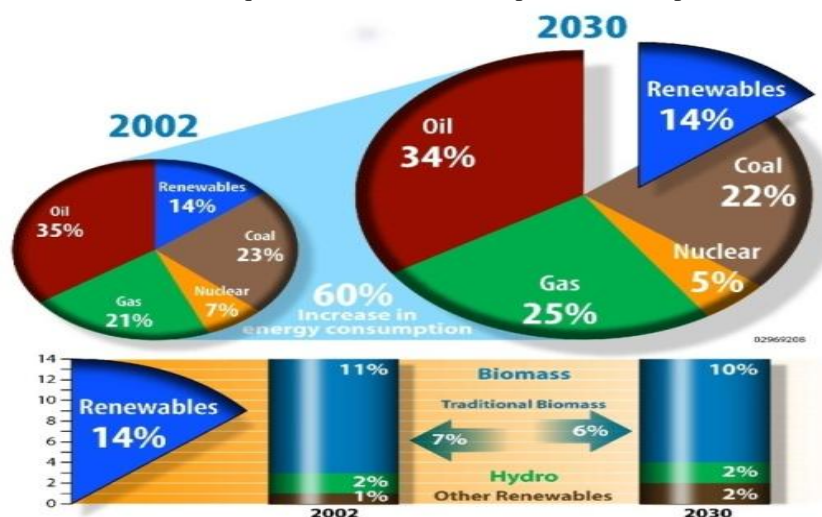


Figure 1. World Energy Consumption Million tons of oil equivalent (Mtoe).

In 2009, world energy consumption decreased for the first time in 30 years (-1.1%) or 130Mtoe, as a result of the financial and economic crisis (GDP drop by 0.6% in 2009). This evolution is the result of two contrasting trends. China became the world's largest energy consumer (18% of the total) since its consumption surged by 8% during 2009 (from 4% in 2008). Oil remained the largest energy source (33%) despite the fact that its share

has been decreasing over time. Coal posted a growing role in the world's energy consumption: in 2009, it accounted for 27% of the total. Fig. 2 shows the world wide installed capacity of wind power from 1996 to 2013

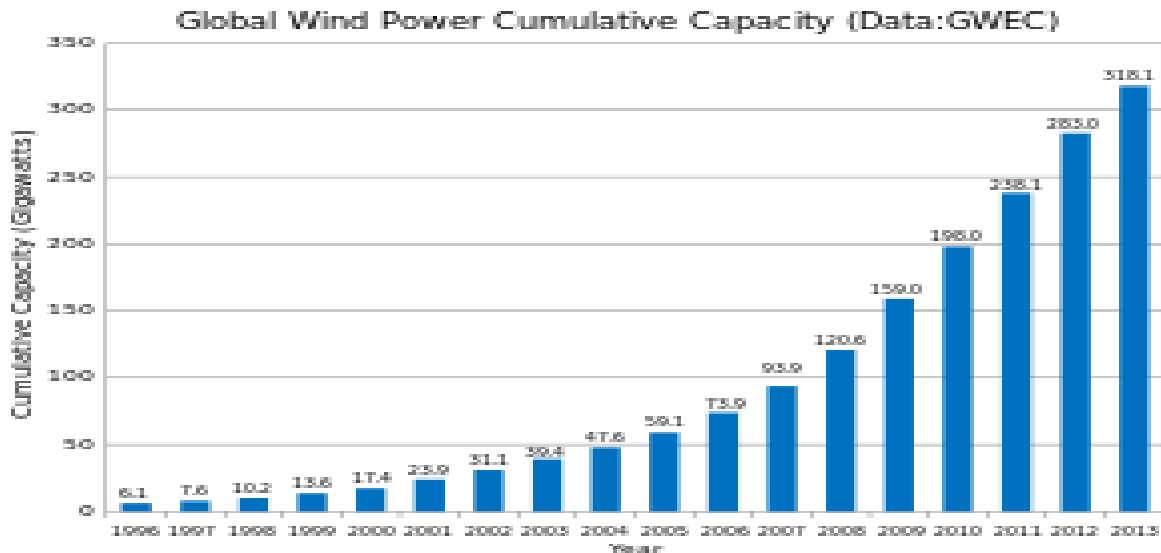


Figure 2. Wind Power: Worldwide Installed Capacity

III. INDIAN SCENARIO OF ENERGY CONSUMPTION

Coal is the predominant energy source (58%) in India, followed by oil (27%), natural gas (7%), lignite (4%), hydropower (3%) and nuclear power (0.22%). Energy consumption patterns in the Indian residential sector vary widely not only among the rural and urban areas but also across various income classes in urban areas. Approximately 86.1% rural households in India use fuel wood and dung cakes for cooking, 3.5% rural households use LPG for cooking, 50.6% of rural households use kerosene and 48.4% use electricity as a primary source of lighting. The annual average fuel wood consumption is around 270–300 million tones, kerosene consumption is about 10.5 million tones out of which 60% is in rural areas. India’s present energy scenario calls for the effective management of all available resources in order to attain national objectives. A well-balanced fuel mix, in which all energy resources are appropriately utilized, is essential for sustainable development.

IV. CURRENT STATUS OF WIND ENERGY IN INDIAN CONTEXT

Electrical energy and mechanical energy can also be produced by wind energy. The gross wind power potential is estimated at around 48,561 MW in the country; a capacity of 2126 MW as of 31st March 2015 has so far been added through wind, which places India in the fifth position globally. Some of the major wind energy plants are located in Tamil Nadu, Gujarat and Maharashtra. India was the world’s fifth largest market (2.3 GW, up 34% over 2013) and remained fifth globally for cumulative capacity (22.5 GW).

Table shows state wise capacity in India which places the Tamil Nadu at first place amongst states . There is a growing number of wind energy installations in states across India.



State wise Wind Energy capacity in India

State	Capacity (MW), as of March 31, 2015)
Andhra Pradesh	1031.4
Gujarat	3645.4
Karnataka	2638.4
Kerala	35.1
Madhya Pradesh	879.7
Maharashtra	4450.6
Others	4.30
Rajasthan	3307.2
Tamil Nadu	7455.2
Total	21264

V. WIND ENERGY PROSPECTS IN INDIA

In the year 2015, the MNRE set the target for Wind Power generation capacity by the year 2022 at 60,000 MW. Wind energy capacity for installed electricity generation 20.23 GW of the total 234.6 GW of electricity generated in India in January 2014. While renewable energy sources together account for nearly 12.6 percent of total capacity, wind accounts for 8.7 percent. In terms of additional annual capacity coming online, Maharashtra led in FY 2013–14 with 847 MW, thanks to favourable wind policies and strong renewable purchase obligation (RPO) compliance and enforcement. The wind energy market in India comprises a relatively tight stakeholder group. The stakeholder organizations include fewer than 20 main project developers that provide end-to-end turnkey solutions; independent power producers (IPP); policymakers and implementing agencies; turbine manufacturers, research and development institutes, and industry associations. As of 2010, the wind energy industry was estimated to be directly and indirectly employing 42,000 people in India. An additional 60,000 wind energy jobs will be needed by 2020, according to growth estimates from the Ministry of New and Renewable Energy (MNRE). These clean energy jobs include project planning, development, construction, and commissioning. Fig. 3 shows the India's wind power Installed generating capacity from 2006 to 2015, which is now reached to 21264 MW in March 2014 and 22644 MW in March 2015.

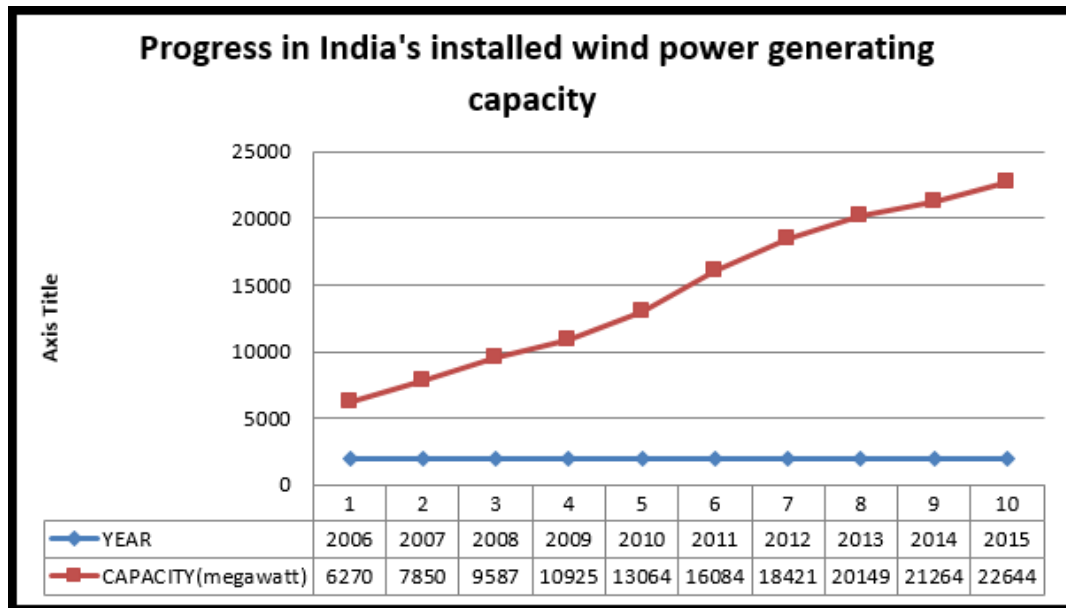


Figure 3. Progress in India's installed wind power generating capacity since 2006 [wiki].

VI. CONCLUSION

Today, these renewable energy technologies are the fastest growing energy technologies (particularly wind and solar) and are cost competitive in a variety of grid, off-grid, and remote applications worldwide. They utilize locally available resources, offsetting the need for costly fuel imports; are environmentally beneficial, without the harmful emissions of conventional energies; provide diversification to a country's energy mix; and create local job and income opportunities. The integrated development of all these components is essential for environmentally sound development of the region. The natural resource base has deteriorated considerably due to the rapid growth in population coupled with unplanned developmental activities including industrializations and urbanizations. This also has resulted in exponential increase in fossil fuel consumption.

The global wind power market resumed its advance in 2014, adding a record 51 GW the most of any renewable technology for a year-end total of 370 GW. An estimated 1.7 GW of grid-connected capacity was added offshore for a world total exceeding 8.5 GW. India invested 7.4 billion USD in 2014 for renewable energy.

Wind power accounts nearly 8.5% of India's total installed power generation capacity and generated 28,214 million Kwh(MU) in the fiscal year 2014-15 which is nearly 2.6% of total electricity generation. India to Quadruple Renewable Capacity to 175 Gigawatts by 2022. India's current installed renewable capacity stands at 34 gigawatts. India will seek to add 100 gigawatts of photovoltaic capacity, 60 gigawatts of wind power, 10 gigawatts of biomass and five gigawatts of hydro projects.

By working with financial institutions to establish effective financing policies, instruments and mechanisms, the Indian government and wind energy stakeholders can support and enable a needed resurgence in the wind energy market that can sustainably power its future and help mitigate climate change's worst impacts.

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