

WIND TECH SUMMIT 2019
August 21-22, 2019
The Lalit, New Delhi

INTRODUCTION

Current Scenario

India currently has the fourth highest wind installed capacity in the world, after China, the US and Germany, with total installed capacity of 34.98 GW as on October 2018 against a target of 60 GW by 2022. Further, around 9.4 GW capacity is under implementation or have been tendered out.

Wind power capacity in the country grew significantly by 66 per cent from 21.04 GW in March 2014 to 34.98 GW in October 2018. As of October 2018, a total of around 73.35 GW of renewable energy capacity has been installed in the country from all renewable energy sources, of which wind energy accounted for 47 per cent at 34.98 GW.

Wind Power Capacity Addition in India

Year	Capacity addition (MW)
2014-15	2,311.78
2015-16	3,423.05
2016-17	5,502.37
2017-18	1,865.23
2018-19 (April-October)	841.35
Cumulative capacity (as of March 31, 2014)	21,042.57
Cumulative capacity (as of October 31, 2018)	34,986.35

Source: Ministry of New and Renewable Energy, Government of India

The outlook for the wind sector in India looks bright in the current fiscal 2018-19, with capacity addition expected to increase by 34 per cent to 2,500 MW in 2018-19 over the previous year. This growth is being driven by the recent project awards. Projects of 10,000 MW capacity have been awarded by the Solar Energy Corporation of India (SECI) and NTPC, as well as state distribution utilities, between February 2017 and September 2018.

The Ministry of New and Renewable Energy (MNRE) plans to bid out 10 GW wind power capacity each year for 2018-19 and 2019-20, so that bidding gets completed for entire 60 GW capacity addition by March 2020, leaving two years' time for execution of projects. According to reports, Suzlon Energy is planning to capture about 30 per cent of the 20 GW of wind capacity likely to be commissioned by 2020-21. Further, the government has projected that India will have to bid out 140 GW of wind energy to meet demand by 2030.

The wind power projects in the country are installed on the basis of commercial viability through tariff-based competitive bidding (TBCB) process. As of December 27, 2018, the bids for setting up of wind power projects of aggregate 8,389.9 MW capacity have been finalised through SECI and NTPC, as detailed in the following table. Besides, bids of 500 MW each have been finalised by the states of Tamil Nadu, Gujarat and Maharashtra.

Status of Wind projects finalized through SECI and NTPC (as of December 2018)

SECI Bid	Project Capacity (MW)	Project Locations	Tariff Rs/unit	Present Status
SECI Tranche I	1,049.90	Thirunelveli (Tamil Nadu) and Bhuj & Bachau (Gujarat)	3.46	425.9 MW commissioned. Financial closure achieved for 624 MW
SECI Tranche II	1,000	Tuticorin (Tamil Nadu) and Bhuj & Bachau (Gujarat)	2.65-2.65	Scheduled commissioning date is 03.05.2019
SECI Tranche III	2,000	Tuticorin (Tamil Nadu) and Bhuj & Bachau (Gujarat)	2.44-2.45	Scheduled commissioning date is 23.11.2019
SECI Tranche IV	2,000	Pugalur, Thirunelveli, & Palakkad (Tamil Nadu) and Bhuj (Gujarat)	2.51-2.52	Scheduled commissioning date is 28.02.2020
SECI Tranche V	1,190	Bhuj (Gujarat) and Hiriyur (Karnataka)	2.76-2.77	Scheduled commissioning date is 22.07.2020
NTPC	1,150	Pavagada (Andhra Pradesh), Osmanabad (Maharashtra), Karur & Tirupur (Tamil Nadu), Kutch (Gujarat) and Devangere (Karnataka)	2.77-2.83	Scheduled commissioning date is 13.07.2020
Total	8,389.9			

Source: Ministry of New and Renewable Energy, Government of India

The Government of India has set a target of installing 60 GW of wind power capacity by 2022, against which 35 GW capacity has already been installed. Wind energy has spread across the South, West and North regions of India. The potential of wind energy is concentrated in the states of – Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu and Telangana. The state-

wise installed capacity and energy generation (actual production) of wind power in the country during last four years are given in the following table.

State-wise installed capacity and energy generation of wind power in India

State	2015-16		2016-17		2017-18		2018-19	
	Install ed capaci ty (MW)	Energy generati on (MU)	Install ed Capaci ty (MW)	Energy generati on (MU)	Install ed capaci ty (MW)	Energy generati on (MU)	Install ed capaci ty (MW) (as on Nov 30, 2018)	Energy generati on (MU) (as on Oct 31, 2018)
Andhra Pradesh	400.10	2013.04	2187.45	3187.85	348.10	6354.11	107.40	774.50
Gujarat	392.40	6446.58	1392.00	7720.01	272.80	9635.65	239.25	1885.09
Karnataka	230.90	4797.95	882.30	6058.65	857.00	7410.29	63.90	998.60
Kerala	8.40	51.45	8.00	72.59	1.00	98.46	0.00	10.78
Madhya Pradesh	1261.40	1558.43	356.70	3563.17	22.10	4139.84	0.00	1081.38
Maharashtra	207.85	6121.34	117.55	7490.75	12.60	6541.35	4.20	1060.68
Rajasthan	685.50	4583.59	287.70	5562.52	16.00	5665.45	2.00	1123.47
Tamil Nadu	158.80	7273.23	247.57	11935.26	335.64	12358.01	427.80	723.82
Telangana	77.70	0.00	23.10	211.93	0.00	195.29	27.30	29.81
Others	0.00	183.77	0.00	201.61	0.00	267.65	0.00	75.70
Total	3423.05	33029.38	5502.37	46004.34	1865.24	52666.1	871.85	7763.83
Cumulative Capacity	26777.39	--	32279.76	-	34145.00	-	35016.85	-

Source: Ministry of New and Renewable Energy, Government of India

The expansion of the wind industry in India has resulted in a strong ecosystem, project operation capabilities and a manufacturing base. Notably, the wind power generation in the country has gained a high level of attention and acceptability compared to other renewable energy technologies. New technological developments in wind power design have contributed for the significant advances in wind energy penetration and to get optimum power from available wind. State-of-the-art technologies are now available in the country for the manufacture of wind turbines. All the major global players in this field have their presence in the country. Over 24 different models of wind turbines are being manufactured by more than 12 different companies in India. Wind turbines and components are being exported to the US, Australia, Europe, Brazil and other Asian countries. Around 70-80 per cent indigenisation has been achieved with strong domestic manufacturing in the wind sector.

Government Incentives & Initiatives

The Government of India is promoting wind power projects in entire country by providing various fiscal and financial incentives such as Accelerated Depreciation Benefit and concessional custom duty exemption on certain components of wind electric generators. Besides, Generation Based Incentive (GBI) is being provided to the wind projects commissioned before March 31, 2017.

In addition to fiscal and other incentives, following steps also have been taken to promote installation of wind capacity in the country:

- Technical support including wind resource assessment and identification of potential sites through the National Institute of Wind Energy (NIWE), Chennai.
- In order to facilitate inter-state sale of wind power, the inter-state transmission charges and losses have been waived off for wind and solar projects to be commissioned by March 2022.
- Issued guidelines for tariff-based competitive bidding (TBCB) process for procurement of power from grid connected wind power projects. These guidelines aim to enable the distribution licensees to procure wind power at competitive rates in a cost-effective manner.

The recent assessment conducted by NIWE indicates a gross wind power potential of 302 GW in the country at 100 metres above ground level. The capacity addition till 2017 were through Feed-in-Tariff (FiT) mechanism. Subsequently, the tariff regime has been shifted from FiT to bidding route.

Some of the recent government initiatives include:

- The Government has issued 'Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Wind Power Projects', vide Resolution notified on December 8, 2017, with an objective to provide a framework for procurement of wind power through a transparent process of bidding. This has resulted in discovery of lowest ever tariff for wind power.
- The National Wind-Solar Hybrid Policy was issued in May 2018. The main objective of the policy is to provide a framework for promotion of large grid connected wind-solar PV hybrid system for optimal and efficient utilization of wind and solar resources, transmission infrastructure and land. The wind - solar PV hybrid systems will help in reducing the variability in renewable power generation and achieving better grid stability. A bid for setting up of first 1,200 MW greenfield wind-solar hybrid project was floated by SECI.
- The National Offshore wind energy policy was notified in October 2015 with an objective to develop the offshore wind energy in the Indian Exclusive Economic Zone (EEZ) along the Indian coastline.

- Initial studies carried out by NIWE indicate offshore wind energy potential off the coasts in Gujarat and Tamil Nadu.
- LiDAR was commissioned on the monopile platform in November 2017 at Gulf of Khambhat, off Gujarat coast for wind resource assessment.
- NIWE floated Expression of Interest (Eoi) for establishment of 1 GW offshore wind farm in Gulf of Khambhat region off Gujarat coast. 35 companies (both national and international) showed interest.
- National targets for offshore wind capacity additions of 5 GW by 2022 and 30 GW by 2030 declared.

The wind sector in India is growing at a rapid pace with increased utilization of wind energy for power development. The modern wind turbines have higher hub heights, larger rotor diameter, higher capacity and improved capacity utilization factor (CUF) along with technological improvements. Under these developments, there is a need for comprehensive document which provides the complete technical requirements which shall have to be complied by the wind turbines for the safe and reliable operation by all the stakeholders - OEMs, independent power producers (IPPs), wind farm developers, financial institutions, utilities and others. Also, there is a need for technical regulations which shall facilitate common ground for OEMs, developers, investors and financial institutions for systematic development.

In this regard, the MNRE, in consultation with NIWE, has prepared a draft of new Scheme called Indian Wind Turbine Certification Scheme (IWTCS) incorporating various guidelines. The IWTCS is a consolidation of relevant National and International Standards (IS/IEC/IEEE), technical regulations and requirements issued by Central Electricity Authority (CEA), guidelines issued by MNRE and other international guidelines. It has also strived to incorporate various best practices from other countries to ensure the quality of the wind energy projects.

Global scenario

The global wind power industry has experienced exceptional growth for over a decade, mainly boosted by soaring wind power installation capacities from the world's largest wind energy producing countries. With the growing demand for alternative and eco-friendly energy around the world, wind power has emerged to become one of the most cost-effective renewable energy sources with low carbon emissions. Therefore, many of the world's major countries have been rapidly investing and increasing the capacity of their wind power installations in recent years. While the wind power installations continue to grow globally, the world's top 10 largest wind energy producing countries, namely, China, USA, Germany, India, Spain, UK, France, Brazil, Canada and Italy are expected to maintain their dominance in the global wind power industry in the near future, due to their high newly installed capacities year on year. It is estimated that the global additions of new wind power capacity will be 689 GW over the next 10 years, which will bring the cumulative installations to 1,160 GW by the end of 2027, and these top 10 wind energy producing countries will remain as the main driving force for the future growth.

Top 10 Largest Wind Energy Producing Countries by Cumulative Installed Capacity by end-2017

Rank	Country	Cumulative Installed capacity by end-2017 (MW)	% share in world
1	China	188,392	35
2	USA	89,077	17
3	Germany	56,132	10
4	India	32,848	6
5	Spain	23,170	4

6	UK	18,872	3
7	France	13,759	3
8	Brazil	12,763	2
9	Canada	12,239	2
10	Italy	9,479	2

Source: Global Wind Energy Council

According to a recent market report from ReportLinker, the global wind energy market size increased from about US\$24 billion in 2006 to over US\$100 billion in 2016, growing at a CAGR of 15.6 per cent. During 2017-2025, the wind power market size is expected to grow to over US\$110 billion. According to World Wind Energy Association, the global wind power capacity by the end of 2017 reached 539,291 MW. The new installations of wind power capacity reached 52,552 MW globally in 2017. All wind turbines installed by end of 2017 can cover more than 5 per cent of the global electricity demand. For many countries, wind power has become a pillar in their strategies to phase out fossil and nuclear energy. In 2017, Denmark set a new world record with 43 per cent of its power coming from wind. An increasing number of countries have reached a double-digit wind power share, including Germany, Ireland, Portugal, Spain, Sweden or Uruguay.

Top 10 Largest Wind Energy Producing Countries by Newly Installed Capacity in 2017

Rank	Country	Newly Installed capacity in 2017 (MW)	% share in world
1	China	19,660	37
2	USA	7,017	13
3	Germany	6581	12
4	UK	4270	8
5	India	4148	8
6	Brazil	2022	4
7	France	1694	3
8	Turkey	766	1
9	South Africa	618	0.9
10	Finland	535	0.9

Source: Global Wind Energy Council

Wind farms can be based onshore (on land) or offshore (sea or freshwater). As per the data by the World Wind Energy Association (WWEA), 80 countries across the globe are already using wind power on a commercial basis, wherein prominent countries, such as the U.S., Canada, and the U.K. are ranked first, second and eighth, respectively in terms of installed capacity (both onshore and offshore).

With regard to offshore wind capacity, globally there has been installation of about 17 to 18 GW of off-shore wind power led by countries such as UK, Germany, Denmark, Netherlands and China. Recent years have witnessed fall in off-shore wind tariff in some of these markets. The UK is the world's largest offshore wind market and accounts for just over 36% of installed capacity, followed by Germany in the second spot with 28.5%. China comes third in the global offshore rankings with just under 15%. Denmark now accounts for 6.8%, the Netherlands 5.9%, Belgium 4.7% and Sweden 1.1%. Other markets including Vietnam, Finland, Japan, South Korea, the US, Ireland, Taiwan, Spain, Norway and France make up the balance of the market.

Offshore wind energy forms an integral part of the clean energy resources and has a higher capacity factor as compared to the onshore wind energy. Wind turbines use the power of natural wind to generate electricity. The growth of the offshore wind energy market is attributed to the increasing demand for clean energy to reduce carbon emissions and the increasing demand for electricity generation with the help of renewable energy resources.

Presently, North America and Europe are at the forefront of the offshore wind energy market, with high market penetration in countries such as the U.S., the Netherlands, the U.K., Spain, Italy, and France, among others. However, the Asia-Pacific region is expected to display the highest growth rate in the coming years. Increased awareness about the use of renewable energy mix for power generation is supporting the growth of the offshore wind energy market in the region.

Several developing countries have opened up huge opportunities for the global offshore wind turbines market since the pressure of keeping the carbon emissions low is increasing day-by-day. Some of the prominent players in the offshore wind energy market are GE Renewable Energy, Siemens Gamesa, MHI Vestas, Adwen, Orsted, ABB, Statoil, Senvion, Sinovel, Petrofac Inc., Nexans, and EEW Group.

The global market for small wind turbines (SWTs) has been on the rise over the last several years. This is driven by rapidly growing energy demand, varying fossil fuel prices and improved SWT technology, which can be deployed for a diverse pool of applications, both in 'grid-tied' and 'stand-alone' modes. The recorded small wind capacity installed worldwide has reached over 800 MW. Based on the world distribution of turbine manufacturers, the production of small wind turbine remains concentrated in very few countries and developing countries continue to play a minor role in SWT manufacturing.

India could benefit significantly from exploiting the potential of micro-generation technologies that can meet energy needs under the distributed generation mode, so as to provide long-term solutions. Small Wind turbine system is useful for Off-grid / Mini-grid / Micro-grid / distributed renewable energy-based electricity generation in rural areas / un-electrified areas / complex terrains or areas falling under low wind regime. The MNRE has been implementing programmes to promote small wind turbines system all over India. As on March 2017, a cumulative total of 1516 nos. of water pumping windmills and an aggregate capacity of 3,289 kW of aero-generators / hybrid systems are installed across India.

Top Companies: India

Some of the top wind turbine manufacturers in India are:

1. Vestas India
2. Suzlon Energy
3. ReGen Powertech
4. Wind World India
5. Orient Green Power
6. Indowind Energy
7. GE Wind Energy
8. Inox Wind
9. Leitwind Shriram Manufacturing
10. RRB Energy

Top Companies: Global

The top wind turbine manufacturers in the world are:

1. Vestas
2. Siemens Gamesa
3. Goldwind
4. GE

5. Enercon
6. Nordex Group
7. Senvion
8. United Power
9. Envision Energy
10. Suzlon
11. Acciona
12. Eveready
13. Sinovel
14. Sany Global
15. Vergnet

ABOUT WIND TECH 2019

Wind Tech Summit 2019 is a technical event for experts in the wind industry with the goal to push forward technical development in India in the coming years. The conference will discuss the current developments, key strategies and innovations, and promising equipment and technologies. The summit will bring together technical experts working to improve these technologies which involve both cross-sector (public, private, and academic) and cross-disciplinary (wind engineering, meteorology, systems engineering, observations, aerodynamics, controls, materials, etc.) collaborations to make this happen. Wind Tech Summit will help to foster these collaborations in order to accelerate future advances.