

Wind Energy in India

Wind energy in India has a huge potential to fulfill the country's power needs and boost the economy. India has the third largest operational wind power plants in the world. with a lot of potential to claim to world's largest wind energy producer from the current third position.

The ability to install wind power plants in India is increased with the entry of private players in the sector. The government has also made policy changes to tap the potential of wind energy in India. Agencies can install onshore and offshore windmills in India to fulfill the country's power needs. Check the largest wind farm in India below.

Largest Wind Farm in India

The largest wind farm in India is the Muppandal Wind Farm. With a huge potential for wind energy, a few wind farms in India are among the 10 largest wind parks in the world. India has a well-established wind energy industry, and the nation is home to some of the best wind farms in the world.

Muppandal Wind Farm

The Energy Development Agency of Tamil Nadu created the project in Muppandal of the Kanyakumari district of Tamil Nadu. It is the largest wind farm in India, with an operational capacity of 1,500 MW. It is also the third-largest onshore wind farm in the world.

Jaisalmer Wind Park

The second largest wind farm in India is the Jaisalmer wind park. This project is situated in Rajasthan, Western India's Jaisalmer district. The initiation of the project happened in August 2001. The company Suzlon Energy built this wind farm. India's second-largest active onshore wind farm is at the Jaisalmer Wind Park.

Vankusawade Wind Park

The third largest wind farm in India is Vankusawade wind park. It was installed 40 kilometers away from Satara town in Maharashtra. Vankusawade Wind Park's wind farm is situated 1,150 meters above the Koyna Reservoir on a high mountain plateau.

List of Wind Power Plants in India

Following is the list of wind power plans in India along with their capacity and location.

| Wind Power Plant in India | Megawatt (MW) | Location of Wind Farms in India |
|---------------------------|---------------|---------------------------------|
| Muppandal wind farm | 1500 | Tamil Nadu, Kanyakumari |
| Jaisalmer Wind Park | 1064 | Rajasthan, Jaisalmer |
| Brahmanvel wind farm | 528 | Maharashtra, Dhule |

| | | |
|-----------------------|-------|-------------------------------|
| Dhalgaon wind farm | 278 | Maharashtra, Sangli |
| Vankusawade Wind Park | 259 | Maharashtra, Satara District. |
| Vaspet | 144 | Maharashtra, Vaspet |
| Tuljapur | 126 | Maharashtra, Osmanabad |
| Beluguppa Wind Park | 100.8 | Beluguppa, Andhra Pradesh |
| Mamatkheda Wind Park | 100.5 | Madhya Pradesh, Mamatkheda |
| Anantapur Wind Park | 100 | Andhra Pradesh, Nimbagallu |

Types of Wind Farms in India

There are mainly 3 farms of Wind Energy in India. The segregation is based on the location of the farm concerning water. Types of wind farms are explained below:

- **Onshore Wind Farms:** Currently, they are the most prevalent. They are 3 kilometers or more inland and rely on inland air currents for their food. This location has the benefit of being easily accessible and close to the energy grid.
- **Nearshore Wind Farms:** Even though they are on land, they are only a few kilometers from the ocean. The benefit of choosing this location is that it can use land and marine winds to generate energy.
- **Offshore Wind Farms:** These constructions are constructed several miles to sea. The wind's force is greater, at a lower height, and more regular than on land, which is one of their key advantages over installations on land.

Policies Related to Wind Energy in India

The National Wind Power Policy was the government's initial plan. Later, wind policies for offshore and onshore wind farms were developed. To encourage the use of renewable energy, several states have created their own wind energy regulations.

- The National Offshore Wind Energy Policy Framework was introduced in October 2015. The offshore wind energy policy intended to develop wind energy was formulated along the Indian coastline in the Indian Exclusive Economic Zone (EEZ).
- In May 2018, a Solar-Wind Hybrid policy was announced. The policy was established to support the massive hybrid grid connection between the wind-solar photovoltaic (PV) system for the most effective and economical use of transmission infrastructure, wind and solar resources, and land.

Potential of Wind Energy in India

Since the wind is a variable and site-specific energy source, it is crucial to conduct a thorough Wind Resource Assessment before deciding on suitable locations. In collaboration with the National Institute of Wind Energy (NIWE), the government has set up more than 800 wind monitoring stations across the nation and published wind potential maps at heights of 50, 80, 100, and 120 meters.

According to a recent estimate, the country has a gross wind energy potential of 302 GW at 100 meters and 695.50 GW at 120 meters above the earth. Most of this potential, as seen below, is present in windy states:

| State | Wind Power Potential at 100m (GW) | Wind Potential at 120m (GW) |
|----------------|-----------------------------------|-----------------------------|
| Gujarat | 84.43 | 142.56 |
| Rajasthan | 18.77 | 127.75 |
| Maharashtra | 45.39 | 98.21 |
| Tamil Nadu | 33.79 | 68.75 |
| Madhya Pradesh | 10.48 | 15.40 |
| Karnataka | 55.85 | 124.15 |
| Andhra Pradesh | 44.22 | 74.90 |
| Others | 9.28 | 43.78 |
| Total | 302.25 | 695.50 |

Highest Wind Energy Producing State in India 2022

Check the installed Wind Energy in different states of India. It included the onshore and offshore installation. Tamil Nadu does the maximum installation of wind energy in India. Gujarat is just behind Tamil Nadu with a 19% share in wind energy.

| State | Capacity |
|-------------|----------|
| Tamil Nadu | 9000 MW |
| Gujarat | 7855 MW |
| Maharashtra | 4789 MW |

| | |
|-----------|---------|
| Karnataka | 4779 MW |
| Rajasthan | 4292 MW |

Advantages of Wind Mill in India

Numerous benefits of using wind energy in India. It is a non-perishable source of energy that, once established, needs little upkeep and degradation. There is no need for gasoline. See further advantages below:

- Power generation begins soon after commissioning, with a brief gestation time. Power is available without cost once generation begins.
- Because there are no input costs and recurring expenses are nearly nonexistent, power generation is less expensive.
- Wind energy is clean and pollution-free for the environment.
- In contrast to diesel power, generation is continuous. Never invest in the void.

Disadvantages of Wind Energy Farms

While there are many benefits to using wind energy in India, there are also some drawbacks. It particularly risks the region where wind farms are situated.

- Since turbines can only produce electricity when the wind is blowing strongly, onshore wind is an intermittent energy source.
- The fossil fuel-based power supply is required as a backup when wind power is inadequate for turbines to function, which can momentarily boost greenhouse gas emissions.
- According to some research, those who live or work nearby suffer a poorer quality of life, irritation, tension, sleep disturbance, headache, anxiety, depression, and cognitive impairment. Numerous researchers, however, hold contrasting views.
- The term "wind turbine syndrome" or "wind farm syndrome" refers to the supposed unfavorable effects on human health linked to wind turbine vicinity. The term "wind turbine syndrome" refers to pseudoscience.
- Wind Parks must be erected in untamed, rural areas and require more acreage than conventional power plants, which may result in the industrialization of the countryside.

Problems Associated with the Wind Energy Sector

Several issues plague the Wind Energy industry. Look at the list of obstacles preventing the growth and success of wind energy.

- In December 2017, the Indian government developed the framework for auctions. Every auction has a tariff cap that is applied. Since winds vary by region, reaching the desired tariff rate becomes challenging.
- General issues affecting distribution firms (discom risks) include reduced electricity production and late payments to energy suppliers.

- Delivering electricity from wind farms to metropolitan areas is necessary to meet demand but must overcome installation difficulties. As a result, it might greatly reduce the cost of boosting the nation's transmission network to connect regions with plentiful wind resources to major population centers.
- Wind farms may impact local fauna. Although wind energy projects have less impact on wildlife than other energy initiatives, the study is still required to reduce wind-animal interactions.

World Largest Wind Energy Parks

The United States is home to half of the largest wind farms in the world. China, India, and the United Kingdom are major wind energy producers. Renewable energy is in high demand right now. With more than 350,000 wind turbines installed worldwide, wind energy is one of the most popular renewable energy sources. The 10 biggest wind farms in the world are listed below.

| Wind Power Plant | Megawatt (MW) | Location |
|--------------------------|---------------|--------------------------------|
| Gansu | 7,965 | China |
| Alta | 1,548 | United States of America (USA) |
| Muppandal wind farm | 1500 | Tamil Nadu, Kanyakumari |
| Jaisalmer Wind Park | 1064 | Rajasthan, Jaisalmer |
| Los Vientos Wind Farm | 912 | United States of America (USA) |
| Shepherds Flat | 845 | United States of America (USA) |
| Meadow Lake Wind Farm | 801 | United States of America (USA) |
| Roscoe | 782 | United States of America (USA) |
| Horse Hollow | 736 | United States of America (USA) |
| Tehachapi Pass Wind Farm | 705 | United States of America (USA) |

