

Tamil Nadu Energy Development Agency (Government of Tamil Nadu Enterprise)



Wind Energy

Wind is generated due to heating of the earth's surface. Uneven heating of different areas of earth causes difference in pressure and makes the air flow from high pressure region to low pressure region, which is termed as "Wind". As wind contains tremendous amount of energy, it can be harnessed to generate power on a large scale matching with conventional sources.

India is at present ranked 4th in the world in wind power generation as shown below :

S.No.	Country	Installed Capacity (December 2007) MW
1	Germany	22247
2	United States	16818
3	Spain	15145
4	India	8000
5	China	6050
6	Denmark	3125

Worldwide - 93849 MW as on 31.12.2007

The total installed capacity in India is 9521 MW on 30.9.2008, of which Tamil Nadu with installed capacity of 4099 MW accounts for 43 % and is **No. 1** State in the country.

Potential in Tamil Nadu



S. No.	Location	Tentative Gross Potential	Harnessed upto 31.10.2008
		MW	

(i)	Aralvaimozhi Pass (Muppandal area) Kanyakumari / Tirunelveli Districts	2100	1583
(ii)	Sengottah Pass (Kayathar area) Tirunelveli, Thoothukudi Districts	1300	840
(iii)	Palghat Pass (Kethanur area) Coimbatore, Erode and Dindigul Districts.	1650	1670
(iv)	Coastal area Ennore near Chennai and Rameswaram in Ramanathapuram District and other areas.	450	8
Total		5500	4101

Wind Resource Assessment

This programme was started in Tamil Nadu after the inception of TEDA in 1985 – 86. Under this programme, identification of high wind prone zones with annual mean wind speed of 18 kmph and above and annual mean Wind Power Density (WPD) of 150 W / m² and above, at 50 m height was undertaken by TEDA with financial assistance from Ministry of New and Renewable Energy (MNRE), Govt. of India and Govt. of Tamil Nadu. Technical assistance was provided by the Indian Institute of Tropical Meteorology, Bangalore initially and now by [Centre for Wind Energy Technology \(C-WET\)](#), Chennai. TEDA, set up a total of 69 stations in 16 districts, each covering a radius of 10 km. The study in each station lasted for one to two years with bimonthly data collection after which the stations were dismantled and installed in other places.

Micro survey was also carried out by C-WET to provide reliable data to wind farm developers.

[No. of sites surveyed assessment carried out: 69](#)

[No. of sites identified as potential : 41](#)

[No. of sites under exploitation : 26](#)

[Sites for which micro survey conducted : 27](#)

Sites currently under installation and study : 9

Demonstration Wind Farms

To demonstrate the techno-economic viability of wind power and attract private investments in wind mills, demonstration wind farms were set up for the first time in India at Mullaikadu in Thoothukudi in 1986. This was later extended to 7 other locations in 4 Districts for a total capacity of 19 MW till 1993 with financial assistance from MNRE and Govt. of Tamil Nadu. [\(View Details\)](#). This helped to convince the private investors about the potential for power generation from wind mills and its viability.

Growth of wind farms in Tamil Nadu

The spectacular growth of wind farms in Tamil Nadu is attributable to early efforts of Government to assess wind resource potential, set up demonstration farms and the conducive policies adopted to attract private investment. As a result of combination of various favourable factors, private investments came in a big way, starting with the first wind electric generator of 55 kW capacity in Muppandal in 1990 in the private sector.

The capacity of single wind electric generator which was less than 100 kW initially has gone up gradually to 2.0 MW in 2004.

The total installed capacity has also increased to 4101 MW including 17 MW under demonstration programme as on 31.10.2008. Tamil Nadu continues to maintain # 1 position in the country in wind power with 43% of total installed capacity in India.

[View Details on Growth of wind mills](#)

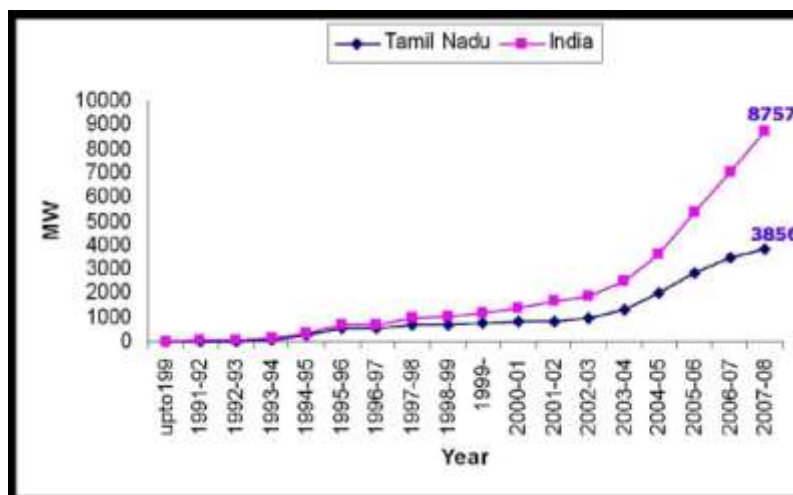
Tamil Nadu and India

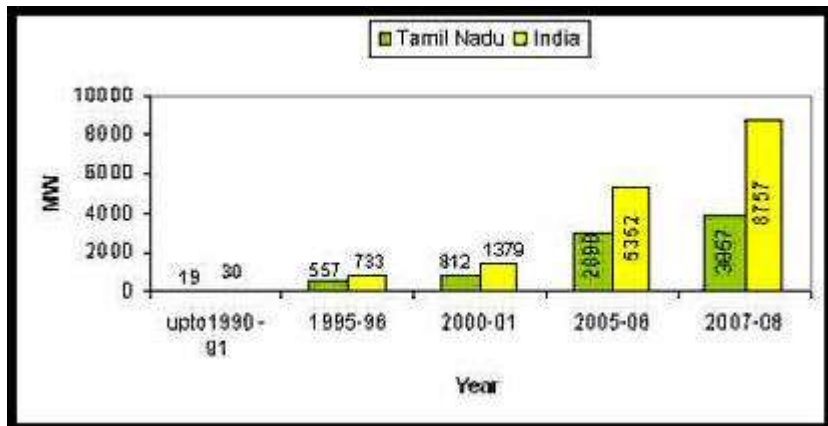
	2007 – 08 (MW)	Cumulative total as on 31.3.2008 (MW)	2008-09 up to October (MW)	Cumulative total as on 30.09.2008 (MW)
India	1663	8757	764	9521
Tamil Nadu	381	3856	243	4099

During 2003 – 04 alone, 371 MW capacity was added, out of total of 613 MW created in the country. The growth during 2004 – 05 is also remarkable with capacity addition of 679 MW. In 2005-06, the addition is 858 MW. During 2006-07, the addition is 577 MW. During 2007-08 the addition is 381 MW. For 2008-09, the addition upto 31.10.2008 is 245 MW.

The private wind farms consist of 7978 wind electric generators (a total capacity of 4084 MW) as on 31.10.2008 apart from 111 Nos. of 17 .555 MW from demonstration wind farms, all of which generated a total of 32312 million units of electricity (cumulative) as on 31.10.2008. The units generated in the year (2007 - 08) is 6092 Million Units and during 2008-09(up to October 2008) is 6538 million units.

GROWTH OF WIND POWER (INDIA & TAMILNADU)





Technologies for harnessing Wind Energy

- i. Wind Electric Generator for power generation
- ii. Wind mills for water pumping
- iii. Small wind power generators (small aero generators)



Efforts taken in Tamil Nadu to promote wind power:

- Carried out extensive wind resource assessment studies.
- Set up demonstration wind farms to establish the techno-economic viability.
- Conducted micro surveys in potential areas to provide detailed information on power generation potential.
- Encouraged commercial wind farms through investor - friendly policies - such as wheeling & banking facilities for captive consumption, etc.
- TNEB developed adequate infrastructure including power evacuation facilities
- Enabled setting up of Centre for Wind Energy Technology (C-WET) in Tamil Nadu
- Facilitated a good manufacturing / servicing facilities in the state.

Economics of Wind Power (Tentative)

Capital Cost	Rs 5 to 6 crores per MW.
Power Generation	30 -35 lakhs kWh / MW / year
Plant Load Factor (PLF) in Tamil Nadu	25 - 30 %
Operation and Maintenance (O&M)	1.5% to 2% of capital cost
Interest on loan	12 % / year (IREDA lending rate)
Annual earnings (tentative)	Captive use : Rs.114 lakhs / MW / year Export : Rs.94 lakhs / MW / year
Tax benefits	<ol style="list-style-type: none"> i. Accelerated depreciation 80% ii. Income Tax holiday for 10 years

Incentives offered for investors

MNRE, Govt. of India

- i. Accelerated depreciation on wind electric generator is permissible upto 80 % for income tax calculations subject to a minimum utilization for 6 months in the year in which deduction is claimed.
- ii. Import of wind electric generator is permitted under Open General License
- iii. Customs duty concessions on wind electric generators and certain essential spares.
- iv. Tax holiday is allowed for 10 years in respect of profits / gains from the private wind electric generators

Govt. of Tamil Nadu

- i. TNEB buys surplus energy at the rate of Rs.2.75 per unit from the existing wind mills commissioned before 15.5.2006 from the date of renegotiation of existing agreement and Rs.2.90 per unit from the wind mills commissioned after 15.5.2006 as per the new Tariff order issued in May 2006 by the Tamil Nadu Electricity Regulatory Commission. These rates have come into effect as per TNEB order dt. 14.9.07
- ii. Concessional wheeling charges are levied at 5 % for captive use of power under which industries can draw the power produced any where in the state at the point of consumption
- iii. Banking facilities are also allowed subject to 5 % charges for using the power anytime of the year up to 31st March of the financial year

Why Tamil Nadu is a favourable destination for investment in wind power?

- i. Conducive and consistent policies of the State Govt. / TNEB such as attractive wheeling and banking facilities on charges of 5 % each
- ii. Favourable terrain in potential locations with easy accessibility
- iii. Higher plant load factor (PLF) of 30 % and therefore higher power generation per MW.
- iv. Reasonable power tariff and regular payment by TNEB
- v. Adequate infrastructure for power evacuation including permission for investors to put up their own sub-stations

Services offered by Manufacturers / Suppliers:

- i. Preparation of project report for availing loan, etc.
- ii. Selection of suitable sites, purchase and registration of land
- iii. Co-ordination and follow up with Govt. and other statutory agencies for necessary clearance
- iv. Assembly, erection and commissioning
- v. Operation & maintenance services under AMC

[View list of Wind Energy Generator manufacturers](#)



Small aero generator (Mini-wind mills)

It is a stand alone type generator which can be used to produce electricity for captive purposes. It can be installed in places where the wind speed is more than 15 kmph. 41 such places have been identified in 8 districts from 67 sites surveyed which are suitable for installing aero generators. In other places too aerogenerators could be installed where wind speed is > 15 kmph.

It consists of smaller capacity wind electric generator, (up to 30 kW) a tower, a battery bank with an inverter and electronic control system.

Working Principle

Wind force makes the blade rotate and produce mechanical energy which in turn drives the wind electric generator to produce AC electricity, converted as DC, stored in a battery and used for electrical applications (DC or AC) whenever required to supplement EB supply or to save on diesel. There is an in-built self protection mechanism to reduce power output in severe weather conditions.

Potential for use

Industries	Lighting & other electrical uses in Office / factory buildings, Guest houses, residential quarters, street lighting etc.
Local bodies/Institutions	Office buildings, guest houses, tourist home, hostels, remote buildings in remote locations, street lighting etc.
Individuals	Farm houses, gardens, campus lights

Economics (Tentative)

- Cost of system - Rs.2.50 - 3.00 lakhs / kW
- MNRE Subsidy available for the system for 2007 - 08 upto 50% of Ex-works cost for individuals and 75% for community users subject to a maximum limit (subject to change)
- Saves around 2500 kWh per kW per annum depending on wind speed and duration.

Eligible categories of beneficiaries

- Community uses such as street lighting
- Direct use by central and State Govt. agencies
- Individuals, Industrial users
- R & D and academic institutions

No. of systems installed

As pilot project, 5 kW capacity systems have been installed in -

- i. Shri Shiridi Saibaba Spiritual and Charitable Trust, Saipuram, Injambakkam, Chennai.
- ii. Vivekananda Kendra, Kanyakumari District.
- iii. SCAD, Gramodyog Institute, Cheranmahadevi, Tirunelveli District.

Manufacturers

- i. Auto Spare Industries, 4, Kalathiswaran Koil St, Pondicherry – 605001
- ii. Auroville Energy Products, Auroshilpam, Centre for Scientific Research, Auroville, Tamilnadu – 605101



Wind Mill Water pump

This device is ideally suited for pumping water for drinking purposes and / or for minor irrigation. It can operate in places where the wind speed is about **18 kmph**. Gear-type wind mills are also

available which can operate at a speed of **9 kmph**.

Types

There are two types – (i) Gear type and (ii) Gearless type.

Description	Gear	Gearless (AV55)
Tower Height (m)	10	13.5 to 19.5
No of blades	18	24
Blade diameter (m)	3.3	5.6
Pipe size (inches)	2 to 4	3 to 5
Wind speed (kmph)	9	18
Water output (lph)	1000	4000
Water depth (m)	20	15

Working Principle

The wind force striking at the blades is converted to mechanical energy which in turn is used for operating a pumping rod, as in the case of hand pump, to pump water from open or bore well.

Potential for use

Industries	:	Drinking water supply, gardening, especially with drip irrigation
Local bodies / Institutions	:	Micro irrigation / drinking water supply, horticulture farms especially with drip irrigation, community parks etc.
Individual	:	Micro irrigation / drinking water , horticulture farms with drip irrigation

Systems installed as on 31.03.08 : Gear Type - 108
Gearless Type - 770

Economics (Tentative)

- Cost of system - Rs.1.50 to 2 lakhs
- MNRE subsidy available for 2007 - 08 Rs.30,000/- per pump for Gear type and Rs.45,000/- per pump for AV55 Type (subject to change)
- Saves around 1500 kWh per annum depending on wind speed and duration.

[Financial Assistance provided by the Central Government for installation of wind energy systems as per the specification of Ministry of New and Renewable Energy \(MNRE\), Government of India.](#)

Manufacturers

- i. Auto Spare Industries, 4, Kalathiswaran Koil St, Pondicherry – 605001
 - ii. Aureka Aspiration, Auroville, Tamil Nadu – 605101
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Tamil Nadu Electricity Board is a pioneer organization among the State Electricity Boards in India in promoting Renewable Energy programmes. The 1st Wind mill with 50 kW capacity was erected by TNEB during the year 1985 and commissioned in January 1986. Subsequently 19.35 MW of demonstration wind farm projects were executed .

- The total installed capacity of Wind power projects in Tamil Nadu is aggregated 4287.74 MW as on 31.03.2009.
- Tamilnadu's contribution is around 60 % of the country's total installed capacity of wind mill power projects.

Table – I

Potential achieved and balance:

The exploitable potential of the three passes are detailed below:

Location	Gross Technical Potential in MW	Exploitable Potential in MW	So far exploited in MW
Aralvoimozhi Pass	1500	1500	1571.725
Sengottah Pass	1000	750	857.035
Palghat Pass	2000	1500	1681.200
TOTAL	4500	3750	4109.96
Rameshwaram Sea shore			6.850
Mullaikadu Sea shore			1.355
Total			4118.165

Procedure for obtaining approval and technical requirements to be complied with.

1) For Registration:

Application should be submitted in 3 sets with the following documents to CE/NCES office.

Proforma to be submitted along with the application for the wind power generation – [Specimen Proforma given.](#)

Proforma Invoice.

Land documents with original for verification and proposed plan of SF.Number, FMB copies.

Village map topo sketch

Self certificate with power curve.

Manufacturer certificate

Authorization letter or Power of Attorney

If the applicant is a firm /company they should furnish Partnership deed/ Memorandum of Association

and articles and list of Board of Directors.

Indemnity bond in Rs.80/- stamp paper ([Specimen given](#))

Undertaking in Rs.80/- stamp paper. ([Specimen given](#))

Purchase order copy for offer and acceptance

Single line diagram

Type approval from C-WET.

Payments at the time of Registration:

Registration fees for 1 no. WEG = Rs.1000/- (Not refundable)

Consultancy charges for 1 No. application irrespective of No. of WEGs = Rs.10,000/- (Not refundable)

Infrastructure development charges = Rs.25.75 Lakhs/MW

(to be refundable if not technically feasible and likely to reviewed)

To remit the above charges, Demand Draft should be taken in favour of Chief Financial Controller/TNEB /Chennai payable at Chennai .

- The validity period of this Registration is six months from the date of original Registration.
- Any request for change in Survey Number will not be permitted . However, to change to any of the nearby location adjacent to the proposed location based on specific field recommendation and valid documents within the validity period of the application is permissible..

Application Name Transfer (Fees : Rs.6000/-) : (Not refundable)

- To change the registered application to any other company of own choice, on production of valid documents on that company's name, on payment of Rs.6000/- (Rupees Six thousand only) per Wind Electric Generator as application name transfer fee stipulated by the Board is permissible.
- The application will be name transferred for the entire survey number notified in the application and part of area included in the application cannot be name transferred.
- Name transfer only once during the validity period is permissible.
- The Date of Registration and the Registration number allotted for the first applicant would be maintained for the developer in whose favour name transfer sought for and the validity period will be for six months, from the date on initial Registration.

All documents are verified at CE/NCES's Office. After payment of necessary charges, assigned a Registration number for that particular application and then sent to concerned field SE/WEDC (i.e.) Tirunelveli (or) Udumalpet for feasibility report and recommendation for grid tie up.

Field feasibility report and recommendation in respect of Feeder load and Substation capacity should be submitted within 6 months from the date of Registration.

Noted for Record Name Transfer (Fees: Rs.1,00,000/-) : (Not refundable)

• If name transfer was not done within six months from the date of initial Registration, Noted for Record letter and Grid tie up approval will be issued to the applicant only after receiving the letter from the applicant about releasing of the application. Thereafter, after paying of Rs.1,00,000/- only, name transfer could be obtained and the WEG should be commissioned within one year from the date of issue of Original "Noted for Record letter" and "Grid tie up" approval.

• For the Name Transfer by paying Re.1.0 lakh after six month period also, the developer/client should submit 3 sets of application for which issue of required approval will be considered by the Chief Engineer/NCES.

Option available:

- 1) Sale to Board : Should be mentioned in the application.
- 2) Wheeling : Wheeling and surplus energy sale to Board

Wheeling & Surplus energy banking. For proof, attested copy of present H.T. Bill under tariff I/I should be produced. If bill is in the name of group concern, necessary attested copy of ROC of both wheeling owning end and wheeling availing end should be produced.

Metering Arrangements:

Electronic trivector meter with TOD provision will be provided for measurement in slot wise manner so that adjustment, if opted, could be considered accordingly.

Miscellaneous:

- If the average Power Factor of the export meter is below 0.9 penal levy will be made in the bill amount as prescribed in Tariff notification of H.T.Services (vide letter No:4020/A1/98-3, dt.22-5-98 and letter No:6551/A1/98-3, dt.25-8-98).
- Individual Energy Purchase Agreement shall be executed with TNEB for purchase of power by TNEB. The Energy Purchase Agreement will be for a period of 15 years or the expected useful life period of the plant which ever is less. The EPA is under finalization and the specimen EPA will be made available shortly.
- All metering arrangements and protection system will be tested annually by TNEB and defect if any will be set right on cost basis. The cost of annual testing of the metering and protection system, to be charged to the consumer at stipulated rate.

TARIFF :

(A) TNEB was the earlier paying a tariff of Rs.2.25 per unit for the wind energy, for the year 1995-96 with 5% annual increase for a period of 5 years, based on the guidelines issued by M.N.E.S. While reviewing the same during the year 2000, the above energy rate was pegged at Rs.2.70 per unit for a period of 5 years without any escalation. This was done based on the fact that there is no significant variation in the variable cost of the tariff and part of the capital cost might have been realised.

(B) Wind Energy is allowed to be wheeled to their own / subsidiary industrial concern by paying 5% of the energy so wheeled in kind. The company can opt for the wheeling of wind energy to a maximum of 2 Nos. H.T. Services coming under the same Distribution Circle.

However, the above issues including other facilities to be extended is under review by the Tamil Nadu Electricity Regulatory Commission (TNERC) and hence policies with regard to the energy price, wheeling, deemed demand etc. indicated above are subject to review / modification by TNEB in consultation with the TNERC and the Govt. of Tamil Nadu.

POWER EVACUATION FACILITIES :

Normally, an wind electric generator are interfaced at 11 KV, 22 KV, 33 KV level, depending upon the voltage level of the network available in that area. The wind mill promoting companies is permitted to carryout the above work with materials specified by TNEB after paying a 11% charges on DCW basis.

However, the above power has to be despatched to the load centre by means of 110 KV and 230 KV lines only by creating suitable E.H.T. network. To create such facilities the TNEB is collecting Infrastructure Development Charges (IDC) at Rs.25.75 Lakhs per MW. In order to, cope with the development pace of the wind energy sector, TNEB is now permitting private WEG manufacturers / promoters to create the required infrastructure facilities and the expenditure incurred is either adjusted against the IDC to be paid or reimbursed after completion of the works.

Erection and Commissioning of WEG in the field:

- Private developer erect WEG and H.T. link line and get safety certificate from CEIG. 11% of the estimated cost to be paid to TNEB and ISI materials alone shall be used for line and other works.
- O & M and Other charges should be collected based on respective power transformer and Sub-Station on which the WEG to be connected
- Issue of 2nd notice by concerned Superintending Engineer/Wind Energy Development Circle
- Concerned Superintending Engineer/EDC executed EPA (Energy Purchase Agreement) with the developers (Based on Wind Mill location)
- Concerned Superintending Engineer/EDC & MRT effect the supply
- On successful commissioning of Wind Farm, H.T.Service Connection Number will be assigned by concerned SE/EDC.

For other details specifically required, kindly contact O/o CE/NCES, IInd floor, Eastern Wing, 800 Anna Salai, Chennai – 2 with prior appointment obtained by calling Phone No.28520167.