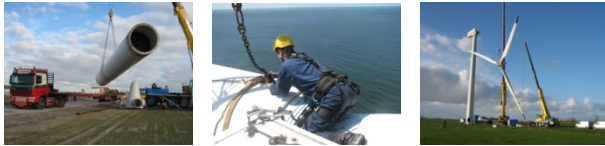




Wind Measurement

"We believe Wind energy has the future. Not only for a sustainable environment but especially as a positive message to people all over the world."

Wind Turbine Service is a leading independent Management, Installation, Operations and Maintenance organization based in The Netherlands (Europe). Our experience (which goes back to the early 90s), methods, techniques and high motivation is our daily drive that make us a reliable and attractive business partner.



Wind energy is a highly specialized part within the Energy section. It requires knowledge and experience to build and maintain a wind farm. Wind Turbine Service has these skills and experiences on the upmost level. To prove that we are highly specialized and work with the latest techniques and safety methods we are certified by TÜV on ISO 9001 and VCA**.



How to assess wind resource?

Typically, wind is measured at a height of at least 60 m nowadays for a year or more. Equipment designed specifically for wind power is used — weather stations are not sufficient.

Anemometers on a tower: Meteorological towers, or “met towers” are the most common and cost effective method. The height of the met tower depends on the topography and nearby trees.

Wind Maps: computer models can be used to predict annual average wind speed and maps created by these programs are useful as a screening tool for potential wind power sites.



Why assess wind resource?

The amount of power in the wind is very dependent on the speed of the wind. Because the power in the wind is proportional to the cube of the wind speed, small differences in the wind speed make a big difference in the power you can make from it. A 10% difference in speed makes about a 33% change in power.

This gives rise to the primary reason for wind resource assessment. In order to more accurately predict the potential benefits of a wind power installation, wind speeds and other characteristics of a site's wind regime must be accurately understood.

There are also important technical reasons for studying a site's wind characteristics. Wind speeds, wind shear, turbulence and gust intensity all need to be specified when procuring a wind turbine, designing its foundation, etc.



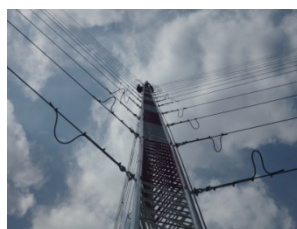
However, these maps do not eliminate the need for more precise and thorough wind data collection.



In the same place as the wind turbine?

Ideally, wind is measured at the exact spot and hub height of the proposed wind turbine. Realistically, this precision is not usually possible. First, wind is measured at a different height, because most turbine towers are taller than standard met towers.

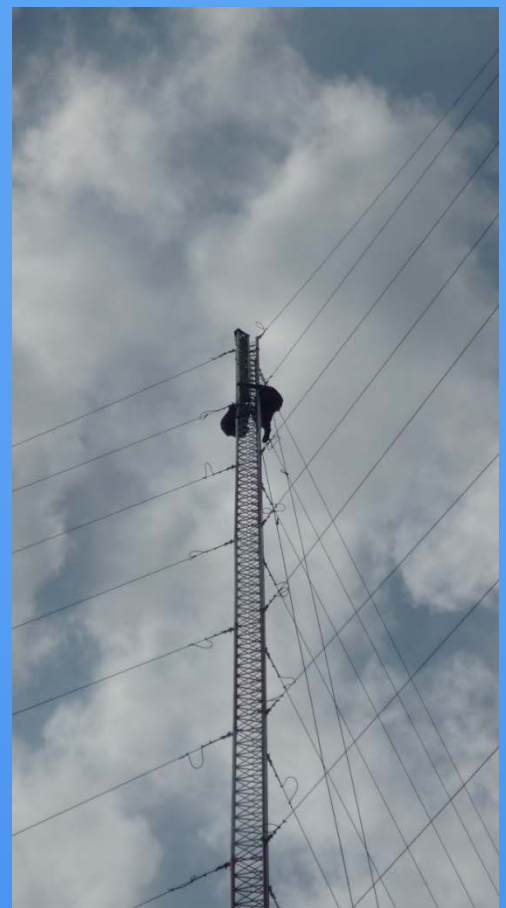
Second, met towers have different site requirements than turbines, so they may not be able to fit in the same area. In practice, the data will need some amount of extrapolation. If sufficient data are available, computer models that consider terrain can be used to extrapolate wind speeds measured at the met tower in one place, to a nearby turbine location.



Met towers & anemometry

Towers:

The most common equipment is a 60, 80 or 100-meter met tower supported by guy wires. This type of tower is a temporary structure. No foundation is required. In some cases, anemometers can be mounted on existing cell phone towers, although this is not necessarily easy; the instruments must be mounted on long enough booms to minimize "tower shadow" effects, i.e. disturbances in the wind caused by the obstruction. Depending on the cell tower type, a sensor might need to be as far away as 7 times the tower diameter to maintain an error of under 1%. This may result in long and heavy booms.



Your own Wind Farm?

Count on us...

Wind Turbine Service possesses many years of experience and a huge cooperation network within the wind energy business. We stay in contact with suppliers and manufacturers for wind turbines all over the world.

There are many reasons why you would or should invest, develop and operate a wind farm. In many cases the most important reasons are probably because you want to have a profitable investment, create a better world, use your land for good purposes etc.

We gained lots of experience in Project management, wind measurement, feasibility studies, building and maintaining wind turbines around the world.

Therefore you've found just the right company to build and maintain your wind turbine throughout a long period of time and at good rates/terms.



Instruments:

A cup anemometer & a direction vane designed for wind power applications. The turning speed of the anemometer indicates the wind speed, and the direction of the vane indicates wind direction.



Data Logger:

The instruments send low-voltage electrical signals to a data recorder at the base of the tower, where various averages can be set to record the speeds and direction in memory. It is possible to equip the logger with internal cell phones that can send the data back to a computer modem; in all cases, there is a data-card insite to be sure that the data is being logged and can be swapped out and brought back the office to collect the data.

Siting a met tower

Ideally, wind is measured for at least a year at the proposed site of the wind turbine, using a met tower. Met towers have different site requirements than do wind turbines, and occasionally the met tower is not put in the same place as the proposed wind turbine site. The typical 60, 80 and 100-meter met towers are temporary and transportable. A tower consists of a small base plate that sits on the ground. The tower is supported by guy wires which are held by anchors into the ground. The land must be cleared of trees and shrubs. There must not be any electrical or telephone wires within a distance of 1.5 times the tower height. Minimum clearing required is given in the following table.

Tower Height	Minimum D (Guy diameter)	Minimum L (Space to lay the tower down)
60 meter	100 meter	62 meter
80 meter	150 meter	82 meter
100 meter	200 meter	102 meter

More clear space is preferable. Some towns require building permits or zoning variances for temporary towers, while others do not.

Wind Turbine Service

To request more information on Wind Measurement, Feasibility Studies Developing, Building and Maintaining your wind turbine and/or wind farm please contact our organization by e-mail

info@windturbineservice.eu

or call our office

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Strada Dezrobirii 114

900280 Constanta

Romania

Soon be opening

Wind Turbine Service EMEA

In Turkey

www.windturbineservice.eu



specification for complete wind measurement

Prices on request

pos.1 Hardware (control)

- Interface module (multiboard)
- Solar Panel 50 W
- Waterproof housing IP54
- Solar Charge Controller
- GPRS Modem
- Overvoltage detection (8 channel)
- Battery enclosure
- Sensor cable per meter € 2,25

pos.2 Software / License's *

- Subscription website (annually)

pos.3 Measuring sensors

- Humidity / Temperature (inc shielding)
- Anemometer professionally
- Air pressure sensor
- Wind vane Professional
- Mounting Bracket top
- Mounting Bracket anemometer

pos.4 Calibrations

- Calibration Anemometer (1 year validity)
- Calibration Wind vane (1 year validity)
- *** option change humidity, temperature (about 3 years)
- ***option Calibration Measnet Anemometer (1 year validity)

pos.5 Installation

- Installation Measuring sensors
- Installation Interface measurement unit (location Holland)
- Installation on site based on costing
- Site Acceptance test

pos.6 Service

Based on costing

Pos. 7 Telescope mast

60 Meter telescopic mast consisting of aluminum tubes.

The mast is guyed on 5 heights

The mast consist of :

11 aluminum tubes up to 6 meter from Ø200 to Ø50mm.

1 bottom frame with hinge and 4 earth pins.

4 ground screw anchors for the attachment of the Guys (cables).

4 steel cable drums in a shaft for construction.

20 guys including tensioners and accessories

Hoist for extension of the mast.

(can be used for more than one mast)

SWR tractor for hoisting the mast

Pos. 8 Reporting

One comprehensive measurement report

Online monitoring (available from start)

Pos. 9 Transport

Prices are valid in 2011

** on costing, calculation afterwards

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