

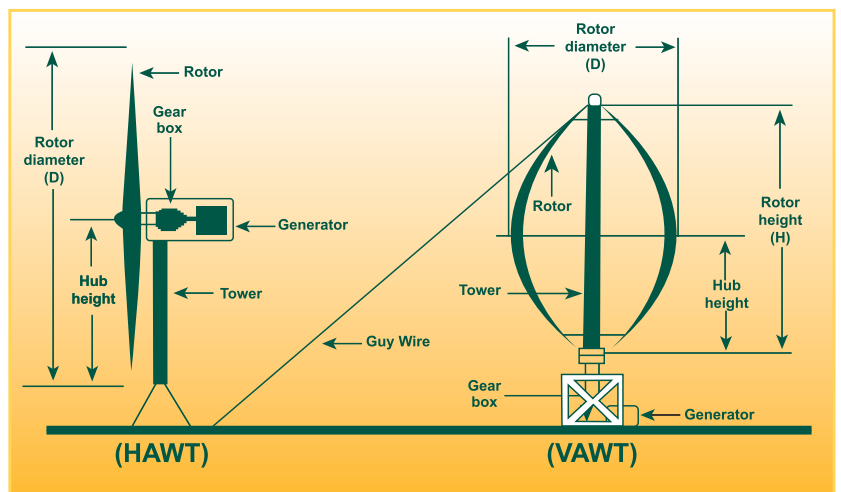
Wind Energy



Application: Electricity

Wind turbines harness wind energy by turning aerodynamic rotors which generates electricity. There are two basictypes: Horizontal (HAWT) and Vertical (VAWT) Axis Wind Turbines.

HAWT are the more common windmill type. VAWT are the anemometer type used for micro generation because they are smaller and do not need to orientate towards the wind. However, VAWT need an initial electricity input to get them going, although lower torque models have now been developed. www.wind-eco.com



Eg medium sized turbine (E Midlands) owner using electricity with surplus exported to grid:

Capacity:	11 kW
Mast Height:	18.3m
Rotor Diameter:	13m
Average wind Speed:	5.4m/sec
Annual Production: 24,090 kWh @ Generation tariff of £0.23 kWh =	£5,541 pa
Export of surplus: 8,430 kWh @ Export tariff of £0.05 kWh = See <i>paragraph on Tariffs</i>	£422pa
Own consumption: 15,660 kWh @ Buy-in tariff of £0.12 kWh =	£1,879pa
Operating costs:	£740pa
Capital cost:	£50,000
Payback:	~ 8 years without funding

It is essential for efficient operation that wind turbines are sited away from wind breaks such as buildings and trees. Even single storey buildings will disturb the air flow over an 18m turbine. For average local windspeeds visit:

<http://www.renew-reuse-recycle.com/noabl.pl?n=503>

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Correctly sited wind turbines produce no adverse emissions, can neutralise their own carbon cost in the first year and pay for themselves in less than half of their 20 year design life. Most small wind systems are connected to the national grid. Surplus energy is exported, and if required, additional energy is imported seamlessly.

Planning permission will be required for most wind turbines which may include a bat survey. Most turbine suppliers can carry out this requirement.

Grid connection costs can vary hugely from a few thousand pounds to over £70,000 depending on suppliers and negotiations. Likewise an 11 kVA substation can cost from £11,000 – 50,000! Therefore, best to install a turbine that can use the existing farm connection.



Comparison of different wind turbines and associated infrastructure:

Data included from <http://www.icerenewables.com/content/view/13/34>:

Relative rotor diameter (m)	Rated output (kw)	Estimated capital cost	Grid connection requirements	Cable trenching	Cabling & jointing
11	10	£40,000	Existing single phase may be sufficient	n/a	n/a
13	11	£50,000			
14	15	£57,000			
19	50	£150,000	Three phase connection required	£20 per metre	£15 per metre
30	100	£325,000			
32	275	£470,000			
70	750	£755,000	11kVA substations required	£95 per metre across a highway	£25 per metre
80	900	£1,405,500			
120	2000	£2,106,800	(33kVA for 2MW)		

Financial support

Currently Renewable Obligation Certificates are issued to accredited generators of renewable energy for each Mega Watt hour (MWh) produced. These are purchased by electricity suppliers to supplement their obligation to source renewable energy. The current rate works out at £0.045 for every Kilo Watt hour (kWh) of electricity produced from renewable technology.

Alternatively, technologies below 5MW will qualify for 'Feed In Tariffs' from April 2010. These will be paid for total electricity produced (Generation tariff) plus a supplement for electricity actually fed into the grid (Export tariff). In addition, money will be saved by not buying-in electricity off the grid.

Tariffs The tariffs used in the costings on page 1 are taken from the table below:

Technology	Scale	Generation tariff (p/kWh)	Export tariff (p/kWh)	Buy-in tariff (p/kWh)
Wind	1.5–15kW	23	5	12
Wind	15–50kW	20.5	5	12
Wind	50–250kW	18	5	12
Wind	250–500kW	16	5	12
Wind	500kW–5MW	4.5	5	12

Grant funding

The Rural Development Programme funds larger renewable energy projects via the Regional Development Agencies:

<http://www.defra.gov.uk/rural/rdpe/rda.htm>

Funding may also be available from the next round of the Bio Energy Capital Grants Scheme:

<http://www.bioenergycapitalgrants.org.uk>

Micro generation may be funded via the Low Carbon Buildings Programme: www.lowcarbonbuildings.org.uk

Grant funding may forfeit support from tariffs, so check with the funding body before accepting a grant.

Tax relief

The Enhanced Capital Allowances scheme provides 100% first year tax relief on capital expended on many renewable technologies:

<http://www.carbontrust.co.uk/energy/takingaction/eca.htm>