GOOD PRACTICES IN SME

Small-scale wind power

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What are small-scale wind power installations used for?

Small-scale wind power installations use the wind's kinetic energy to generate electric power. The wind's kinetic energy is transformed into mechanical energy by the rotor, which powers an electric generator either directly (direct drive turbine) or a shaft and a gearbox.

Wind turbines can have a vertical or horizontal rotation axis. Vertical axis turbines do not need a wind tracking mechanism, are quieter, and more resistant to strong winds.

Many different turbine and blade constructions are currently in development to achieve better aerodynamics of the turbine.

*Pic. 1 ekolhouse: three blade **horizontal** axis wind turbine*

*Pic. 1 Magnus Larsen: **horizontal** wind turbine withe a diffuser*

*Pic. 3 instsani: **horizontal** wind turbine with multiple blades*

*Pic. 4 Home Energy: Wind ball **horizontal** wind turbine*

*Pic. 3 instsani: Darrieus **vertical** wind turbine*

*Pic. 2 tecnobloc: Savonius **vertical** wind turbine*

*Pic. 4 wikipedia: Darrieus H-rotor **vertical** wind turbine*

*Pic. 5 instsani: screw **vertical** wind turbine*

*Pic. 6 instsani: Helix Wind screw **vertical** wind turbine*

*Pic. 7 instsani: Darrieus helix-type **vertical** wind turbine*

*Pic. 8 instsani: drum **vertical** wind turbine*

Are wind power installations cost-effective?

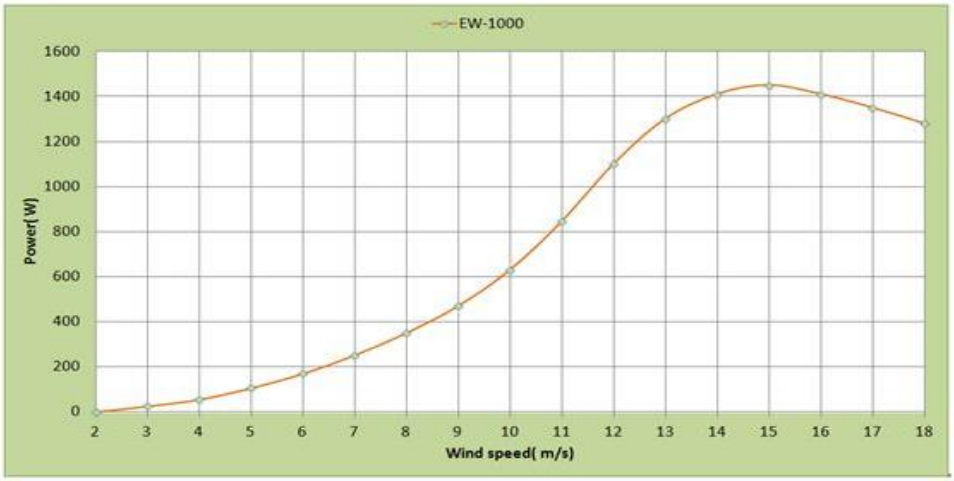
The cost of a 1 kW small-scale turbine along with the controller and inverter is around 10 000 PLN. In the case of a 3 kW turbine the cost will be 20 000 PLN. The return of investment will be comparable to investments in photovoltaics; however, it is much more dependent on the weather conditions at the installation site. In Poland wind conditions are much more variable than solar conditions, meaning the potential for wind power use must be investigated for each site.

The amount of electricity produced by the wind turbine depends on wind speed (cubically). To generate electricity a minimal wind speed must be reached – in the case of smaller turbines about 2 m/s, for larger turbines – 3,5 m/s. Moreover, turbines are equipped with precautions against high speed winds which could cause damage the installation

A small-scale wind turbine could be a good complement for photovoltaic panels. Panels produce more energy in the summer when Poland experiences many more sunny days than in winter. In turn, during winter, wind achieves higher speeds in the winter, which increases the production of the wind power installation.

Example for a small-scale wind power investment

An installation consists of 3 turbines, 1 kW each, with a total cost of 16 000 PLN. The relationship between turbine power and wind speed is shown below. The average wind speed at the site's location is 5 m/s. The graph shows that each turbine produces 100 W of electricity. The average price of electricity is 0,55 PLN/kWh.



Electricity produced annually: $3 \cdot 100\ W \cdot 8760\ h = 2\ 628\ kWh$

Average annual savings: $2\ 628\ kWh \cdot 0{,}55 \frac{PLN}{kWh} = 1\ 445{,}50$ zł

Simple payback time: $SPBT = \frac{16\ 000\ PLN}{1\ 445{,}50\ PLN/year} = 11\ years$

Source: KAPE