Wind turbine in house

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Going back to as early as 5,000 BC, people have been using wind energy to propel boats along rivers and using windmills to grind grain. If you think about it, small-scale wind energy is super retro, just not in the way that great grandpa might remember. But how are we using wind energy now? Let’s blow through the basics, but hold on tight, you’re in for a whirlwind.

Imagine you zapped one of those giant turbines along the highway with a shrink ray. That’s essentially a domestic wind turbine. Domestic wind turbines are just small turbines that can be used to generate energy for an independent household, providing energy for appliances, air conditioners, heaters, and general lighting. Revolutionary, isn’t it?

Wind turbines are powered by wind turning the blades that power a rotor. When the rotor gains power, it spins a small generator, producing energy like any other generator. Something interesting to think about however is that wind is really a different form of solar power! Wind is caused by the sun unevenly heating our atmosphere and meeting irregularities on Earth’s surface mixed with the Earth’s rotation.

Wind can absolutely be used to power a home. Most residential wind turbines are used as supplemental power sources to lower a house’s dependency on the energy grid and lower energy bills. Wind as a residential power source is often combined with other renewable energy sources to make up the whole energy profile, namely solar. This combination works well because solar and wind are both intermittent energy sources meaning they don’t provide consistent amounts of energy 24 hours a day.

Energy storage is also an option. Batteries can be used to store wind-generated energy and have high levels of charging efficiency. Similarly, wind turbines can use excess power to compress air. The air is stored in tanks and when required, the stored air can be used to spin the turbine to create more energy. Energy storage can be expensive but offers a great solution to using renewable sources with intermittency.

No matter which style of wind turbine you’re planning to install, you may need a tower for it to sit on. Towers raise the turbine above the air turbulence level and the higher the tower, the more energy it can produce. There are two types of towers: self-supporting/free-standing towers and guyed towers.

A guyed tower is less expensive but more complicated, it consists of lattice sections, pipe or tubing, supporting guy wires, and a foundation. However, the guy used in the guyed tower must have a radius equaling ½ to ¾ of the tower height, so they need a bit of space. A tilt-down or self-supporting tower is more expensive. They are smaller and lightweight and can be lowered during storms and other hazardous conditions.

Horizontal axis turbines are the most common style of small-scale wind turbines. They have 2 to 3 blades

usually made of fiberglass that oscillate upwards. Although horizontal axis turbines are typically heavier, they are better engineered for higher energy generation. The amount of energy generated is determined by the diameter of the turbine"s rotor.

Although a vertical axis turbine is one of the main styles of turbine, it by itself has 2 different types: Savonius and Darrieus. A Savonius turbine has a recognizable “S” shape when looked down at from above and Darrieus turbines look like a whisk beater. Vertical axis turbines use an axis that is perpendicular to the ground and is designed to capture wind blowing at all angles.

The size of turbine you need is based on what you want to use it for. Small turbines usually range from 20 watts to 100 kilowatts of energy produced, for reference, 20 to 500-watt turbines are used as charging batteries for recreational vehicles, and some sailboats are equipped with turbines that produce 1 to 10 kilowatts, used to pump water.

The price of a typical residential turbine varies depending on how much power they’re producing. Roughly, they range anywhere from $4,000 to $8,000 per kilowatt. A wind turbine system that could offset most of the average household’s energy use would cost close to $50,000. So, not cheap!

Luckily, small residential turbines have lots of incentives and tax credits that can help take that price down, some incentives can cut the taxes on wind power by as much as 30%.

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