



Cost of residential wind turbine

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From manufacturing, transportation, installation, maintenance, and financing, how much do wind turbines really cost? Are they even worth considering if you're a green homeowner hoping to switch to renewable energy? Find out all the answers and more here.

As Londoners experienced Storm Eunice in February 2022 and Coloradoans discovered with the Marshall Fire in December 2021, wind energy is powerful. Gusts of 120+ mph can pack a serious punch. Wouldn't it be great if humans could properly channel wind as a carbon-free energy source?

Like many clean energy advocates, world leaders are recognizing the huge potential of wind turbines to generate renewable energy. United States President Joe Biden, for example, is accelerating offshore wind leases all over the country.

Market analysis for 2022-2027 by Mordor Intelligence forecasts that the wind turbine industry will experience a compound annual growth rate (CAGR) of more than 10%, which is considered quite good.

Over the last few decades, wind energy on both utility scale and residential levels have become more popular. Along with their increased prevalence comes lowered costs of wind turbines and increased government incentives to go green with wind.

In this article, you'll discover how much wind turbines cost today. You'll also find an analysis of the costs and benefits in terms of energy savings from a wind turbine.

The schema below shows the relationships between wind turbine costs and benefits, and how the levelized cost of energy (LCOE) -- as the bottom line or metric in an economic evaluation of wind energy -- is determined.

Given the sheer size of wind turbines, literally tons of materials -- including steel, fiberglass, iron, copper, aluminum, and plastic -- are required to construct the major components of a wind turbine.

Additionally, anchoring the turbines during installation in a location to withstand high wind gusts and sometimes ocean waves is an expensive project in itself. Installation is part of a balance of system cost -- along with electrical infrastructure and assembly -- noted in the table and graph below.

Lastly, the cost of a wind turbine must include insurance and construction financing, together referred to as financial costs in the following graphics.

The tables and graphs below list estimated costs for different wind turbine systems as determined by the



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National Renewable Energy Laboratory (NREL) using 2019 data. Values may fluctuate over time especially as steel markets are volatile.

The values are based on typical wind turbines in use today. On the other hand, newer wind turbine technologies, such as carbon fiber, are more expensive. Engineering designs that eliminate the need for certain turbine components -- such as a transition piece -- tend to drive down costs.

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