Repowering a turbine means replacing existing technology with newer technology

The most common decision when a wind turbine reaches the end of its life is to repower it. This means upgrading existing components of the turbine with more powerful, modern parts. It can also mean making changes to the wind turbine’s foundation, tower, and blades. As wind technology has advanced, existing machines may be replaced with more efficient units that are able to reliably produce more electricity. In addition to increased electricity generation, modern turbines run more slowly and quietly.¹

Wind turbines today are 50 times more powerful than 20 years ago.²

Repowering means more efficient, profitable turbines

Thirty years ago, many wind turbines were small, 50 kWh machines. Today’s taller turbines have a wider rotor diameter so they can capture the steadier and stronger winds that blow higher in the atmosphere. Longer blades also increase the capacity factor, which means the turbine can generate more electricity, even at lower wind speeds.³ This increases the value of a wind project, and sometimes the number of turbines can be reduced.

As technology has advanced, wind turbines have grown taller. A larger swept area allows turbines to generate more electricity more often.

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Why Repower a Project?
Not every wind project has an economic case to be repowered. Many factors must be considered and add up to make repowering financially viable. First, developers determine the economics of operating the site as-is in the present and future and compare it to the cost of repowering. They evaluate changing the hub heights, replacing turbine components, and the layout the wind farm itself. To offset the costs associated with upgrading the turbines, developers may resell existing turbine components to international markets. Finally, developers must perform a study with the electric grid operator to make sure the grid can accommodate more energy coming from the wind project.

Repowering Saves Money for Electric Utilities and Ratepayers
Wind energy is already a least-cost source of new electricity generation in much of the U.S. Repowering a wind project can make the cost of wind energy even cheaper. If a project owner chooses to repower a wind project, the electric utility who purchases the power often negotiates a new or updated agreement with a lower rate. This benefits the owner, the electric utilities, and the ratepayers.

Decommissioning
A wind project is decommissioned at the end of its life if it is not repowered. This means the turbine and foundation are removed and the land restored to its original state. The wind project owner is bound by law and financial incentives to responsibly oversee the decommissioning process, even in the event a company goes bankrupt. Local governments and landowners are not responsible for this process. Often, the wind project owner can recycle the turbine materials, which can recoup up to 80% of decommissioning’s cost. In this way, it is in the project owner’s best interest to oversee the process and ensures a positive outcome for everyone. To date, only 21 utility-scale wind turbines have been decommissioned in the Midwest over the past 20 years.

Leeward Renewable Energy recently repowered the 52 MW Mendota Hills wind project in Illinois. Their financial models indicated that repowering would provide a 30%-50% reduced cost per MW/h, and those savings are passed on to the electric utility and their customers.

“The benefit of [repowering] will flow through to our customers,” said Leeward CEO Greg Wolf.

Fun Facts
Almost every component in a wind turbine can be recycled or resold, including the foundation, tower, generator, and components of the gearbox.

California hosts some of the first wind projects built in the U.S., and the state has already repowered over 1,500 turbines.

15 U.S. wind projects were repowered in 2017, totaling 2,136 MW. Put in perspective, the U.S. added a total of 7,000 MW of new wind power capacity in 2017.

The capacity factor for a wind project, the amount of energy it provides over a period of time, increases from 30% to 40% or 50% after repowering. The typical coal plant has a capacity of 54%.