

Sustainable Energy: Recycling Renewables

Just as sustainability is at the heart of our industry, circular-economy principles are central to the Canadian Renewable Energy Association (CanREA). This series of factsheets on Recycling and Renewables examines the current recycling options for wind energy, solar energy and energy-storage technologies in Canada, and points the way for the future.



Recycling wind-turbine components in Canada

Recycling and renewables go hand in hand. But what happens to renewable-energy components when they reach the end of their life span? This CanREA fact sheet examines the current recycling options for wind turbine components in Canada, and points to the best way forward.

Canada's wind energy fleet

Canada's first, commercial scale wind turbines came online in the 1990s. Since then, our fleet has grown to over 6,800 wind turbines.

To date, there have been very few decommissioned or repowered wind and solar sites in Canada. Thanks to quality technologies and good maintenance practices, many of our older wind energy sites will remain operational well into the 2030s, while our newer sites will enjoy even longer life spans.

Canada's supply of decommissioned wind turbines will remain low for years to come, but we aim to be ready when these reverse-supply chains are needed.

CanREA works with its members to develop a responsible approach to operations, one that holds true to sustainability and safety principles at all stages of the life cycle.

Giving a site new life

At some point in the future, all Canadian wind energy sites will be due for a refresh. Turbines can be upgraded by replacing old components, such as wind turbine blades, generators and inverters, with more efficient or innovative equipment.

A site can also be given new life by decommissioning and returning the land to its original state.

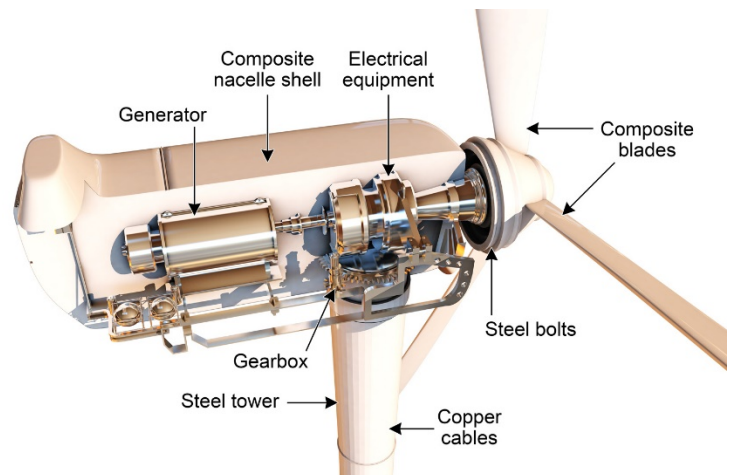
In both cases, the process involves extracting the recyclable materials, like steel, concrete and copper, and properly disposing of any other components in compliance with local requirements.

Turbines are 85-90% recyclable

Approximately 85 to 90 percent of a wind turbine's total mass can be reused or recycled.

In fact, many parts retain a high value at the end of the wind turbine's life. Components like steel towers, copper cables and electrical equipment can be disassembled and recycled.

Examples of materials for recycling in wind turbines



Separating the fibers, epoxy, and other functional components used in the blades is not always an option, but there are several sustainable, end-of-life repurposing strategies for wind turbine blades made of composite materials.

There is not much demand for recycled fiberglass, given that the raw materials are so inexpensive, nor is there much supply, as most wind turbine blades have not yet reached their end of primary use in Canada.

But various recycling methods do exist currently, such as grinding pieces down to various sizes for use as filler material in construction materials. And in some cases, wind turbine blades have been re-used for a variety of structures such as car ports, pedestrian bridges and play structures.

Canadian ingenuity

Even with a low volume of wind turbine blades to recycle, Canadian solution-providers are seeing the opportunity to provide services to the industry.

Canadian entrepreneurs and researchers are also developing new ideas for blade construction, to make the recycling process easier after decommissioning. Interest is so high that Vestas, one of the world's leading wind turbine manufacturers, initiated the "Turbine Blade Circular Economy Challenge" in 2020, to challenge innovation here at home.

Think globally

With its older fleet of wind turbines, the European wind energy market is paving the way for the recycling and reuse of wind-turbine blades.

Canada can look to [WindEurope](#) for useful information on "Accelerating Wind Turbine Blade Circularity," and to the [European Technology and Innovation Platform for Wind Energy](#) for research on the various methods already available for wind turbine blade recycling in support of a circular economy, such as gasification, solvolysis, high voltage pulse fragmentation, pyrolysis, mechanical grinding and co-processing.

In the U.S., much progress is being made in the recycling of blades at scale in order to process a sudden influx of old blades that were replaced by newer models when incentives pushed many wind-farm operators to upgrade.

At the same time, service providers such as [Global Fiberglass Solutions](#) are offering to sustainably dispose of damaged and decommissioned wind turbine blades, while [General Electric](#) has announced it will work with [Veolia](#) to recycle blades into a shredded material to make "greener cement."

Next steps

In Canada today, end-use electricity consumers, as well as manufacturing facilities with strong Environmental, Social, and Governance (ESG) goals, are fueling new interest in working with CanREA to eliminate carbon emissions and improve sustainability throughout the supply chain.

As Canada's fleet of wind energy grows, CanREA members are examining new ways to innovate and close the circular economy loop. From the sourcing of raw materials to the final disposal and reuse of components, the opportunities to push further into sustainability over the full life cycle of our technologies continue to expand.

For more information

Learn more about recycling and renewables in the "Life Cycle" section of the CanREA website: [Repowering and Decommissioning](#).

