

How does wind energy work?

- Each wind turbine consists of multiple blades that convert energy from the wind into rotational energy that generates electricity.
- The rotating blades drive a generator that produces electricity, which can be stored or used by the community.
- Wind turbines can account for different wind directions and speeds by automatically changing the angle of the individual blades.

Windmills have been around for centuries — and today's wind farms tap into that same renewable energy source to generate electricity. Wind energy is abundant in many Northern and remote parts of Canada, offering one of the most cost-effective sources of energy without the need for fuel shipments. Wind turbines can be installed on land or offshore, and do not produce any carbon emissions while in use.

Cost of wind energy^{1,2}:
(onshore wind)

\$\$\$

Wind energy

Transforming power in Northern and remote communities

Wind blows past turbines, rotating their blades.

The kinetic energy is transformed into mechanical energy.

A gearbox spins a generator to produce electricity.

Transformer converts electricity to appropriate voltage.

Electricity can then be stored or transported to grid for distribution.

What this technology can bring to your community

- Once the turbines are installed, wind farms can run for 20 years or longer and have low operating and maintenance costs, making wind the most affordable renewable energy sources available.
- Wind energy creates local jobs for skilled tradespeople.
- Wind energy production peaks during winter, matching the higher energy demand of communities during the coldest months.
- Once installed and operational, wind farms produce cost-competitive electricity without any greenhouse gas emissions.
- Wind farms can complement your existing diesel power-generation systems, reducing how much diesel fuel needs to be purchased and used.
- Wind turbines can be combined with other renewable energy technologies (e.g., solar, hydrokinetic), creating efficient and reliable hybrid microgrids.

Key considerations when implementing this technology

- In cold climates, ice build-up on the turbines affects energy production and adds to the maintenance costs. Fortunately, solutions to prevent and address ice build-up are available.
- Wind farms are large construction projects, often involving lifting equipment such as cranes. They should be designed to meet both your current and future energy needs.
- Wind farms need to be located at a safe distance from communities and airports due to their height and the potential risk of ice falling from the turbine blades.
- Wind farms may have a negative impact on local wildlife. Assessments must be done beforehand to identify and minimize these impacts.
- An energy storage system, like a battery bank, is needed to store and provide energy when wind speeds are low.
- Transporting large turbine parts can be challenging, therefore some remote communities may be limited to smaller turbines.

The bottom line Wind farms offer a dependable, affordable, and environmentally friendly source of energy for Northern and remote communities, contributing to local employment while decreasing their use of fossil fuels like diesel.

Want to learn more?

For more information, please send us an email:
oordremoteenergy-energieadistancebrde@nrcan-rncan.gc.ca

¹ The levelized cost of electricity (LCOE) measures the lifetime costs of running an energy source divided by how much energy it produces over that span (typically in megawatt-hours).

² Estimated range of LCOE for onshore wind in Canada (\$70–\$310/MWh) according to the Canadian Energy Regulator, (2022). Canada's Adoption of Renewable Power Sources – Energy Market Analysis. <https://www.cer-rec.gc.ca/en/data-analysis/energy-commodities/electricity/report/archive/2017-canadian-adoption-renewable-power/canadas-adoption-renewable-power-sources-energy-market-analysis-costs-trade-offs.html>. Additional costs may apply depending on location.



Natural Resources
Canada

Ressources naturelles
Canada

CanmetENERGY
Leadership in ecoInnovation

Canada