

Wind power at Diavik

Constructed in 2012, Diavik Diamond Mine's four 2.3 megawatt (MW) wind turbines have been generating power at the mine site for over a decade. The project is the world's most Northern large-scale wind-diesel hybrid power facility and the first large-scale wind farm in Canada's territories.

The turbines reduce Diavik's reliance on diesel fuel, lower its carbon emissions, and set a new standard for delivering wind power in extreme cold climates. The turbines are notable for their innovative blade heating technology, which allows them to operate in temperatures as low as -40 C.

The total cost of the project including installation was US\$32 million.



Installation

The installation of the turbines took the crew six months, with specialized contractors supporting the project. The proper sequencing of deliveries was important to ensure installation work could begin, even if all parts had not yet arrived. Large turbine bases (using a total of 80 kilometres of reinforcement steel, plus 1,500 cubic metres of concrete) had to be completed prior to installation.

Most of the components, including individual turbine blades, were brought to site over the winter road before installation. A large crane was required to complete the installation.

Key numbers

Capacity

- Four 2.3 MW turbines generate a total capacity of 9.2 MW
- Approximately 17 million kWh of electricity produced per year, or about 12% of Yellowknife's annual consumption

Environmental

- 49 million litre reduction in diesel usage as of December 2024
- 140,000 tonnes reduction in CO₂ emissions as of December 2024
- Six per cent reduction in GHGs annually
- Reduction of 100 fuel tanker truckloads annually

Dimensions

- Total turbine height is 100 metres, with 33 metre blades
- Tower hub height is 64 metres, with a turbine rotor diameter of 71 metres
- Approximately 375 cubic metres of concrete went into the base to support each turbine

Technical

- Four Enercon E70 generators
- 20 year expected life span at time of installation
- Operational to -40 C due to direct drive gearless design and blade heating system
- Approximate eight-year payback period

Maintenance

Wind farm technicians with the turbine manufacturer Enercon come to site a few times a year to perform preventative maintenance and troubleshoot as needed.

In-house electricians at Diavik replace parts and troubleshoot minor issues with remote support from Enercon.

Training to maintain the system was provided to Diavik's team during commissioning. Trained electricians are required for maintenance.

Diavik maintains spare parts on site, as replacement parts often come from Europe and can have long lead times.

Operation

Wind power generation can be highly variable, with almost no daily or seasonal patterns.

Diavik's control room operators watch the wind forecast to gauge future generation and actively manage the balance between wind generation, solar generation, diesel power, and site power demand.

The blades are equipped with heaters to prevent ice buildup. These heaters must be properly maintained as they can inhibit operation during the winter months if they run into issues.

Decommissioning

Diavik's wind turbines will be near the end of their expected life at the end of closure operations. The current plan is to demolish and dispose of them in the site's landfill, however, all options are being investigated for potential repurposing.

Due to the size of the turbines and the high amount of material required to construct their bases, relocating them is costly and challenging.

It is expected that decommissioning will require a specialized contractor.



Additional questions? Contact us at
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