



# Chinook 2000

## Reliable Energy, Anywhere.

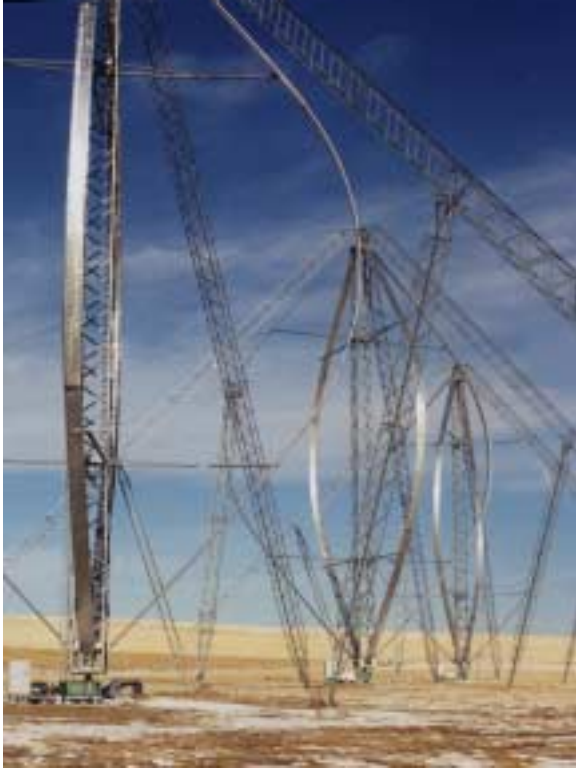
This lightweight vertical axis wind turbine meets a need for an uncomplicated wind turbine that can be easily transported to the site, installed without heavy equipment and operated and maintained by individuals with basic electrical and mechanical skills.

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### General

The Chinook 2000 is based on a solid foundation of years of experience and research into Vertical Axis Wind Turbine technology.

**It is Design Certified by Germanischer Lloyd to meet the requirements of IEC Standard 61400-1 (Wind Turbine Generator Systems – Part 1: Safety Requirements, 1999-02).**

The turbine is readily identified through its use of a tripod rotor support structure composed of three rigid members. The self-supporting structure is designed to reduce the cost of installation and foundations at remote sites and sites with difficult terrain. The Chinook 2000 can be manufactured locally and packaged and transported by conventional means to site for easy installation without the use of heavy equipment.

### Technical and Financial Benefits

The advantages of the Chinook 2000 Vertical Axis Wind Turbine are numerous:

- Low overall cost per kWh
- Low installed cost
- Low operating and maintenance costs
- Benefits to the local economy – most components can be provided by local suppliers
- Simple and robust design
- All drive train components are at ground level, minimizing installation and maintenance costs
- Ease of transportation and installation – turbine is assembled in the field from small components
- No complicated blade pitch control
- “Canadian Coast Logic” extends brake and turbine life, and maximizes energy capture
- Lightning safe design
- No complicated yaw mechanism – the vertical axis design accepts wind from any direction

### **Benefits to the Local Economy**

The Chinook 2000 wind turbine generates immediate and recurring financial benefits for the local economy.

The Chinook 2000 is a simple design that uses primarily standard, widely available components. These components are supplied from local markets benefiting the local economy and reducing transportation costs.

Local technicians with basic mechanical and electrical skills can maintain the simple design.

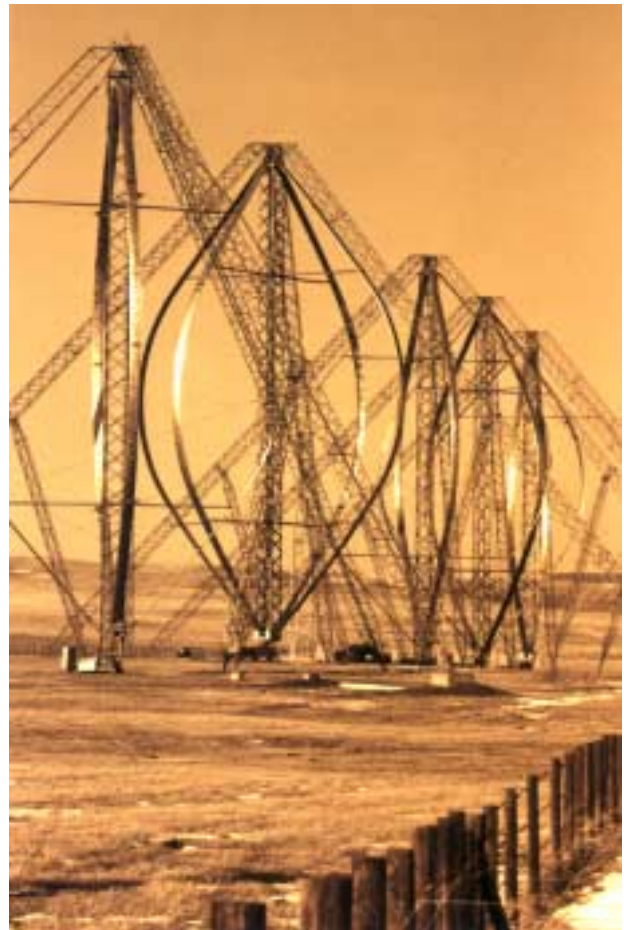
### **Environmental Benefits**

A single Chinook 2000, producing 700,000 kWh of electricity per year, can offset the emission of approximately 700 tonnes of CO<sub>2</sub> by a fossil fuel fired generator.

The Chinook 2000 has low operating noise levels, and the design is less visually obtrusive than comparably sized horizontal axis wind turbines.

### **Designed for Easy Transportation and Assembly**

The Chinook 2000 Wind Turbine is designed using small components that are easily transported to remote locations. This greatly reduces installation costs and creates opportunities to install wind turbines in locations that were previously inaccessible or too expensive.



### **Rotor**

The Chinook 2000 wind turbine uses a four-bladed, vertical axis rotor. The design does not require any complicated yaw mechanism or blade pitch control. It will accept wind from any direction. This feature greatly simplifies the overall design, improves the reliability of the turbine, and reduces the operating and maintenance costs.

The blades are supported by a lattice tower constructed of standard structural steel angles. The steel angles are hot-dip galvanized to ensure long life with superior resistance to corrosion.



### **Drive Train**

All drive train components of the Chinook 2000 are located at ground level to allow easy access for installation, maintenance, and inspection.

The gearbox is a standard, off-the-shelf model selected to ensure wide availability and reduce cost. It is a three-stage gearbox with a right-angle output shaft.

The Chinook 2000 has a high efficiency, three-phase induction generator. The single generator reduces system complexity compared to multiple generator turbines. The generator is cooled by natural convection and is sealed to prevent condensation from damaging the generator. This design

reduces capital and maintenance costs while improving the reliability of the turbine.

### **Brake System**

The Chinook 2000 is equipped with two independent mechanical braking systems to ensure safe operation of the wind turbine. One brake is located on the high speed shaft between the generator and the gearbox. The other brake is located on the low speed shaft between the gearbox and the rotor. Each brake is capable of independently stopping the wind turbine under all operating conditions.

The turbine controller employs "Canadian Coast Logic" to reduce the frequency of brake applications. The spring activated, hydraulic release system is fail-safe, and is applied immediately in the event of hydraulic or electric system failure.

### **Controller**

The Controller ensures safe operation of the wind turbine under all conditions and allows customization of to optimize the operation of the wind turbine for each installation.

The Controller is located at ground level to allow easy access for maintenance or inspection. It includes a display panel and keyboard for user-friendly operation.

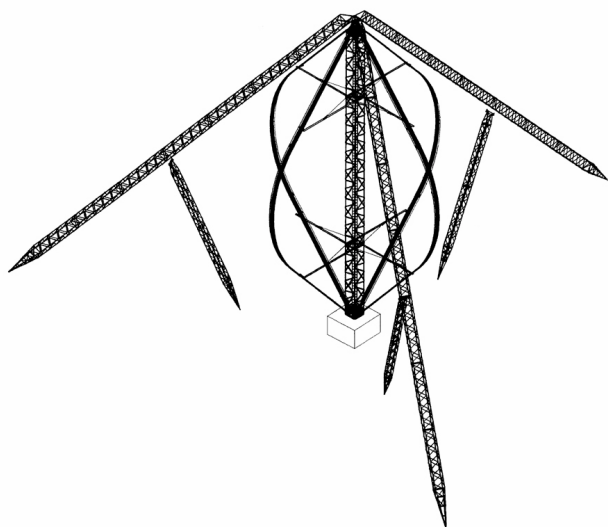
The Controller includes all electrical switchgear and protection devices.

### **Remote Monitoring**

All Chinook 2000 turbines are equipped for remote monitoring and control.

# Chinook 2000

# Technical Specification



## Annual Energy Production

Average Wind Speed (at 10 m Height)	Annual Energy Production
6.0 m/s	368,000 kWh
6.5 m/s	456,000 kWh
7.0 m/s	546,000 kWh
7.5 m/s	635,000 kWh
8.0 m/s	722,000 kWh

Note: Annual Production calculations based on Weibull distribution shape parameter 2.0 and air density of 1.225 kg/m<sup>3</sup>.

## Performance and Operating Data

Nominal Power Output	250kW @ 17m/s
Cut-In Wind Speed	4.5m/s (adjustable)
Cut-Out Wind Speed	25m/s
Calculated Lifetime	20 years

## Rotor

Type	Vertical Axis
Number of Blades	4
Rotor Diameter	21.5 m
Rotor Equator	16.5 m
Swept Area	405 m <sup>2</sup>
Power Regulation	Passive Stall
Yawing System	Not Required
Rotor Speed	39 RPM

## Blades

Material	6063-T6 Aluminum
Blade Chord	600 mm

## Gearbox

Type	3-Stage Right Angle Output Shaft
Ratio	40: 1

## Generator

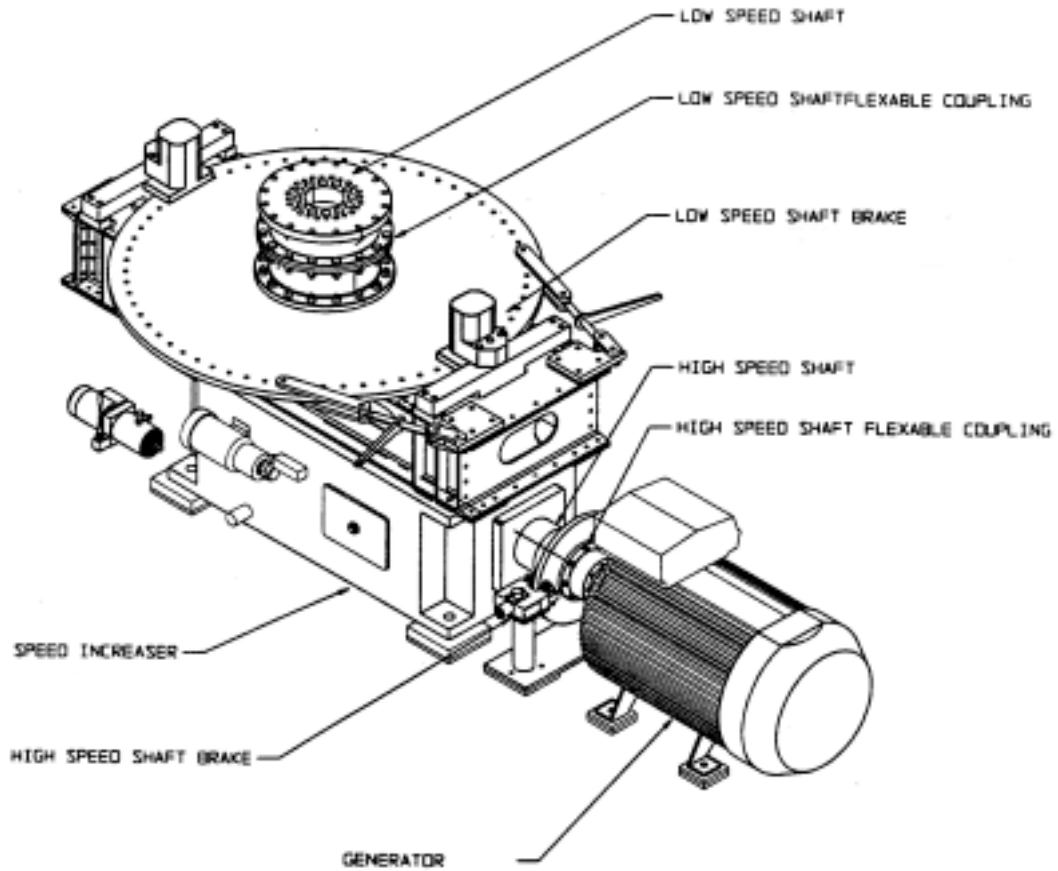
Type	3-Phase Induction
Nominal Voltage	400 V / 480 V
Nominal Frequency	50 Hz / 60 Hz

## Brake Systems

Type	2 Independent Disc Brakes (Spring Applied, Hydraulic Released)
Locations	Low Speed Shaft and High Speed Shaft
Number of Calipers	2 on each Brake



## Chinook 2000 Drive Train



## Chinook 2000 Elevation View

