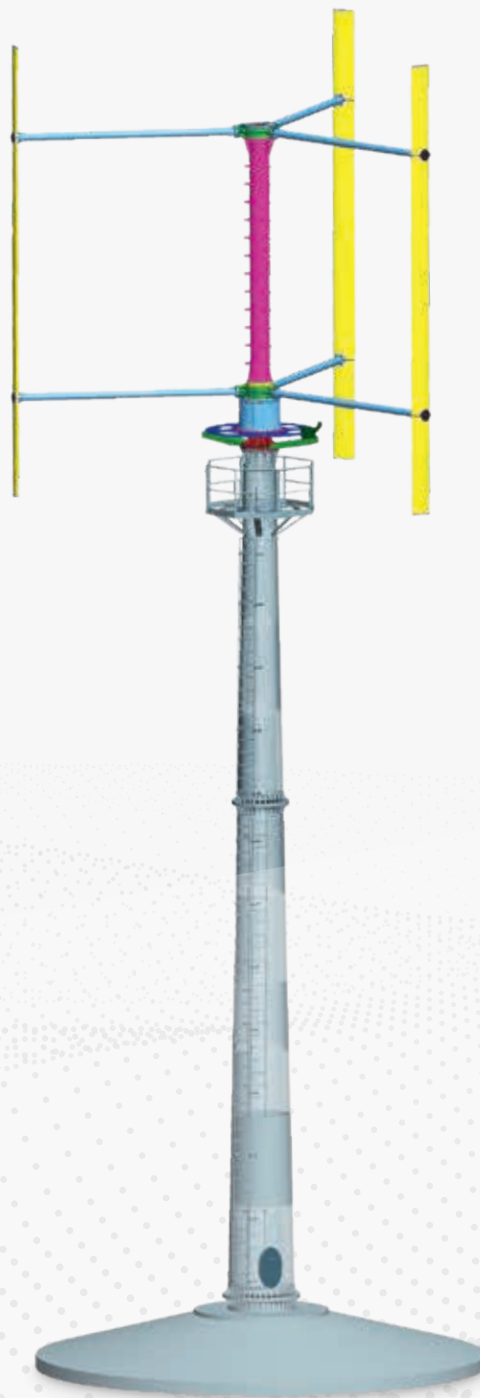


Vertical-Axis Wind Turbines

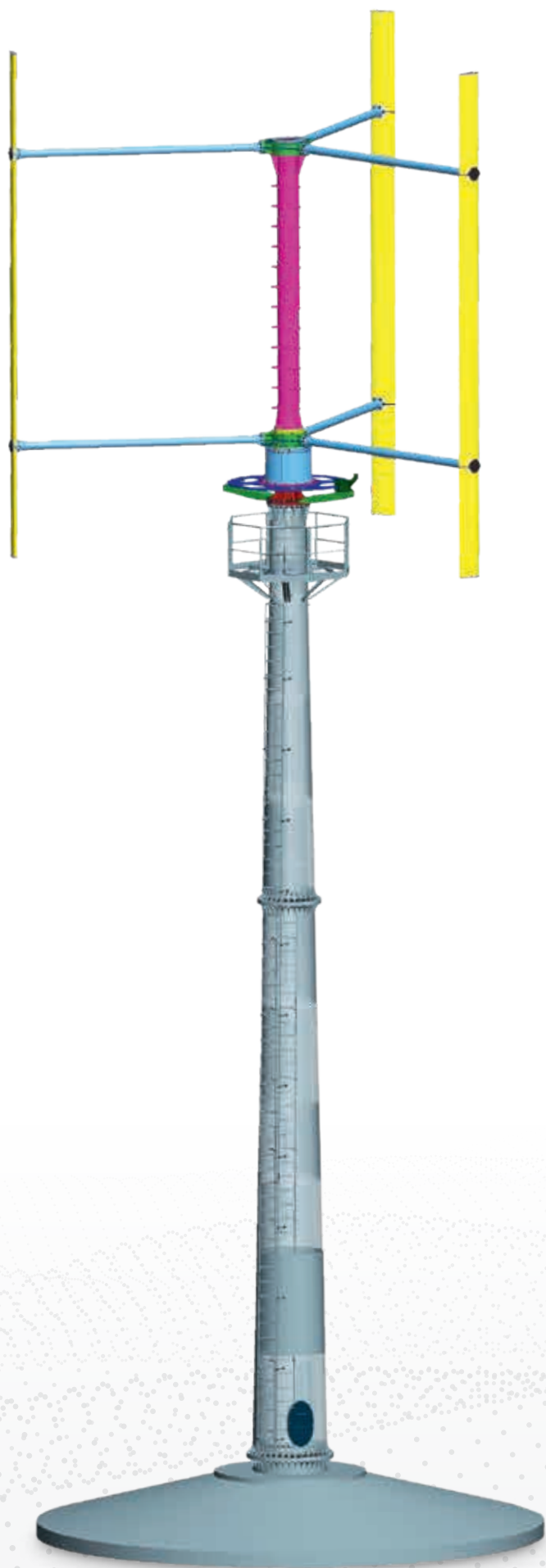
# WINDS OF CHANGE



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## Vertical-Axis Wind Turbines

# WINDS OF CHANGE

Vertical-axis wind turbines (VAWTs) are outnumbered by their horizontal-axis counterparts. Horizontal construction delivers higher electricity yield with lower mechanical loads. However, vertical-axis turbines are more versatile and have lower maintenance costs. Tri-Power New Energy has set itself an ambitious goal: the Beijing-based company aims to build the first VAWT approved to feed the Chinese power grid for regions with turbulent wind conditions.

**Slightly less efficient than horizontal-axis wind turbines but more versatile:** the VAWT with Darrieus design from Tri-Power New Energy.

Tri-Power New Energy specializes in the research and development of on- and offshore wind turbines. The company primarily produces large horizontal-axis turbines for regions with low wind speeds and offers its customers a wide range of services.

### Utilizing Wind Energy in the City

The company aims to expand its business to include vertical-axis wind turbines (power range from 1 to 100 kW). Their structure makes them ideal for areas with turbulent wind conditions. VAWTs also emit little noise, which makes them attractive for use in cities.

For this application the company has already developed a vertical-axis turbine with an output of 20 kW. The stable wind turbine, with an H-bar design and straight blades, is IEC 61400-2:2013 compliant and will be the first to be approved for grid feed in China.

### Perfectly Configured

As with the horizontal-axis models, the mechanics, electrical systems, and controls were developed entirely in-house and are fully harmonized. The outcome is an extremely economical and reliable system. "VAWTs are low maintenance. In contrast to horizontal-axis turbines, they do not require a yaw system, as they produce electricity regardless of wind direction. In addition, there is no need for pitch control. Components that require more intensive maintenance, such as the generator, are located close to the ground, which makes service easier," says Professor Xinwei Cui, General Manager at Tri-Power New Energy.

### Reliable Operation

For variable speed operation, the company uses a direct-drive permanent magnet synchronous generator. Tri-Power New Energy's vertical-axis turbine is controlled with a Bachmann M1 controller and a compact MX213 processor module. During development, the company relied on SolutionCenter as user-friendly engineering software.

According to Prof. Cui, whilst vertical-axis system construction is far more straightforward compared to that of horizontal-axis turbines, some challenges still remain. Due to the system design, blades cannot be moved out of the wind during storms. Tri-Power New Energy therefore had to pay close attention to safety systems during development. "The design and control of the brake system in particular turned out to be challenging. But, together with Bachmann, we succeeded in designing a sophisticated system for this as well," the General Manager happily concludes.



To control the vertical-axis turbine Tri-power New Energy relies on Bachmann's M1 automation system, developed with SolutionCenter engineering software

### TRI-POWER NEW ENERGY

- Based in Beijing
- Specializes in the research and development of on- and offshore wind turbines
- Primarily a producer of large horizontal-axis wind turbines, Tri-Power New Energy offers a wide range of products and services

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