



WIND TURBINES OF THE FUTURE

12 Ways to Utilize Wind Energy

With the costs of oil, coal and gas rising ever higher, alternative forms of energy are being considered as replacements or supplements. One of the most promising is wind energy; wind turbines today are much more than tall towers with slowly rotating blades.

Throughout the world, intensive pioneering efforts are under way to develop new methods for harnessing the power of the wind. Ideas include positioning helium-filled, floating turbines over large, wind-capturing Kevlar sails and using “forests” of carbon-fiber stalks to generate electricity.

According to future-wind-energy specialist Mark Moore from NASA’s Langley Research Center, participants in the new wind projects include both ingenious pioneers and optimistic fortune hunters.

“While there’s a lot of jumping on the bandwagon, there are also pioneering technology efforts going on that could dramatically change the feasibility of wind power,” he says. Moore, an engineer, is working on his own project: wind turbines that fly high in the sky. “The airborne wind turbines simply have a huge potential, because the wind speed is both much higher and more constant at high altitudes,” he says. “From 260 feet to 1,600 feet, the wind speed increases by a factor of between 1.5 and 2, and at an altitude of 6.2 miles, it’s 10 times higher.”

Here are 12 of the most creative wind turbine projects aiming to help solve the planet’s energy problems.

ILLUSTRATION BY ALLAN HODER

ON THE DRAWING BOARD

Wind Dam

Large Sail Captures Wind

Inventors of an approximately 17,000-square-foot Kevlar sail are currently seeking permission to place the wind catcher in a Russian valley. The sail, which resembles the spinnaker of a large yacht, is more than 80 feet tall and 245 feet wide, with a large turbine at the center. It's called a "wind dam" and was invented by the British architectural company Chetwoods Architects. The sail funnels the wind through a large central wind turbine supported by aluminum legs. Unlike traditional turbines, the dam makes optimal use of wind energy.



ALREADY IN USE

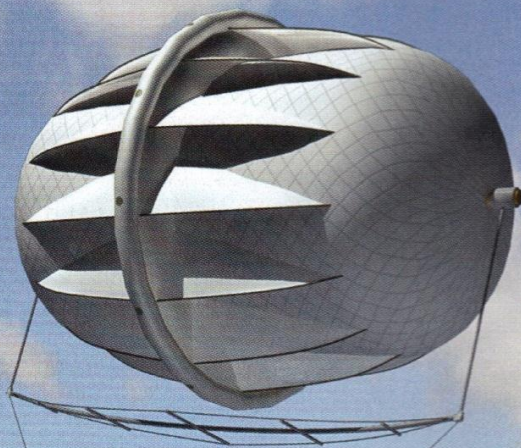
Windspire Turbine Fits Anywhere

Windspire is a 30-foot vertical turbine that rotates around its own axis. The turbine takes up very little space, making wind power a viable option for urban and suburban areas with limited land. The turbine can generate approximately 2,000 kilowatt-hours (kWh) a year in areas with annual average winds of 11 mph, and it is quiet. It costs roughly \$5,000, and with tax incentives that reduce that figure by up to 30 percent, it is affordable for both private individuals and companies.



WINDSPIRE ENERGY

IN THE TEST PHASE



Magenn Air Rotor System (MARS) Floating Turbine Captures High-Speed Winds

Magenn Power's floating, helium-filled wind turbine generates electricity by rotating around a horizontal axis, activating the built-in generator and stabilizing and providing additional lift for the turbine through the Magnus effect. The power generated is transferred down the tether to the Earth's surface, where it is either consumed or stored. The manufacturer says that it will be positioned at an altitude of 600 to 1,000 feet, and it can handle wind speeds up to 60 mph.

ALREADY IN USE

Energy Ball Shape Eliminates Noise

This spherical turbine with six curved rotor blades and a 3.6-foot diameter weighs around 66 pounds and is capable of generating electricity even at very low wind speeds. When the rotor blades rotate, the turbine resembles a sphere. The compact size and low noise mean that the turbines can be used to power private residences as well as larger urban areas.



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IN THE TEST PHASE

Joby Airborne Wind Turbine Circles in the Wind Like a Kite

Joby Energy's flying wind farm is a kind of kite fitted with a number of small wind turbines with electricity-producing generators. The power is transmitted to Earth via a strong tether, which also holds the "kite" in place. It is carried up to an operating altitude of around 2,000 feet, where the strong pressure of the wind causes it to float and move in a constant circular motion. At this altitude, the nearly constant wind is typically 1.5 to three times stronger than at ground level.

JOBY ENERGY

ALREADY IN USE



J.F. FAGAN/CAMPX

Bahrain World Trade Center A Part of the Structure

Three 65-ton wind turbines are mounted between the two towers of the 787-foot-tall Bahrain World Trade Center. The project is the first large commercial building that has integrated wind turbines into the structure. The turbines each have a 95-foot diameter, and depending on wind speed, they account for 11 to 15 percent of the twin skyscrapers' power requirement. The turbines generate 1,100 to 1,300 megawatt-hours a year.

IN THE TEST PHASE

Selsam Superturbine Turbine Blades Like Beads on a String

The offshore version of the Selsam Superturbine consists of a long, flexible carbon-fiber shaft anchored to the bottom of the ocean with a great number of small turbines mounted on the shaft. Inventor Doug Selsam has designed a number of wind turbines featuring many small turbine blades instead of a few large ones.

ILLUSTRATION BY ALAN HARRIS

ON THE DRAWING BOARD

NOVA

Large-Scale Offshore Wind Power Project

The British Novel Offshore Vertical Axis (NOVA) is an offshore wind turbine focusing on aerodynamics. The 120-foot-tall, V-shaped construction generates electricity by rotating around its own axis in high-speed offshore winds. It is intended to generate 1 gigawatt-hour a year.

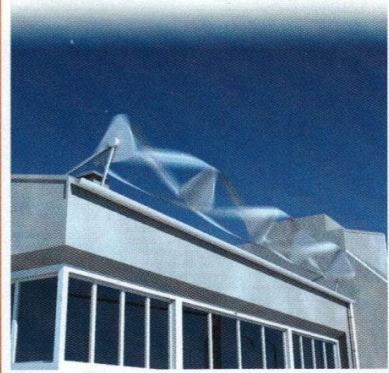
GRIMSHAW ARCHITECTS

IN THE TEST PHASE

EdgeFlow

Right on the Edge

Developed by Danish engineers, the EdgeFlow wind turbine is meant to sit on the roof of a building, taking advantage of markedly accelerated wind after it hits a building and is forced to pass over it. A 118-foot-long horizontal turbine is mounted at the edge. One turbine can account for 30 to 35 percent of an average building's power consumption.



ON THE DRAWING BOARD

Solar Wind

Viaducts Full of Turbines

Solar Wind is a very different attempt at integrating wind turbines into existing structures. The concept, invented by three Italian architects, consists of placing a number of wind turbines between the bridge supports of the viaducts that dot the southern Italian landscape. According to the architects, a bridge with 26 wind turbines could generate 36 billion kWh a year. Moreover, the inventors recommended that the bridge be lined with solar cells, which would produce another 11.2 million kWh.



IN THE TEST PHASE

Sky WindPower

Flying Wind Turbine Resembles Helicopter

Sky WindPower engineers have invented a flying electric generator that resembles a helicopter. It is equipped with four large rotors that can lift the structure upward to where the wind is strongest. Once there, the strong winds rotating the blades will not only keep the turbine floating but will also generate electricity that is transferred back to Earth along the tether. Australian scientist Bryan Roberts originally developed the idea. Recent research suggests that if the turbine, with its speeds of more than 200 mph, operated in the jet stream, it could generate 10 to 50 times more electricity than turbines on the ground. The first prototypes have been tested on a smaller scale.

ILLUSTRATION BY ALLAN HUGHES

ON THE DRAWING BOARD

Windstalk

Stalks Bend in the Wind

This "forest" of 180-foot-tall stalks could be built outside the planned city of Masdar in the United Arab Emirates. The stalks are filled with piezoelectric discs. When the stalks bend in the wind, the discs are forced together, and a generator at the root of the stalk creates energy. The stalks are made of carbon fiber and have a diameter of 30 cm and 5 cm at the base and top, respectively. They are silent and harmless. The tops of the stalks glow when the wind blows. In windless conditions, they are dark and look like an energy-producing art installation.

