

Wind Turbines

Story by Marilyn Nelson Photos by Greg Mitchell & Jan Vick



When driving east along Highway 12 as you near Rio Vista, look to your right on the Montezuma Hills and you will see some enormous kinetic sculptures. Sometimes they are erroneously called windmills, but they are really wind turbines. There are currently over 750 of them that belong to three

renewable energy projects (Shiloh Wind Power Plant, FPL Energy's High Winds Energy Center and one owned by the Sacramento Municipal Utility District). There are even plans to build 200 more wind turbines in the area.

Wind flow patterns and speeds vary greatly across the United States. The wind is also modified by bodies of water, vegetation, and differences in terrain.

That is why the terrain greatly affects the placement of the wind turbines. The ones near Rio Vista are on hills in a naturally windy area that provides an optimum location. By grouping these large turbines together into wind farms, they become more cost effective by providing bulk power to the electrical grid.

The terms "wind energy" or "wind power" describe the process by which the wind is used to generate mechanical power or electricity. People have been using the power of the wind for over a thousand years. The earliest devices were windmills that were used to pump water and crush grain. The windmills have evolved now into wind turbines that convert the kinetic energy in the wind into mechanical power using a generator to produce electricity. The turbines can generate enough electricity to power entire towns.

Wind turbines operate on a simple principle, the energy in the wind turns the three propeller-like blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity.

The turbines need to face into the wind. Since the wind direction changes, there is a velocity sensor sitting on top

of the turbine to measure the wind speed and direction. This sends a signal to a yawing mechanism that aligns the turbine with the wind direction. The three blades are also aligned with the optimal angle with the wind flow.

Why three blades on the propeller? Each blade produces more power, so four blades would be preferred if it weren't for the cost. The addition of a fourth blade would increase the cost so much that the profit would not outweigh the revenue. Why not a less expensive two-blade turbine then? For a two-blade design to match the power of the three-blade design, the length of the cord of the blade would have to be doubled. Again, this would increase the cost so much that it would be pointless. The rotation of two blades could be increased to match the output of the three-wing design, but spinning faster is a negative. A faster spinning blade would create more noise, so people would not want to live anywhere near them. Therefore, the three-blade design is the optimum choice – not too much and not too little.

The electricity produced in wind turbines is transported to the consumer via a series of transmission and distribution networks. Each component of the network changes the voltage of the electrical power to optimize its transition to the next part of the network. Due to the structure of these networks it is currently not possible to buy wind energy alone. All sources of electricity feed power into the same grid. It is therefore impossible to know exactly where the power you are buying comes from.

It is difficult to comprehend how immense these amazing "sculptures" are when you see them from the highway. If you would like to see them up close, drive down Main Street in Rio Vista and turn right

onto 2nd Street. Follow 2nd out of town where it becomes Montezuma Hills Road. As you continue on the road you can see the wind turbines fairly close up so that you can get an idea of their size. As a point of reference, the towers are slightly taller than the Statue of Liberty!

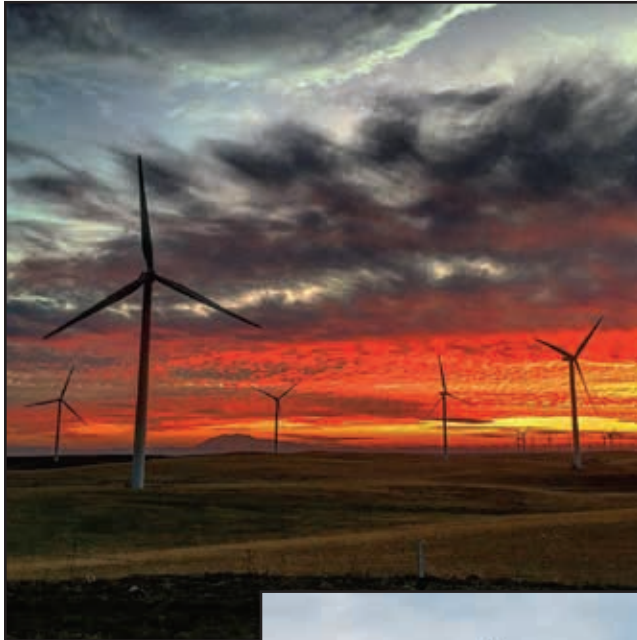


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