

Wind Energy

Grades: 4-6

Subjects: Science, Math

Approximate Time: 1 day

Montana Standards: Science 5,6; Math 1,2.

Objectives: Students will

- Learn how wind turbines work
- Learn that wind is a renewable resource
- Compare wind capacity developments over a period of time

Keywords:

- Kinetic energy
- Wind energy
- Wind turbines
- Generator
- Greenhouse gas
- Solar energy
- Domestic energy source

Brief Description:

Wind is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth. Wind flow patterns are modified by the earth's terrain, bodies of water, and vegetation. Humans use this wind flow, or motion energy, for many purposes: sailing, flying a kite, and even generating electricity.

The terms wind energy or wind power describes the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity.

So how do wind turbines make electricity? Simply stated, a wind turbine works the opposite of a fan. Instead of using electricity to make wind, like a fan, wind turbines use wind to make electricity. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.

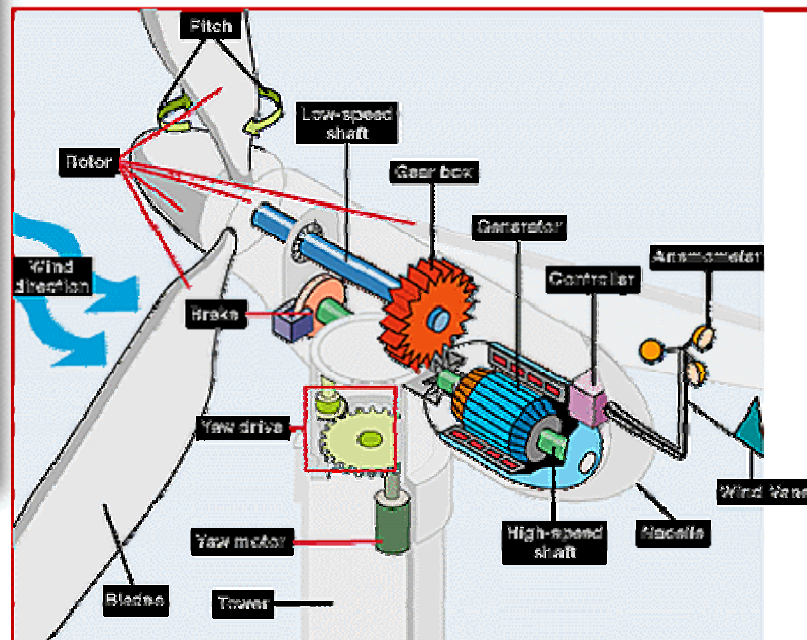
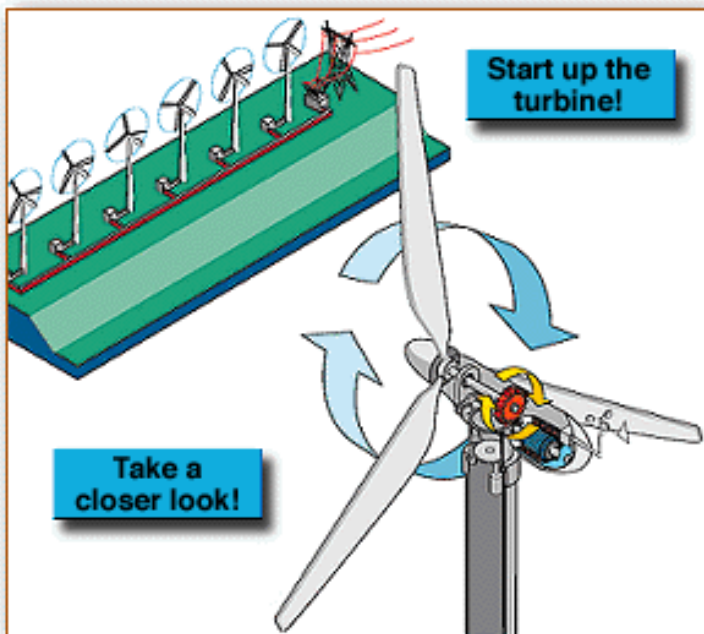
Wind energy is fueled by the wind, so it's a clean fuel source. Wind energy doesn't pollute the air like power plants that rely on combustion of fossil fuels, such as coal or natural gas. Wind turbines don't produce atmospheric emissions that cause acid rain or greenhouse gasses.

Wind energy is a domestic source of energy, produced in the United States. The nation's wind supply is abundant.

Wind energy relies on the renewable power of the wind, which can't be used up. Wind is actually a form of solar energy; winds are caused by the heating of the atmosphere by the sun, the rotation of the earth, and the earth's surface irregularities.

Wind energy is one of the lowest-priced renewable energy technologies available today, costing between 4 and 6 cents per kilowatt-hour, depending upon the wind resource and project financing of the particular project.

Wind turbines can be built on farms or ranches, thus benefiting the economy in rural areas, where most of the best wind sites are found, especially in Montana! Farmers and ranchers can continue to work the land because the wind turbines use only a fraction of the land.

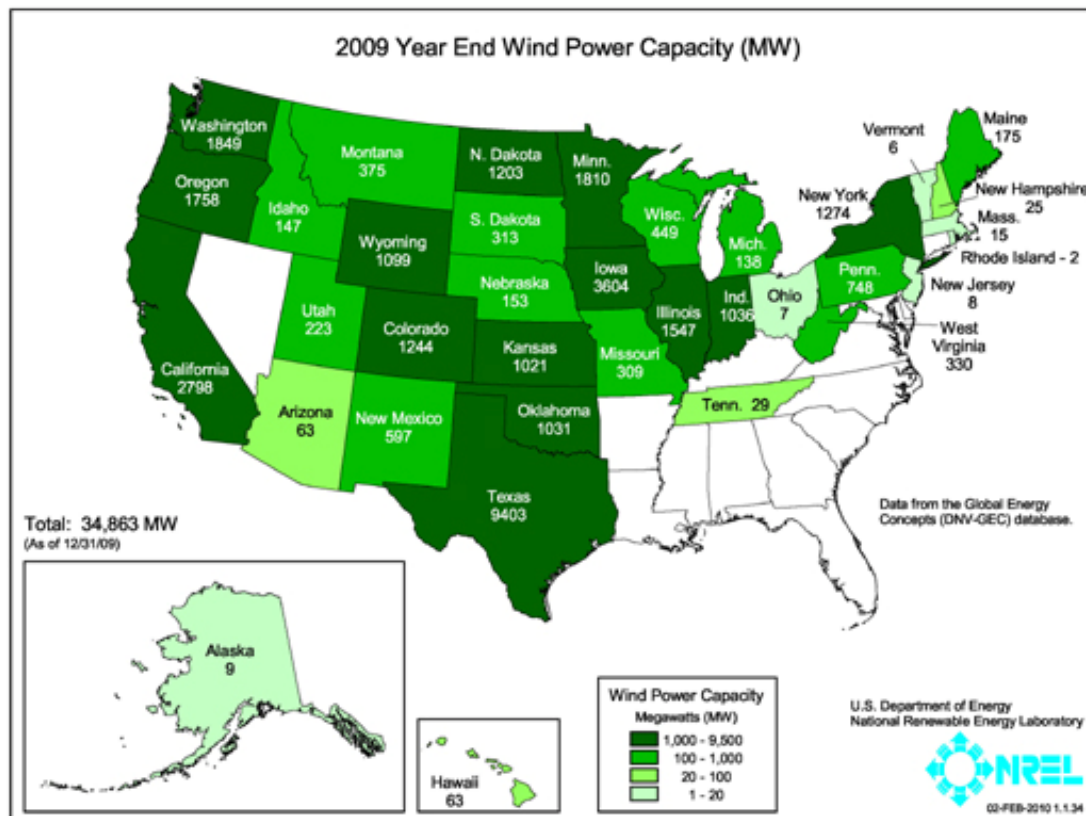
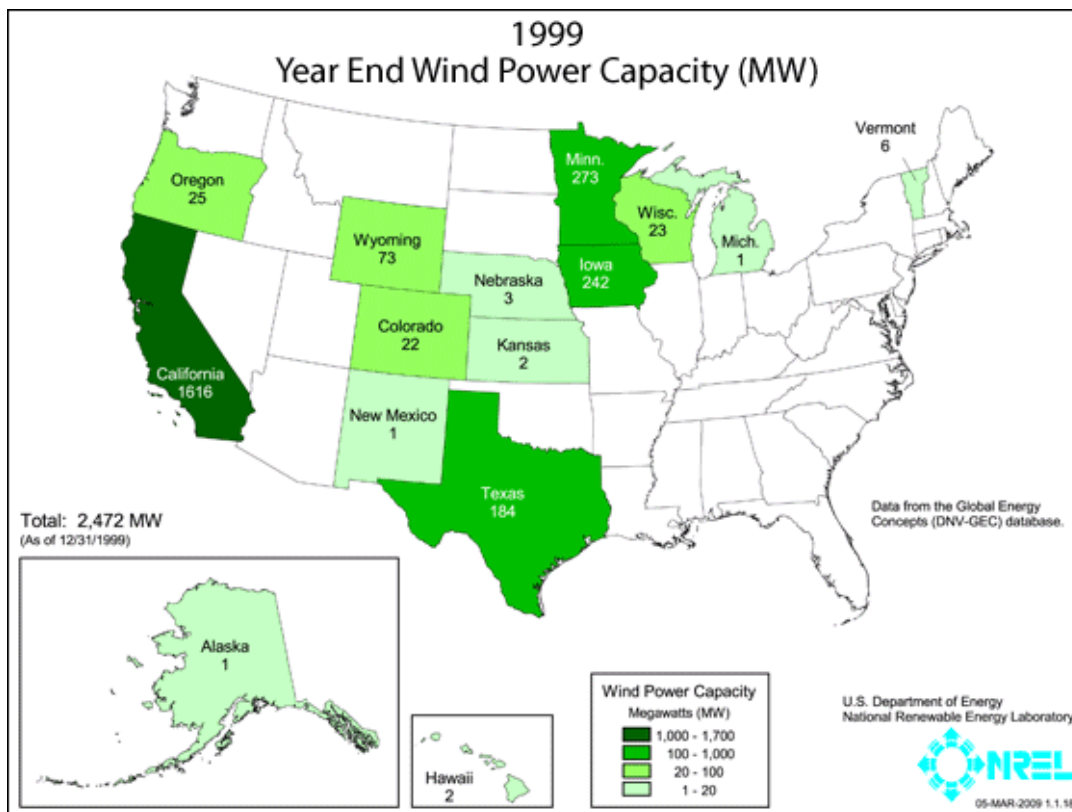


Source: National Renewable Energy Laboratory, U.S. Department of Energy (Public Domain)

Lesson: Give students copies of the diagrams on the following two pages showing the change in wind power capacity of each state from 1999 – 2009. Have them answer the following questions.

Assessment:

1. What percentage of change in wind power capacity happened in Montana during this period?
2. What major events in history may have made wind power plants expand? What state had the largest increase in wind power capacity?
3. What does that tell you about weather in that state?
4. Find at least one interesting fact that you can share with the class about the changes.



Maps from the US Department of Energy:
http://www.windpoweringamerica.gov/wind_installed_capacity.asp