Wind Turbines

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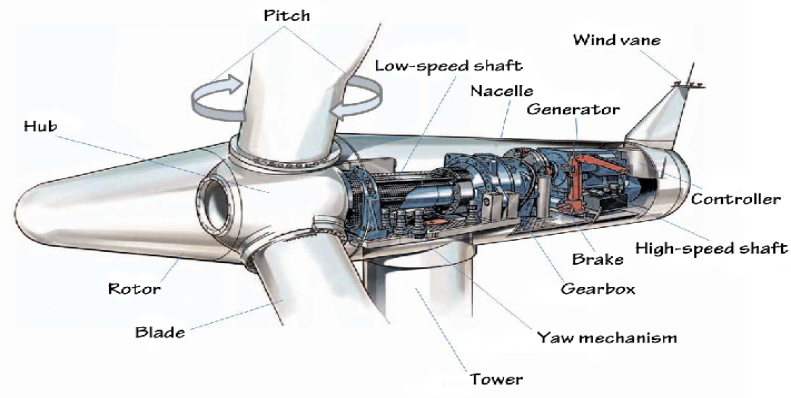
What is Wind Power?

Wind power captures the natural wind in our atmosphere and changes it into useable energy. Wind turbines (or windmills) have been around for centuries and have been able to convert wind into energy for multiple purposes. Some of these purposes include: pumping water, grinding grain, and lighting houses. There are a few different types of wind power. One type is called **Utility-scale wind**. This type of wind power generates electricity to power a large area of space, such as an entire community. The second type of wind power is called **Distributed or "small" wind**. This type of wind power provides enough energy and electricity to directly power something smaller such as a home. The third wind power type is called **Offshore wind**. This type of energy is created by wind turbines that are placed in large bodies of water around the world.

How Does Wind Energy Work?

Have you ever seen those huge propellers on a wind turbine? Well, those are large blades that capture energy when the wind blows and makes them rotate. These large blades are connected to a **gearbox**, which is a part of the wind turbine that increases the speed at which these large blades rotate. Wind turbines are interesting because they are equipped with equipment that will automatically rotate the large turbine into the direction the wind is blowing. The picture below shows you what the inside of a wind turbine looks like. Look inside! Isn't it interesting to see the machinery that produces the wind energy?

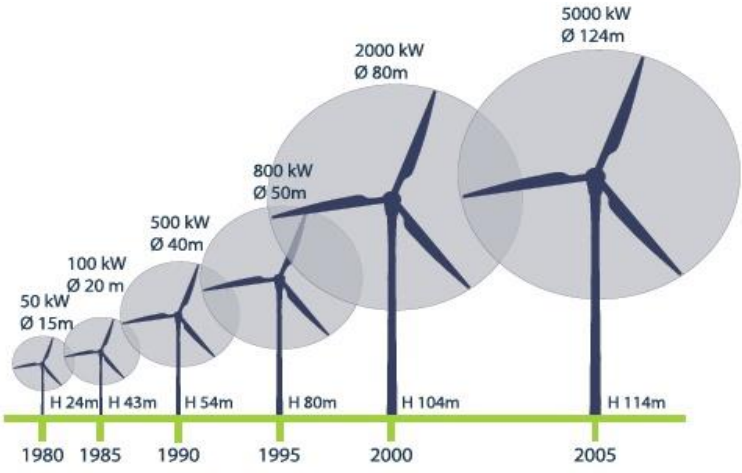
Diagram 2. The major components of a wind turbine



SOURCE: Center on Globalization, Governance, and Competitiveness, Duke University

Cost of Wind Turbines

Wind is a **renewable resource**, which is any natural resource that can replenish itself naturally over time. That means, that wind itself is a free resource that we use. The most expensive cost about wind energy is building the wind turbines. There are many different sizes of wind turbines, which effect the cost. Smaller turbines, such as one that would power a single home, cost less than a large turbine that you would see in farming fields. The price for a wind turbine can range from $10,000 to $70,000. The purchase price along with the installation price of a large turbine can cost up to $350,000. The picture below shows the many different sizes of wind turbines.



What Influences the Cost?

There are reasons as to why wind energy can be so expensive. The first reason is called **capital costs**, which is the cost of building, installing, and managing the turbines. The cost to build the wind turbines is the largest financial aspect of creating wind energy. The cost of installing the wind turbines is expensive too. It takes a lot of machines, workers, and time to correctly install a wind turbine. The good news is that even though it's expensive, the American Wind Energy Association is reducing the total cost each year, making wind turbines a more affordable entity each year.

Benefits of Wind Turbines

Some of the benefits of wind turbines include:

- Wind Turbines produce a clean fuel source.
    - The nice thing about energy generated from wind turbines is that it doesn't pollute the air!
- Wind Turbines produce wind energy, which is **sustainable**, meaning able to be maintained.
    - The nice thing about wind is that it never goes away! Wind will always be on earth, which will allow wind turbines to produce lots of energy.
- Wind turbines can be built on farmland.
    - Large flat lands such as farmland or ranches provide a lot of great space for wind turbines to be placed. The more turbines, the more wind energy!

Drawbacks of Wind Turbines

Some of the drawbacks of wind turbines include:

- No wind, no wind power or energy.
    - One of the difficulties with determining where to build a **wind farm**, a place designed to hold many wind turbines, is knowing how much wind a certain place will get. Sometimes, it hard to know which areas will receive a lot of wind. Without wind, there is no energy produced.
- Turbine blades may harm wildlife.
    - The blades on the wind turbine are so large, that sometimes wildlife such as birds fly into them and get badly injured.
- Building wind turbines is expensive.
    - As discussed earlier, wind turbines are not cheap to produce. Some cost hundreds of thousands of dollars to make and install!

Summary

In summary, wind turbines are very large machines that help produce wind energy by capturing the wind in our atmosphere and changing it into useable energy. Wind energy is produces when the large blades on the wind turbines turn when the wind is blowing, bringing the wind into a generator that converts the wind into a source of energy. Although wind turbines are expensive to build, engineers and builders are working together to lower the cost of building and installing these large machines each year. There are both benefits and drawbacks to wind turbines. A benefit being that wind turbines use a renewable resource to help create energy, and a drawback being that it's hard to predict where the wind will be blowing. All in all, wind turbines are helping keep our world a greener place by providing the possibility to have clean, renewable and sustainable energy.

Glossary

Distributed or "small" wind: This type of wind power provides enough energy and electricity to directly power something smaller such as a home

Capital Costs: The cost of building, installing, and managing the turbines.

Gearbox: A part of the wind turbine that increases the speed at which these large blades rotate.

Offshore wind: This type of energy is created by wind turbines that are placed in large bodies of water around the world.

Renewable Resource: Any natural resource that can replenish itself naturally over time.

Sustainable: Able to be maintained.

Utility Scale Wind: This type of wind power generates electricity to power a large area of space.

Wind Farm: A place designed to hold many wind turbines.

Wind Power: Captures the natural wind in our atmosphere and changes it into useable energy

Common Core State Standards

CCSS.ELA-LITERACY.RI.5.4
Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.

CCSS.ELA-LITERACY.RI.5.2
Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

Questions

1. Why is farmland and open spaces a desirable place to put many wind turbines?

2. How expensive are wind turbines to build? Does the size of the wind turbine affect the cost?

3. What is one drawback of wind turbines? Why?

4. What is one benefit of wind turbines? Why?

5. What is a renewable resource? Is wind a renewable resource? Explain.

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