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A Background of Wind Turbines

 Wind turbines can be found on the hills of California. They are usually seen as large white machines equipped with large blades. To make sure of the definition of turbine I looked it up on dictionary.reference.com, they are “various machines having a rotor, usually with vanes or blades, driven by the pressure”.

 The history of wind turbines can be dated all the way back to 200 B.C. — the Chinese were using windmills to pump water in 200 B.C. Industrialization caused the making of wind turbines. Wind turbines, a term commonly used for large windmills that generate electricity appeared in Denmark around the 1890’s. Popularity of wind powered generators fluctuates with fossil fuel prices. For example, the 1970’s: when oil prices went up, so did interest in wind turbines. This historical information is according to the “History of Wind Energy” on http://www1.eere.energy.gov/wind/wind\_history.html. The 21’st century needs green energy, thus we see windmills on the hills today.

 Many turbine blade designs exist, different for different styles of catching the wind’s energy. Three of them are: the wind blades with tubercles inspired by whale fins, the common three blade design for the large white wind turbines, and blades like the Windspire machine with vertical airfoils. The whale fin blades have tubercles, a biological feature of a whale’s fin. Tubercles are bumps on the fins of humpback whales. These whales use tubercles to avoid stalling. Tubercle designs on blades allow for steeper angles without having a stall or excessive drag. In low wind speeds, steep angled blades theoretically produce more power. Information on the different blade styles, the Windspire, and the blades with the tubercle design are taken from “10 Wind Turbines That Push the Limits of Design” by Lisa Merolla on popularmechanics.com. Also “Whale-Inspired Wind Turbines” by Tyler Hamilton on technologyreview.com was used as a reference. Then we have our common three blade design on the white turbines. These blades use airfoils to get wind energy. They have a specialized shape that allows the wind to create a pressure pocket as it passes the blade, the pressure pocket pulls the blades for rotation. This knowledge for the three bladed white turbines are taken from “parts of a turbine” on ecw.org. The funny Windspire has no propeller rotor. It is also a tall but thin white machine. Energy is produced by the vertical airfoils that catch the wind causing a rotation. These tall and thin machines can work in 12 mph winds.

Energy from the wind is sustainable, for wind is a naturally reoccurring resource. Some day we will run out of fossil fuels, but wind energy seems to last; wind occurs almost on a daily basis. Some places have something called wind farms for wind energy. A wind farm is an energy plant that has its source from the wind. They usually have several wind turbines built close together. The term wind farm is explained in “Wind Energy Basics: How Wind Turbines Work” on the website nrel.gov. Take note, the location of the wind turbines is very important for if you place a turbine on a place with no wind, then nothing will happen vs. when you put it somewhere windy on a high mountain. The top 3 countries for most wind energy output are: China, U.S., and Germany according to “Top 10 Wind Energy Producing Countries 2013” by AMNA on thecountriesof.com. Power output depends on design; windmills designed for immense heights should produce immense power, small windmills for small wind speeds likely won’t produce as much as we can make that logical conclusion as we look at the small scale Honeywell Wind Turbine found in the article “10 Wind Turbines That Push the Limits of Design” by Lisa Merolla on popularmechanics.com. The blade’s angle and wind direction determines whether the blades spin clockwise or counter clock wise. Turbines do have cons, habitat loss is a concern for bats and birds as we can see on the report “Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions” from http://www1.eere.energy.gov/wind/pdfs/birds\_and\_bats\_fact\_sheet.pdf. Basic parts of a turbine are: blades, nacelle (houses the generator and gearbox), the tower, and the base. Blades catch the wind making the generator and gearbox turn, these things are then on a tower and base for stabilizing the turbine. Basic parts information credited to “parts of a turbine” on ecw.org. What about energy storage? Interestingly batteries on a utility-scale work for energy storage for solar power systems, though not for wind farms according to “Study: Battery Energy Storage Benefits Solar, Not Wind” by Silvio Marcacci on cleantechnica.com. This information can then cause the question for our local area: What about Benicia and wind energy? According to Mr. Bradley and Indy’s research, Benicia requires about 15,000 large scale wind turbines to be powered only by wind energy.

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