

Abstract:

Many established renewable energy sources have the capacity to produce enough energy to help fuel a college campus. One of these energy sources is biomass, which relies on the use of plant and animal waste to produce energy. Another renewable energy source with great potential for this application is wind. This type of energy has no direct emissions, but does occupy a good deal of physical space. A third source of renewable energy, hydropower, is created through the conversion of water's potential energy to electricity, and does so without substantial reduction of water quality. Solar power also provides a promising means of generating renewable energy. One approach to solar power particularly appropriate to this investigation relies on photovoltaic cells to generate electricity. Our research will investigate the capacity of each of these energy sources to contribute to a college campus of the scale and scope of the University at Buffalo.

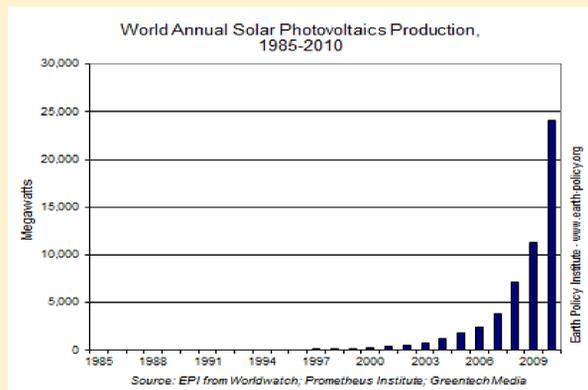
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Solar Power

Solar power is typically converted to electricity through the use of solar panels, specifically photovoltaic cells. A common solar panel is 1.6 meters long, 1 meter wide and generates 250-Watts of power producing enough energy to run 84 compact fluorescent light bulbs for 1 hour a day. Based on the graph below, solar production has increased exponentially since 1985, demonstrating that the world is realizing the benefits of solar power.



UB Solar Strand

UBs solar strand produced 750 kilowatt hours of electricity. The solar strand will clearly help UB achieve its goal to become climate neutral by 2030. The solar strand is 140 feet wide and a quarter mile long. The solar strand is available to visitors, allowing footpaths between the solar panels.



http://www.buffalo.edu/utreporter/archive/2009_05_13/images/SolarArrays.jpg

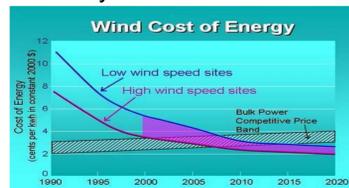
Benefits of Solar Power

- Solar power does not produce any greenhouse gasses.
- Solar power is formed by using the sun's radiation and converting it into electricity. This process is free of using any gasses and chemical byproducts.
- Nations trying to meet climate change requirements benefit from this green energy technology.

- The generation of electricity through solar power does not require any raw materials beyond those necessary for the creation of solar panels or other accumulators.
- Solar power is less expensive and does not require any intense labor.
- Life expectancy of solar cells are up to 40 years.
- Solar power avoids the use of transporting coal, oil, and gas across the country used for conventional electricity.
- Solar power creates high tech jobs which include maintaining solar panels, research, design, development, installing, and manufacturing

How wind projects are developed

Wind energy projects are developed by companies that seek out the areas with the strongest wind resources but also review other critical factors like access to land, access to the transmission lines, ability to sell the electricity, and public engagement other significant development factors. Once a site is identified, a developer will conduct wind resource assessment, siting and permitting, transmission studies over a period of several years.



Benefits of Wind Energy

Wind energy is a clean, renewable form of energy that uses virtually no water and pumps billions of dollars into our economy every year

Wind energy helps avoid a variety of environmental impacts due to its low impact emitting zero greenhouse gas emissions or conventional pollutants and consuming virtually no water.

Wind energy is a drought-resistant cash crop in many parts of the country, providing economic investment to rural communities through lease payments to landowners.



Bio Fuel

What is biofuel: a hydrocarbon that is made by and or from a living organism which we can harness and turn into energy.

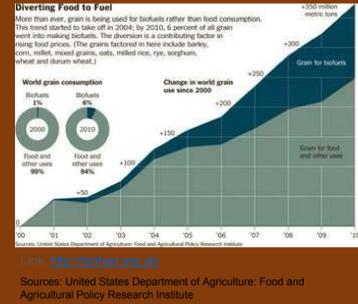
Amount of space that biofuel would take up at a college campus: None because it is made at farms and processed at plants.

The different types of biofuel

- Ethanol, Biodiesel, Methanol, Bio butanol

Is it better than fossil fuels with respect to greenhouse gasses?

- Yes, even though it does produce carbon dioxide the amount is drastically lower than that of fossil fuels.



Hydro power

Hydropower is used primarily to generate electricity. Broad categories include: Conventional hydroelectric, referring to hydroelectric dams. Run-of-the-river hydroelectricity, which captures the kinetic energy in rivers or streams, without a large reservoir and sometimes without the use of dams.

How Does it Work

Hydropower systems use the energy in flowing water to produce electricity or mechanical energy.

The water flows via channel or penstock to a waterwheel or turbine where it strikes the bucket of the wheel, causing the shaft of the waterwheel or turbine to rotate. When generating electricity, the rotating shaft, which is connected to an alternator or generator, converts the motion of the shaft into electrical energy. This electrical energy may be used directly, stored in batteries, or inverted to produce utility-quality electricity.

Small hydroelectric plants can be developed at existing dams and have been constructed in connection with river and lake water-level control and irrigation schemes.

By using existing structures, only minor new civil engineering works are required, which reduces the cost of this component of a development.

ADVANTAGES OF HYDROPOWER

- Hydropower is fueled by water, so it's a clean fuel source, it won't pollute the air like power plants that burn fossil fuels, such as coal or natural gas.

- Hydroelectric power is a domestic source of energy, allowing each state to produce their own energy without being reliant on international fuel sources.
- The energy generated through hydropower relies on the water cycle, making it a renewable power source, a more reliable and affordable source than fossil fuels.



http://images.fastcompany.com/upload/hydropower2_large.jpg

- impoundment hydropower creates reservoirs that offer a variety of recreational opportunities, notably fishing, swimming, and boating.

- Some hydropower facilities can quickly go from zero power to maximum output. Because hydropower plants can generate power to the grid immediately, they provide essential back-up power during major electricity outages or disruptions.

Conclusion

All of the renewable energy sources could be efficient in their own way in supporting a college campus like UB. Solar energy would be useful because it would produce carbon free energy and save money for the future. Yet a downside of solar energy would be the need to clear solar panels of snow. Hydropower could be used on UBs campus to provide a clean fuel source. Hydropower could be located in locations like UB's Lake Lasalle or in Lake Erie rather than the more distant Niagara River. Wind Power, readily available on the a large open campus like UB, can provide a clean and renewable form of energy. Biofuel could work mainly because it would not take up any space on campus and could be burned in generators either on or off site. In essence, Solar, Wind, Hydro, and Biofuel sources could all as part of a comprehensive renewable energy program at a campus like UB.

References:

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