Energy and sustainability problem set.

Due Dec. 3 2019.

1) Wind power:

The Enercon E115-2.500 turbine

https://en.wind-turbine-models.com/turbines/427-enercon-e-115-2.500

has a cut-in wind speed of 3m/s and a cut-out wind speed of 34m/s and a rotor diameter of 115m.

Consider wind speeds 9m/s and 6m/s:

- What is the ratio of the power available from the wind at 9m/s compared to 6m/s?
- What is the ratio of the power collected by this turbine at 9m/s compared to 6m/s (consult power curve on website listed above)?

Consider wind speeds 12m/s and 24m/s

- What is the ratio of the power available from the wind at 24m/s compared to 12m/s?
- What is the ratio of the power collected by this turbine at 24m/s compared to 12m/s (consult power curve on website listed above)?

Contrast.

- What is the mechanism that causes the significant variance between how much can be collected vs how much is collected at higher wind speeds?

2) Solar power:

The Astronergy 370 PV solar panel produces up-to 370W under ideal conditions. And is 77" x 39".

- Use the NY solar resource map https://www.nrel.gov/gis/solar.html to find the solar resource available in Cortland NY.
- Interpret this number to mean the number of effective hours of ideal light conditions per day in Cortland to estimate the amount of energy that can be collected in one year.
- A typical house uses, on average, 1kW of electrical power at all times through the year. How much electrical power does a typical house use in one year?
- How many panels would a typical house in Cortland need to replace all of its electrical energy with solar power?