

More Windpower

Physics and Mathematics of Sustainable Energy

College of the Atlantic. 3 October 2023

1. Areas and such:
 - (a) 54 kilometers is how many meters?
 - (b) 54 square kilometers is how many square meters?
 - (c) If an square has an area of 54 square kilometers, what is the side of the square?
 - (d) 54 square kilometers is how many hectares?
 - (e) 54 square kilometers is how many acres?

2. How many square feet is COA's main campus?

3. Residential electricity use in Maine is 21 billion kWh/year. What area of land would be needed to generate this electricity from terrestrial windpower?
 - (a) Answer in square meters, square kilometers, square miles, and acres.
 - (b) A square of what side (in km or miles) has this same area?

4. The Hog Creek Wind Project in Ada, Ohio, has a nameplate capacity of 66 MW. In 2020 it generated 200,813 MWh of electricity.
 - What is the wind farm's capacity factor?
 - The area of the wind farm is very roughly 18 km^2 . What is the power density of the wind farm in W/m^2 ?
 - The average Ohio home uses 873 kWh a month. About how many homes could the Hog Creek wind farm supply electricity to?

5. First Wind claims that the 34 MW of wind capacity at its Bull Hill wind installation is sufficient to power 15,000 Maine homes. Does this seem right? The average Maine home uses around 520 kWh per month.¹

¹<http://www.businesswire.com/news/home/20111115006743/en/Wind-Announces-Agreement-Vestas-Purchase-77-V108>, http://www.thewindpower.net/windfarm_en_16013_bull-hill.php.