

Still More Windpower and Areas

Physics and Mathematics of Sustainable Energy

College of the Atlantic. January 27, 2021

1. In this problem we'll think about electrifying the transportation sector in Maine. The transportation sector in Maine in 2014 used 38×10^9 kWh.
 - (a) Go here: https://flowcharts.llnl.gov/content/assets/images/charts/Energy/Energy_2018_United-States_ME.png. How much energy did the transport sector use in 2018? Express your answer in kWh. (A BTU is a unit of energy. There are 3412 BTU in 1 kWh.)
 - (b) Convert this to kWh per person per day.
 - (c) Convert this to W.
 - (d) Suppose we wanted to replace half of this energy with electricity from wind? (This would roughly result in a complete electrification of the transport sector, since electric vehicles are much more efficient than gas vehicles.) How much land mass would we need to devote to wind turbines in order to do so? Express your answer in a meaningful way.
 - (e) Ponder the implications of your answer.
2. COA uses around 800,000 kWh of electricity in one year.
 - (a) Express this power in Watts.
 - (b) What size terrestrial wind installation would we need shore to generate this much power? Express this area in a meaningful way.
 - (c) What size offshore wind installation would we need shore to generate this much power? Express this area in a meaningful way.