

Homework 8 Solar Power for Africa
Due Monday October 17, 2022

This week we have discussed wind power.

- a) Derive that the maximum efficiency of a wind turbine (or any power harvesting device using the wind) is about 60%?
- b) Explain the difference between a windmill and a wind turbine. What differences in design would you consider for pumping water, grinding grain, and generating electricity and how do these differences lead to different machines used for these purposes?
- c) Why can't a wind turbine in a hurricane generate an enormous amount of energy? What problems with wind turbines does your answer point out?
- d) Richard Epstein described the SWET device. Explain the "mobility problem" and derive an equation that describes the net power output from a SWET as a function of the applied voltage and the wind velocity. How would a SWET be operated in a hurricane? Could it collect enormous amounts of energy under extremely high wind velocities?
- e) Compare conventional wind turbines, vibrating beams, SWET and the EWICON device at Delft University. What are the advantages and disadvantages of these different technologies for collection of wind energy.