



Faculty of Engineering and Technology
Department of Mechanical and Mechatronics Engineering

Energy Conversion ENME 531
Homework #5 Nonreactive Energy Resources

Prob. 13.5 (Energy Conversion Systems, by Sorensen).

A wind turbine generator is designed to produce 3.5×10^6 kWh/year with a plant factor of 0.40. The design wind velocity is 45 km/hr. The conversion efficiency is 0.73 and the mechanical and generator efficiencies are 0.90 and 0.96 respectively. The ambient conditions are 100 kPa, 25°C. Calculate the required rotor diameter and the power coefficient.

Prob. 13.6 (Energy Conversion Systems, by Sorensen).

A Proposed site for a tidal power plant has an average tidal range of 8.5m. The prescribed annual average power output of the plant is 850 MW. The power plant operating efficiency is 0.10. Estimate the mean area of the tidal basin required to produce the prescribed power output.

Prob. 13.20 (Energy Conversion Systems, by Sorensen).

A south-facing solar panel is inclined at an angle of 55° from the horizontal plane. The latitude is 45° N. and the solar declination is -10 at 2 P.M. solar time the normal beam radiation is 550 W/m², and the diffuse radiation from the sky is 130 W/m². The ground reflectance is 0.20, Calculate the total radiation received by the panel.

Extra credit homework

1. Search internet for flat plate, evacuated tube, and parabolic solar collectors and give one example of commercial product for each with complete technical specifications including the useful heat and efficiency.
2. Give on example of commercial product for the following solar energy application, include the website in the answer; solar desalination system, solar cooker, solar dryer, and solar driven heat engine.