Solar Power

Problem

To explore and perhaps inhabit a new world, a way to generate power will need to be determined. Solar power may be an option. Let's begin by exploring solar panels for a typical home on Earth.

A household in the U.S. with an average daily solar irradiance of 5 kWh/m²/day is considering installing solar panels to cover its energy needs. The average daily energy consumption of the household is 30 kWh. The selected solar panels have an energy conversion efficiency rating of 20%, and overall system losses (losses due to heating of resistive components, inductive losses, etc.) are estimated at 12%.

Solar irradiance: the amount of solar energy received on a given surface area in a specific time.

Calculate:

1. The estimated daily energy production per square meter of solar panels
2. The area of solar panels required to meet the household's daily energy consumption
3. If the size of a solar panel is 1.8 m², calculate the number of solar panels needed to power this house.