6. A family uses 8 kW of power.

a. Direct solar energy is incident on the horizontal surface at an average rate of 200 W per square meter. If 20% of this energy can be converted to useful electrical energy, how large an area is needed to supply 8 kw?

b. Compare this area to that of the roof of a typical house.

Sol.

a. Power consumed by the family is, $P = 8000$ W

Solar energy received is $= 200$ W/square meter

The efficiency of conversion is $= 20$ %

let area required to generate the desired electricity is $= A$

As per the information given in the question, we have:

Power consumed is given by $=$ efficiency of conversion $\times$ solar energy received per unit area $\times$ Area

$8000 = \frac{20}{100} \times (A \times 200)$

$\therefore A = \frac{8 \times 10^3}{40} = 200\text{m}^2$

b. The area needed is comparable to roof area of a large sized house.