



# Solar Power

## Solution

1. Estimated daily energy production/m<sup>2</sup>:

$$\text{Solar irradiance} = 5 \text{ kWh/m}^2/\text{day}$$

$$\text{Panel efficiency} = 20\%$$

$$\text{Efficiency losses} = 12\%$$

$$\begin{aligned} \text{Daily energy production/m}^2 &= \text{Solar irradiance} \times \text{Panel efficiency} \times (1 - \text{Efficiency losses}) \\ &= 5 \text{ kWh/m}^2 \times 0.20 \times (1 - 0.12) \\ &= 0.88 \text{ kWh/m}^2 \end{aligned}$$

2. Required area of solar panels:

$$\begin{aligned} \text{Area of Solar Panels} &= (\text{Daily energy consumption}) / (\text{Daily energy production/m}^2) \\ &= (30 \text{ kWh}) / (0.88 \text{ kWh/m}^2) \\ &\approx \mathbf{34.09 \text{ m}^2} \end{aligned}$$

3. Number of solar panels:

$$\text{The size of a solar panel} = 1.8 \text{ m}^2$$

$$\begin{aligned} \text{Number of solar panels} &= \text{Area of Solar Panels} / \text{size of a solar panel} \\ &= 34.09 \text{ m}^2 / 1.8 \text{ m}^2 \\ &= 18.94 \\ &\approx 19 \end{aligned}$$