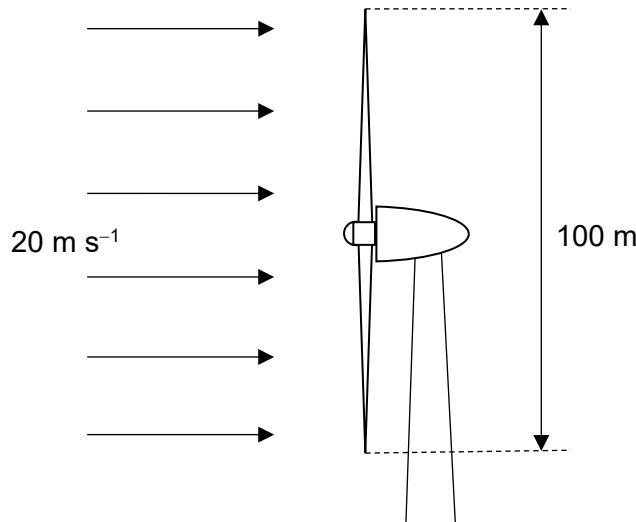


- 3 Fig. 3.1 shows a wind turbine with a diameter of 100 m. Wind of density 1.2 kg m^{-3} is incident normally on the blades of the turbine at a speed of 20 m s^{-1} .



- (a) Calculate the volume of air that passes through the area swept out by the turbine blades in one second.

$$\text{volume} = \dots \text{m}^3 \quad [2]$$

- (b) Hence, calculate the mass of air that passes through the area swept out by the turbine blades in one second.

$$\text{mass} = \dots \text{kg} \quad [1]$$

- (c) After passing through the blades, the wind speed decreases to 15 m s^{-1} .

- (i) Determine the rate of loss of kinetic energy of the wind.

rate of loss of kinetic energy = W [2]

- (ii) Using Newton's second law, determine the force exerted by the turbine blades on the wind.

force = N [2]

- (d) Explain how the answers obtained in (c)(i) and (c)(ii) are related by the equation $P = Fv$.

.....
..... [1]

