Small turbines are produce less than 1000 w/sec and have a sweep area less than 200$m^{2}$.

In order to convert kinetic energy into electrical energy, small turbines typically require a minimum wind speed of 4 m / s. Write equations to Complete Table 2., then complete Table 2. using your equations.

From the equation *P* = $C\_{p}$$\frac{1}{2}$𝞺*A*$V^{3}^{}$

$C\_{p}$= \_\_\_\_\_\_\_\_\_\_ 𝞺 = \_\_\_\_\_\_\_\_\_ V = \_\_\_\_\_\_\_\_\_ *A = 𝝅*$r^{2}$



Simplified, at each velocity

100% of hours = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Table 1. Average wind speeds for Medford**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Velocity (m/s)** | **Percent Time** | **Hours** **(Annual)** | **Velocity (m/s)** | **Percent Time** | **Hours** **(Annual)** |
| 1-4 | 77 |  | 6-7 | 3.8 |  |
| 4-5 | 8.7 |  | 7-8 | 1.9 |  |
| 5-6 | 6.5 |  | 8+ | 2.1 |  |

*Note: Percents reflect the hours between 5am and 8pm starting Jan. 1, 2018 and ending Dec. 31, 2018.*

1. Write an equation to find P w/sec P= \_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Write an equation to find P w/min P= \_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Write an equation to find P w/hr P= \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Table 2. Power generation of small turbines with a wind velocity of 4-5 m/s.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| $r^{}$ | $r^{2}^{}$ | *P (w/hr)* | *hours* | *P (w/yr)* |
| 0.5 |  |  |  |  |
| 1 |  |  |  |  |
| 1.5 |  |  |  |  |
| 2 |  |  |  |  |
| 2.5 |  |  |  |  |
| 3 |  |  |  |  |
| 3.5 |  |  |  |  |
| 4 |  |  |  |  |
| 4.5 |  |  |  |  |
| 5 |  |  |  |  |
| 5.5 |  |  |  |  |
| 6 |  |  |  |  |
| 6.5 |  |  |  |  |
| 7 |  |  |  |  |
| 7.5 |  |  |  |  |
| 8 |  |  |  |  |

**Note: Use 4 m/s for your calculations.**

Once you have completed Table 2., use the same equations to determine the electrical output of the remaining wind speeds.Use 5 m/s, 6 m/s, 7, m/s, and 8 m/s for your calculations. *(I highly recommend creating a google sheet.)*