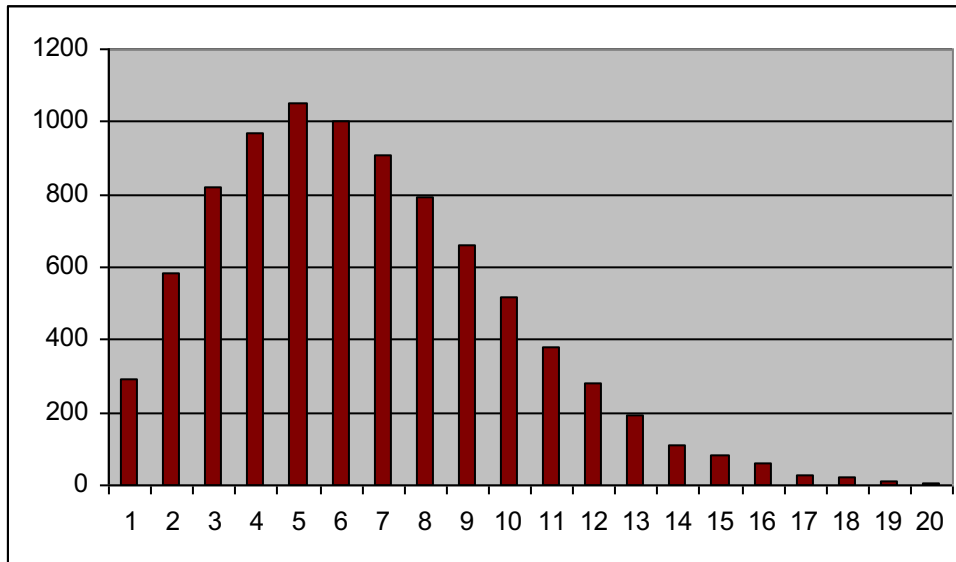


Electricity production from a wind turbine with given wind distribution at the site

- Data :**
- Nominal wind turbine power for a wind of 10 m/s: 150 kWe
(i.e. $> v_{nom} = 10$ m/s, the turbine power is :)
 - Wind velocities (Weibull-like) distribution [y hours/yr at x m/s]:



x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
y	290	585	820	970	1050	1000	910	790	660	520	380	280	190	110	80	60	30	20	10	5

- Operating range of the wind turbine: 5 m/s (cut-in speed) $\leq v \leq 25$ m/s (cut-out speed)
(i.e. below 5 m/s wind speed, power produced is :)
- Mechanical efficiency of the wind turbine: 70 % (in other words: $C_p = 0.59 * 0.7 = 0.41$)
- Air density: 1.22 kg/m³

Questions:

- What is the diameter D of the turbine?
- Evaluate the total electricity produced during a year by this turbine
- Evaluate the *mean* equivalent power of this turbine
- What is the equivalent annual load factor at nominal power?
- Calculate the wind mean velocity and mean cubic velocity (within the operating range, and for the total wind distribution).
- Estimate the Weibull c - and k -parameters from the above wind velocities distribution