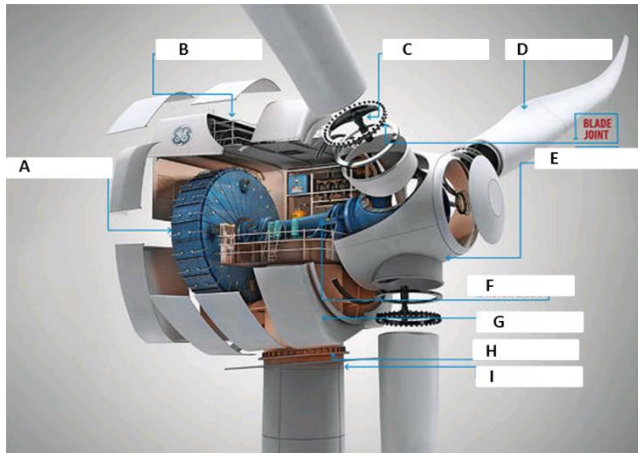


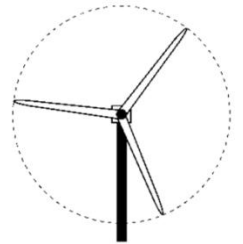
## Round: 12B



- Figure 1 (above), shows different pieces of equipment that make up an offshore wind turbine. Match the letters from the diagram with the parts below. (9 pts)

Generator	_____	Pitch Controller	_____
Electrical Circuitry	_____	Rotor	_____
Blade	_____	Tower	_____
Yaw Drive	_____	Rotor Shaft	_____
Nacelle	_____		

- The size of offshore wind turbines has steadily increased in recent years, including turbine blade diameter and turbine swept area (shown in Figure 2). The largest offshore wind turbines (with power ratings of 5 megawatts or larger) now under development have a diameter that is about 120 meters.



- Calculate (to the nearest integer) the swept area for the largest offshore wind turbines. Show your work. (3 pts)

- The potential wind power a turbine produces can be calculated by the following equation:

$$\text{Wind power} = .5 \times \text{swept area} \times \text{air density} \times \text{velocity}^3$$

Assuming the velocity for the 5 megawatt-rated wind turbine in Fig. 2 is 15 m/s and the air density at sea level is approximately 1.2 kg/m<sup>3</sup>, calculate the wind power. Show your work. (3 pts)

3. How many commercial offshore wind farms are currently in operation in U.S. waters? (2 pts)
4. Consider the wind power you calculated in Question 2. Compare your answer to the actual power rating of the turbine (5 megawatts or 5000 watts). What law describes the theory for this inefficiency? (3 pts)