

Figure 5-1. Medium-size and large wind turbines. The area swept by large wind turbines has increased steadily since the early 1980s. Today's wind turbines are 50 times larger than those of the early 1980s.

Orientation

There are two great classes of wind turbines: those whose rotors spin about a horizontal axis and those whose rotors spin about a vertical axis (see Figure 5-2. Rotor orientation). Conventional wind turbines, like the Dutch windmill found throughout northern Europe and the American farm windmill, spin about a horizontal axis. As the name implies, vertical-axis wind turbines (VAWTs) operate much like a top or a toy gyro-

scope. Vertical-axis or Darrieus wind turbines will be discussed in the next chapter. This chapter focuses on conventional wind turbines, but many of the design characteristics discussed apply to both conventional and vertical-axis wind turbines.

Conventional wind turbines must have some means for orienting the rotor with respect to the wind. Traditionally, the rotors of conventional wind turbines have been placed upwind of their towers and have incorporated some device for pointing the rotor into the wind.

With the Dutch windmill, for example, the miller had to constantly monitor the wind. When the wind changed direction, the miller laboriously pushed a long tail pole or turned a crank on the milling platform to face the windmill's massive rotor back into the wind. Later versions liberated millers from this toil by using fantails that mechanically turned the rotor toward the wind (see Figure 5-3. Fantail).

On smaller wind turbines, such as the farm windmill, the task is much easier and a simple tail vane will do. The tail vane keeps the rotor pointed into the wind regardless of changes in wind direction (see Figure 5-4 Tail vane).

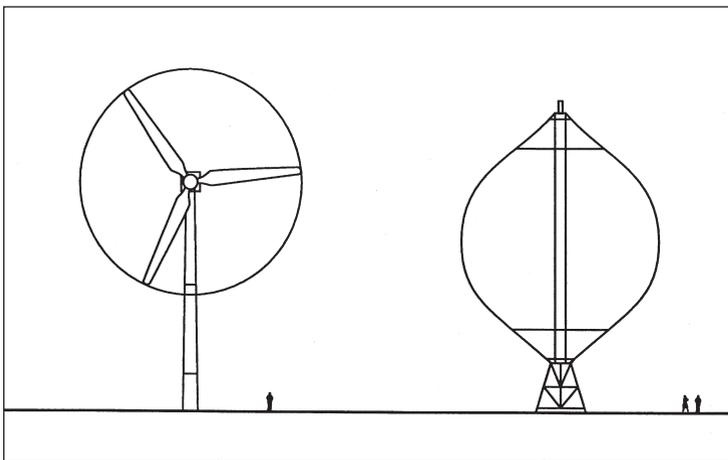


Figure 5-2. Rotor orientation. The rotor on horizontal-axis wind turbines (left) spins about a line parallel with the horizon. The rotor on vertical-axis or Darrieus wind turbines (right) spins about a vertical axis. Wind turbines of the size shown here are capable of generating 200 kW. (Pacific Gas and Electric Co.)