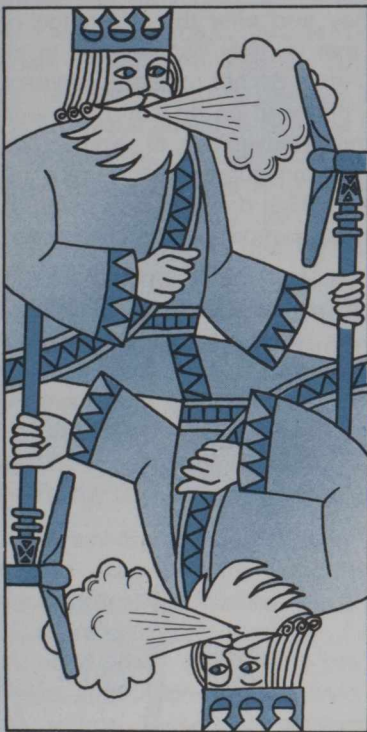


Wind Energy

WIND



QNIAM

1. THE NATURE OF WIND ENERGY

Wind is the energy of motion (kinetic energy) of the Earth's atmosphere. The source of the energy driving atmospheric circulation is the sun, so winds are actually a manifestation of solar energy.

Some of the insolation (incoming solar radiation) received by the Earth's surface is absorbed and then re-emitted to the atmosphere by radiation, conduction and convection. Unequal heating, absorption and re-emission from the surface of the Earth cause differences in the density of the air, setting up variations in atmospheric pressure. These pressure differences originate and maintain the general circulation of the Earth's atmosphere. Although only a small amount of the solar energy incident on the Earth's surface is converted into the kinetic energy of wind, this energy source is vast in comparison to man's needs for mechanical energy.

Extracting Energy from the Wind

The amount of power which a windmill can extract from a volume of moving air is dependent principally upon the area swept by the windmill blades and the velocity of the wind. These factors are not, however, of equal magnitude; the power which can be extracted from the wind increases with the *square* of the blade diameter, but it increases with the *cube* of the wind speed. This latter factor is what makes the application of wind energy technology so site sensitive. For example, a windmill which delivers 1 kW in a 10 km/h wind will deliver 8 kW in a 20 km/h wind. Detailed information concerning wind characteristics is thus essential for proper siting of windmills.

Both wind speed and direction vary considerably with height above the surface. In the lowest few metres,