

Electrical Blog No. 38 - Wind Energy

Wind power is one of the common types of renewable energy (RE) for clean electricity generation. For a commercial scale of wind generation of tens of megawatts, a group of wind turbines are built close together (either onshore or offshore) to form a wind farm, of which its output is connected to a power grid.

Wind turbines, the reverse of aircraft propeller blades, turn in the moving air and power an electric generator that supplies an electric current. Modern wind turbines use three wind blades in order to minimise forces related to cyclic loading fatigue. Wind turbines can be classified into two types, horizontal and vertical, based on the axis in which the turbine rotates. Horizontal axis wind turbines are more common than vertical axis wind turbines since they have better performance coefficient. Typical modern utility-scale wind turbines have diameters of 40 to over 90 metres and the rated outputs are from 500 kW to above 3 MW.

Despite the benefits that wind energy is clean, does not pollute air or in any way contribute to global warming, wind electricity generation is an intermittent energy source. The amount of electricity produced will very much depend on wind speeds, air density, and turbine characteristics. If wind speed is too low (less than around 2.5 m/s), then the wind turbines will not be able to generate electricity. On the other hand, if it is too high (more than around 25 m/s), the turbines will have to be shut down to avoid damage. Thus, the power generation from wind is uncontrollable. Wind energy alone therefore cannot be fully relied on as a sole source of electricity.

To improve the commercial viability of wind turbines in low wind conditions, researches are conducted to reduce cost of electricity generation for large onshore wind systems in Class 4 winds (5.8 m/s at a height of 10 m) and offshore systems in Class 6 winds (6.7 m/s at a height of 10 m).

The Electrical Blog is contributed by the Electrical Division. If you would like to know more about this topic, please contact the Division Hon Secretary, Ir K.M. LEUNG at 'kmleung@emsd.gov.hk'