Wind Energy

Slide 2: ***Wind Energy: What is Wind?***

- Winds are caused by the sun heating the earth's surface unevenly.
- Air above hot land rises.
- It is replaced by air from cooler areas.
- This movement of air is called wind.
- Winds are influenced by the rotation of the earth.
- They are also influenced by differences in temperature between land and sea.

Slide 3: ***Wind Energy: Wind Power***

- Winds travel at different speeds above the ground; winds are slowed down by contact with the earth.
- Between 10 and 15 km above the earth they form strong jet streams, which can blow at 140 km/h.
- Some jet streams reach speeds of 450 km/h.
- Wind changes from day to day, depending on the weather and the seasons.
- However, all over the world there are patterns of wind direction and wind speeds that can be utilized for generating electricity.
- Some sites are better suited for wind farms than others.

Slide 4: ***Wind Energy: Small-Scale Wind Power***

- Wind power was first utilized by sailing boats.
- Sailing ships move forward using the kinetic energy of the wind.
- The first machines to use wind were windmills.
- Windmills use the wind's kinetic energy to turn machinery.
- Early windmills were used to grind grain. The heavy sails of the windmill turned heavy millstones – that's where the name windmill came from.

Slide 5: ***Wind Energy: Small-Scale Wind Power (pictures)***

Slide 6: ***Large Wind Turbines: Using Wind to Generate Electricity***

- Wind turbines turn generators to make electricity.
- They use two or three thin blades that look like aeroplane propellers.
- These blades can be up to 50 m or even longer.
- The wind turbines are fixed on top of tall towers.
- The blades are joined by a series of gears to a generator in the top of the tower.
- If the wind is blowing, the generator will turn and produce electricity.

Slide 7: ***Large Wind Turbines***

- Wind speed increases with height above the earth's surface due to surface drag.
- It is therefore better to build taller wind turbines to utilize the higher speed winds above the earth's surface.

Slide 8: ***Wind Farms: Benefits & Concerns***

- A wind farm consists of wind-powered devices using the kinetic energy of the wind to generate electricity.

Benefits:

- Windmills of all designs do not need any fuel to run them.
- They do not produce any pollution.
- Once the wind turbines have been built, their running costs are low.
- Turbines last up to 25 years before they get worn out and need replacing.
- The scrap metal value of these turbines pay for the decommissioning cost.

Concerns:

- Windmills only work on windy days.
- They have to be shut down if the wind is blowing too hard.
- Only some parts of the country is windy enough for wind farms.
- Wind farms have to be built near the existing electricity grid (otherwise expensive power lines have to be built).
- Some people do not like wind farms because they can spoil the view and they can be noisy.

Slide 9: ***Wind Farms: Existing & Concept Turbines***

- Top pictures show existing turbines, while the bottom ones show turbine concepts.

Slide 10: ***Wind Farms in SA***

- 3.12 MW Klipheuwel experimental wind farm outside Cape Town near the R301 and N1 intersection – installed by Eskom in 2003.
- 5.2 MW Darling demonstrational wind farm near the town of Darling on the West coast. This wind farm was commissioned in May 2008 and sells its power through a wheeling agreement to the City of Cape Town Municipality.
- Single 1.8 MW wind turbine erected in the Koega Industrial Development Zone (IDZ) outside Port Elizabeth in the Eastern Cape. This turbine was commissioned in the first half of 2010 – in time to supply power for the 2010 Fifa World Cup. This turbine is the first turbine of a planned wind farm in the IDZ.