

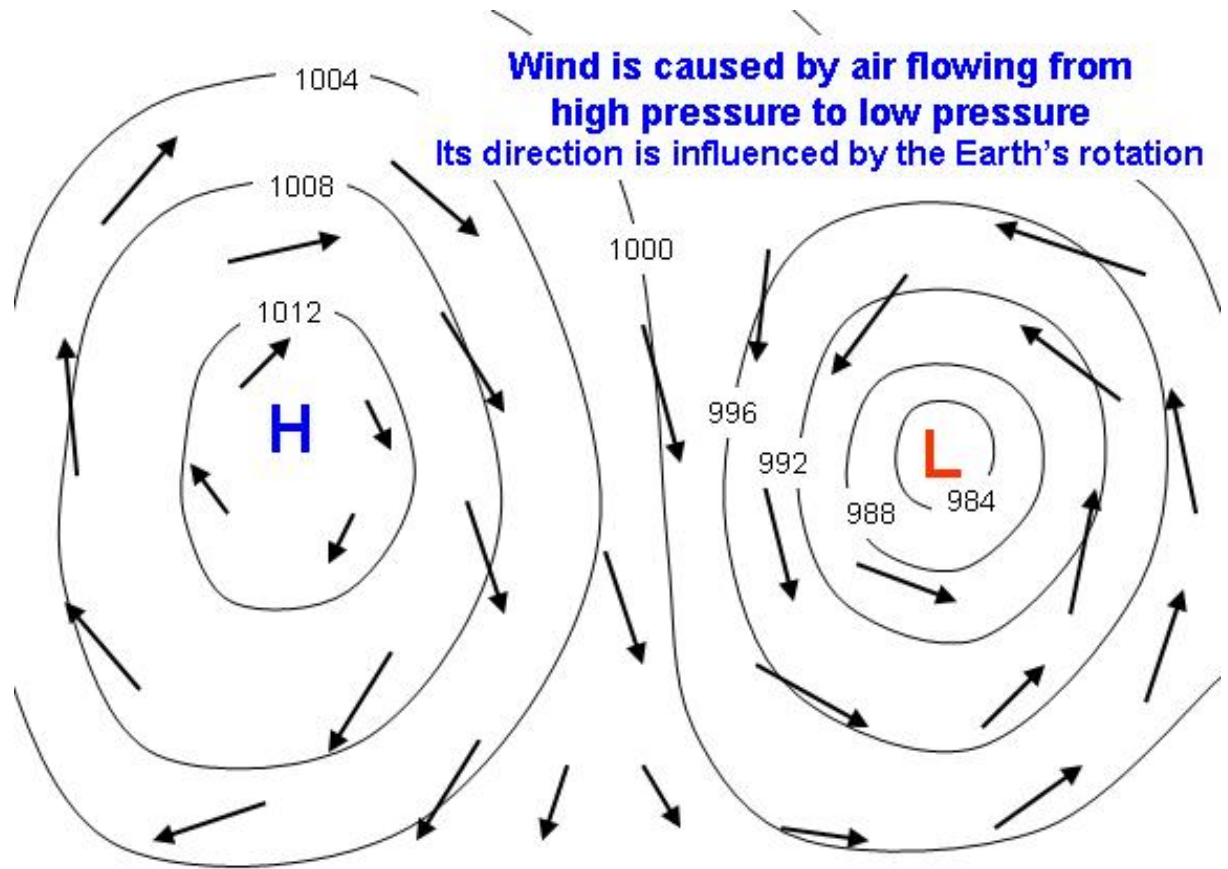
Wind Energy



RENEWABLE & SUSTAINABLE
ENERGY STUDIES

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**
- **Movement** of **air** are called **winds**



Wind

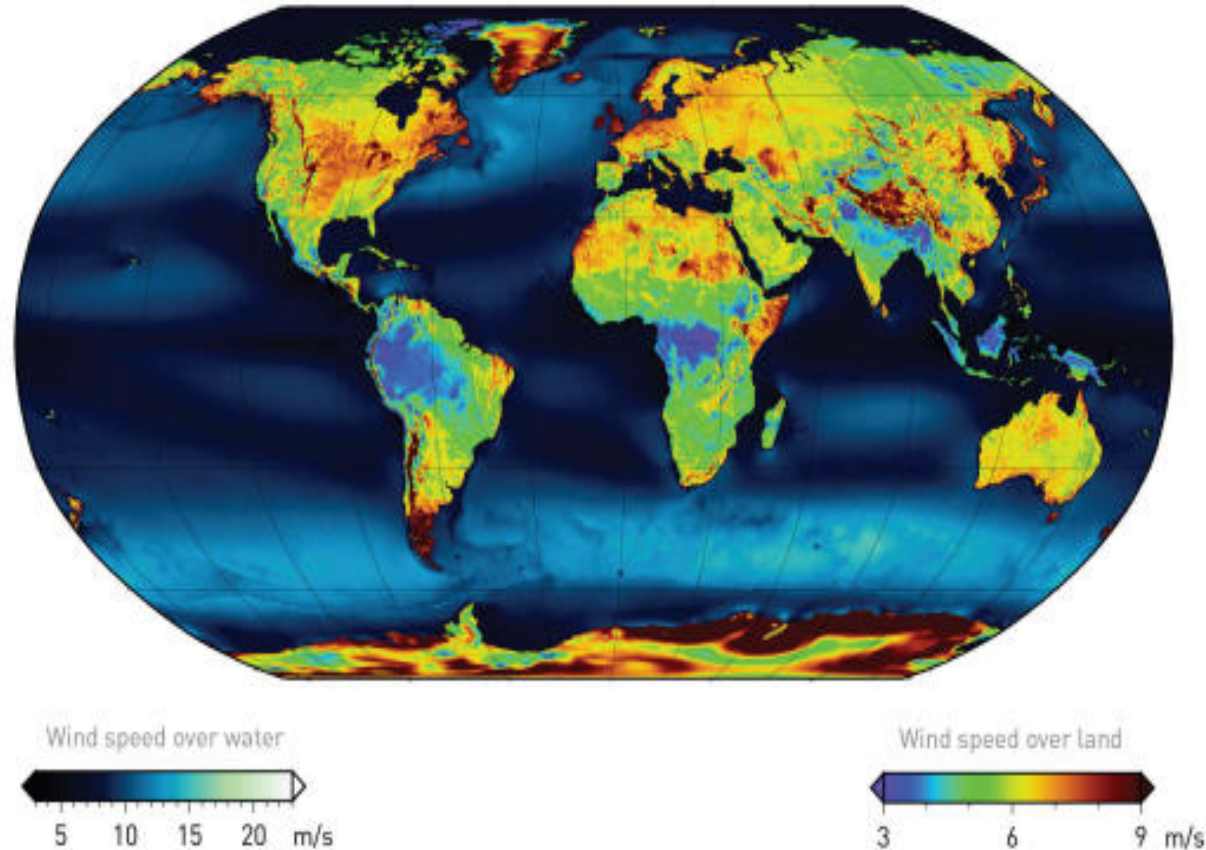
Wind Power

- **Winds** travel at **different speeds**.
- **Wind changes** from day to day, depending on the **weather** and the **seasons**.
- **Patterns of wind direction and wind speeds** can be utilized for **electricity generation**.

15km Global Wind Map at 80m

Mean Wind Speed for 2005
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developed by  **3TIER**



Wind Power

Winds

- Wind power was first use for **sailing boats**
- **Sailing ships** move forward using the **kinetic energy** of the wind
- The **first** machines to use wind were **windmills**
- Windmills use the **kinetic energy** of the wind to turn machinery
- Early windmills were used to **grind grain**



Winds



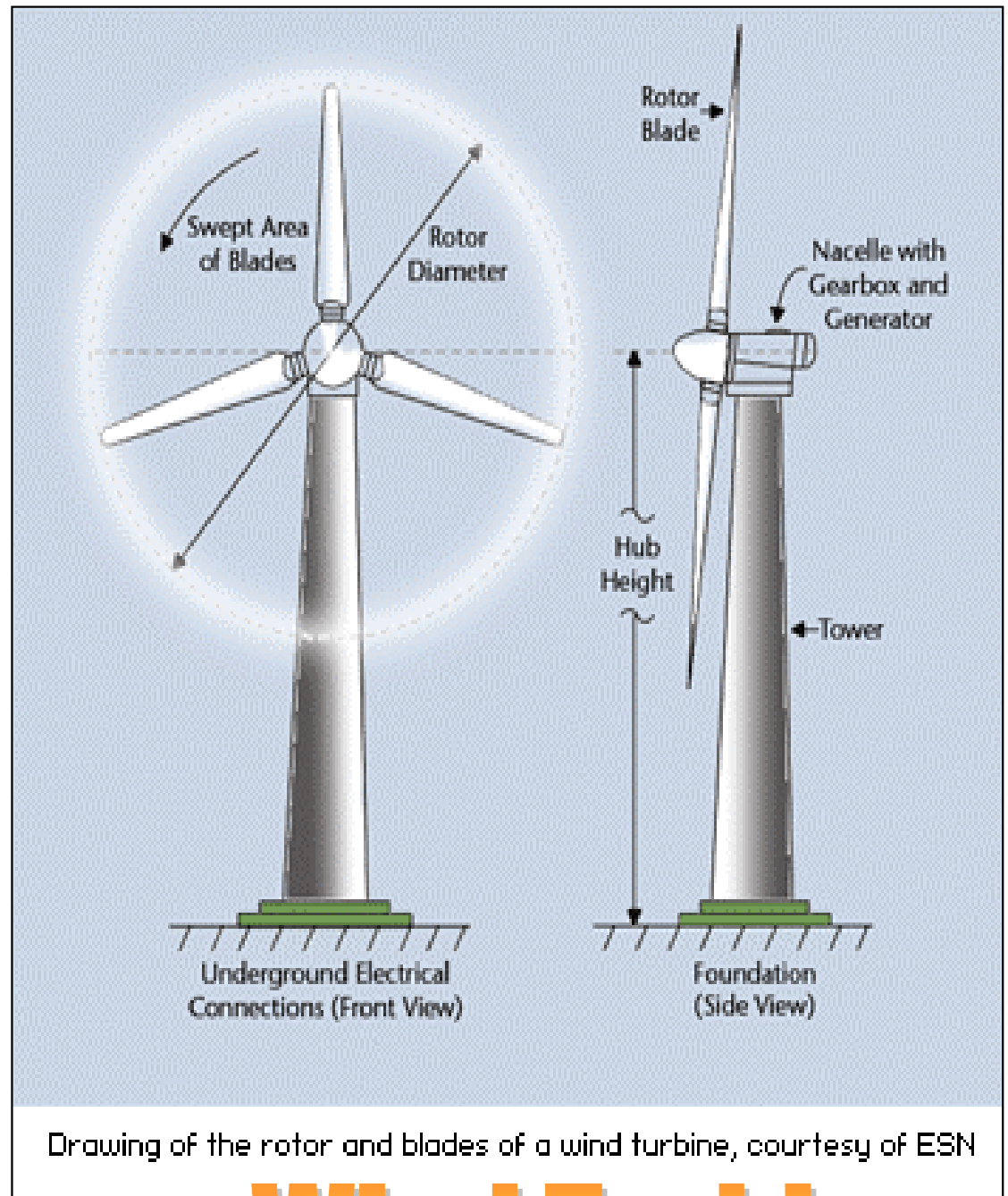
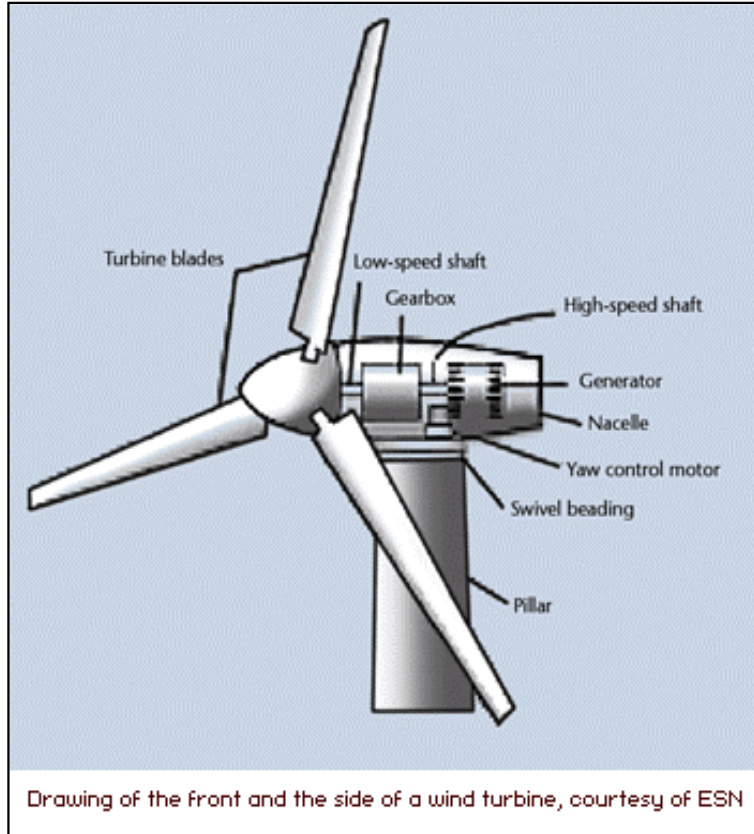
Wind Turbines

- Wind turbines turn **generators** to make **electricity**
- Use two or three **thin blades** can be up to 50m or longer
- Fixed on top of **tall towers**



Large Wind Turbines

- **Wind speed increases** with height **above the earth's surface** due to surface drag
- **Taller** wind turbines utilize the **higher speed winds** above the earth's surface



Wind Turbines

Wind Farms

Benefits

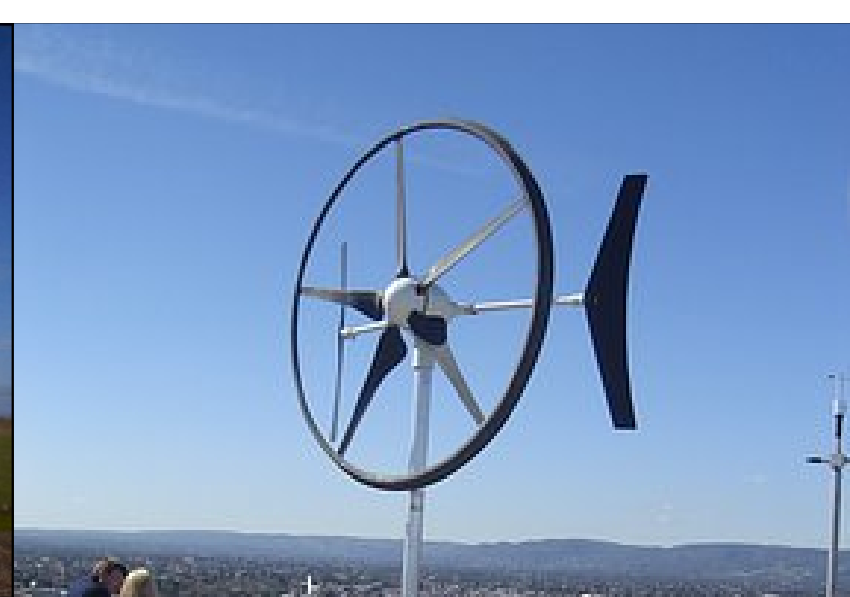
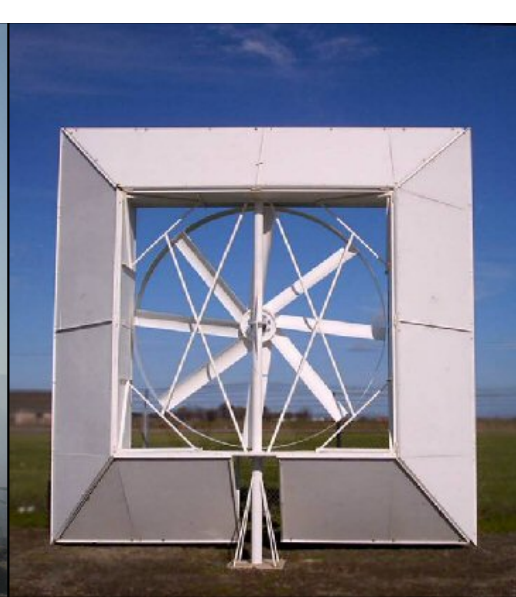
- Do not need any fuel
- Do not produce any pollution
- Running costs are low
- Turbines last up to 25 years
- The scrap metal value of these turbines pay for the decommissioning cost

Problems

- Work only on windy days
- Must be shut down if the wind is blowing too hard
- Wind farms must be built near the existing electricity grid
- Visual and noise pollution



Wind Farms



Dongtan Eco-City, Shanghai,
masterplanning and engineering by Arup.



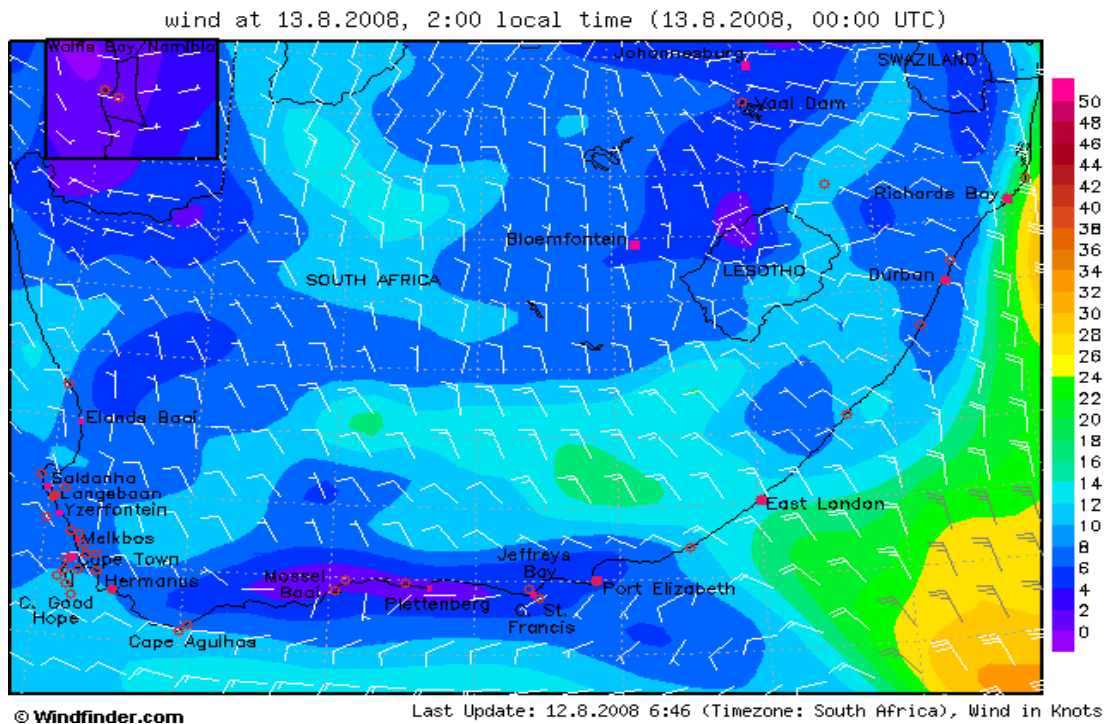
1
maglev
wind
turbine

it powers
750
thousand
homes⁶⁶

1 maglev
wind turbine
requires less than
100 acres

SA Wind Farm

- **Darling Wind Farm** produces 5,2MW
- A **100-MW** wind farm is planned to be built on the **West Coast**, near Koekenaap, in the Western Cape



SA Wind Farm