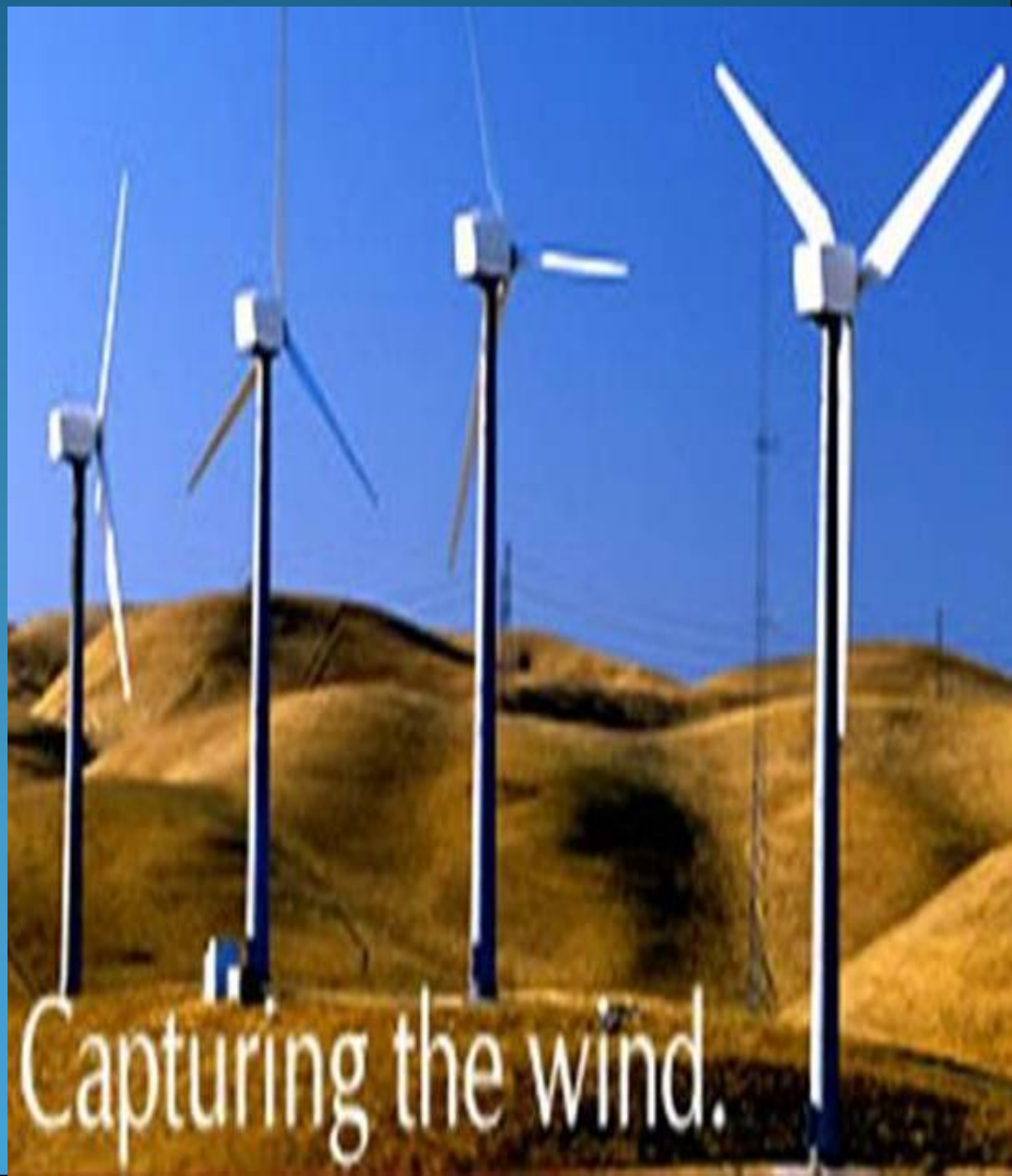
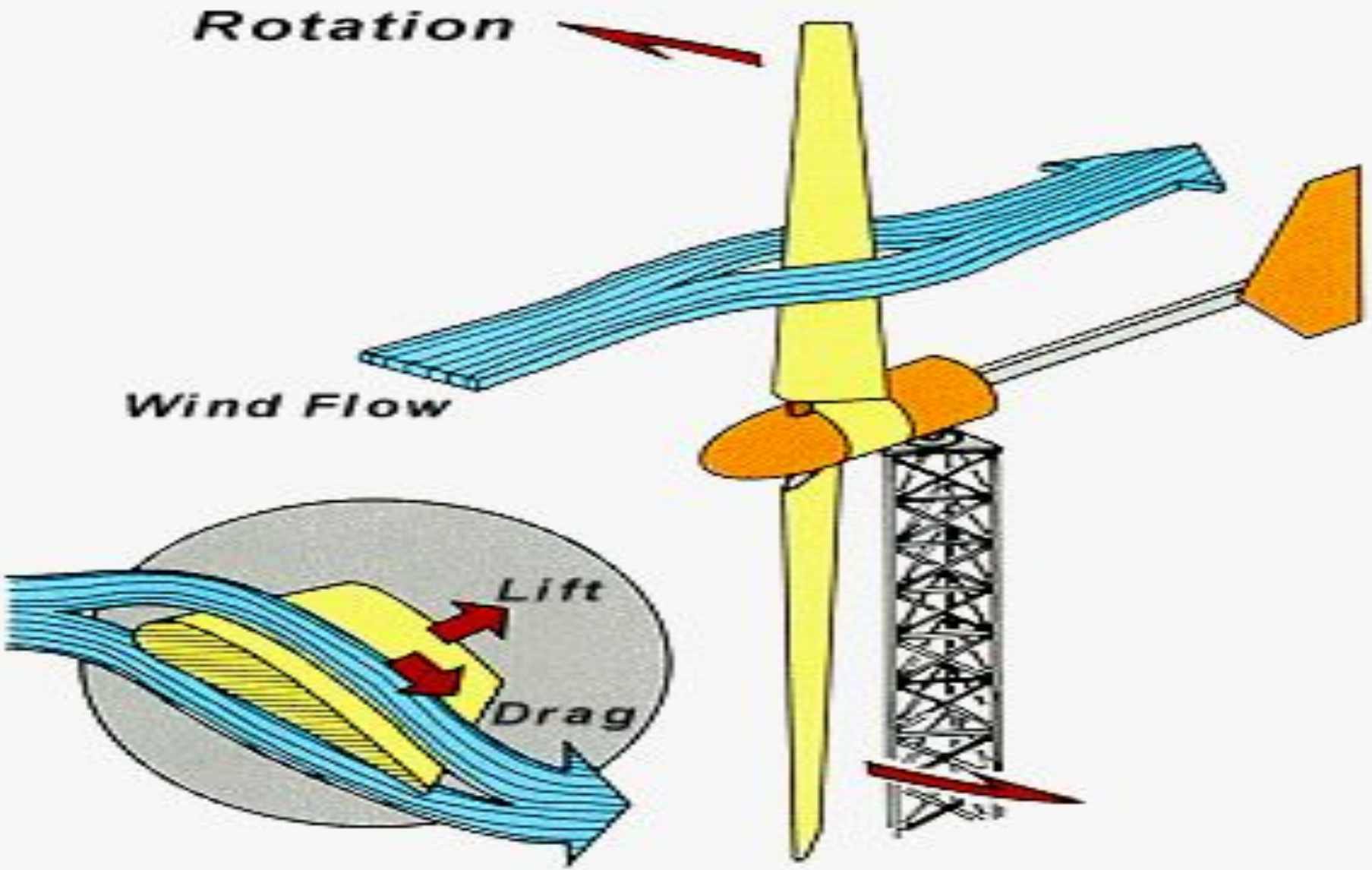
Wind Turbine Power Plant

Introduction Of Wind Turbine

A wind turbine is a rotating machine which converts the kinetic energy in wind into mechanical energy. If the mechanical energy is used directly by machinery, such as a pump or grinding stones, the machine is usually called a windmill. If the mechanical energy is then converted to electricity, the machine is called a wind generator, wind turbine, wind power unit (WPU), wind energy converter (WEC), or aero generator.



Wind Flow Throw Wing



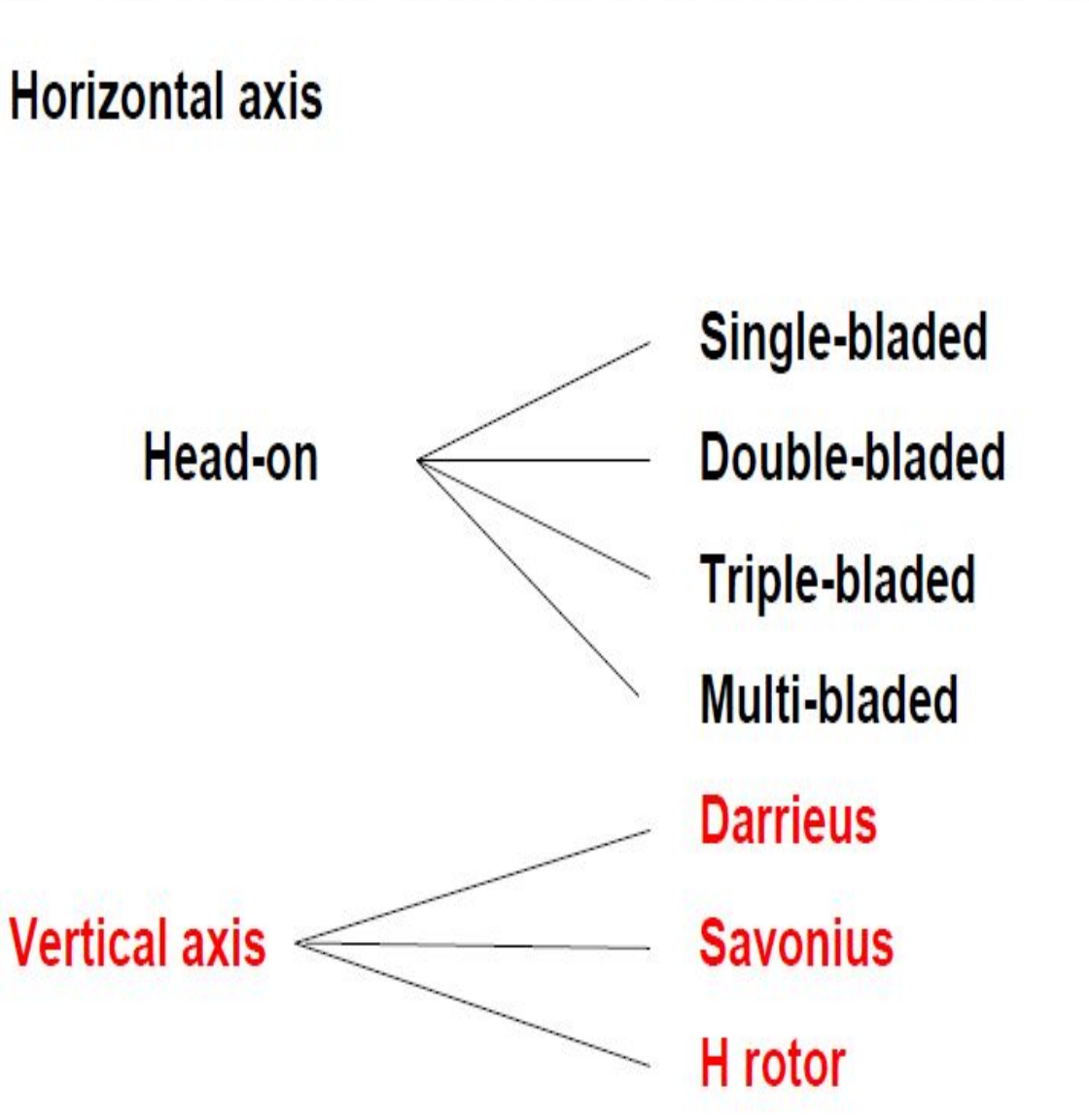
Principles of Wind Turbine Aerodynamic Lift

Wind Turbine Classification

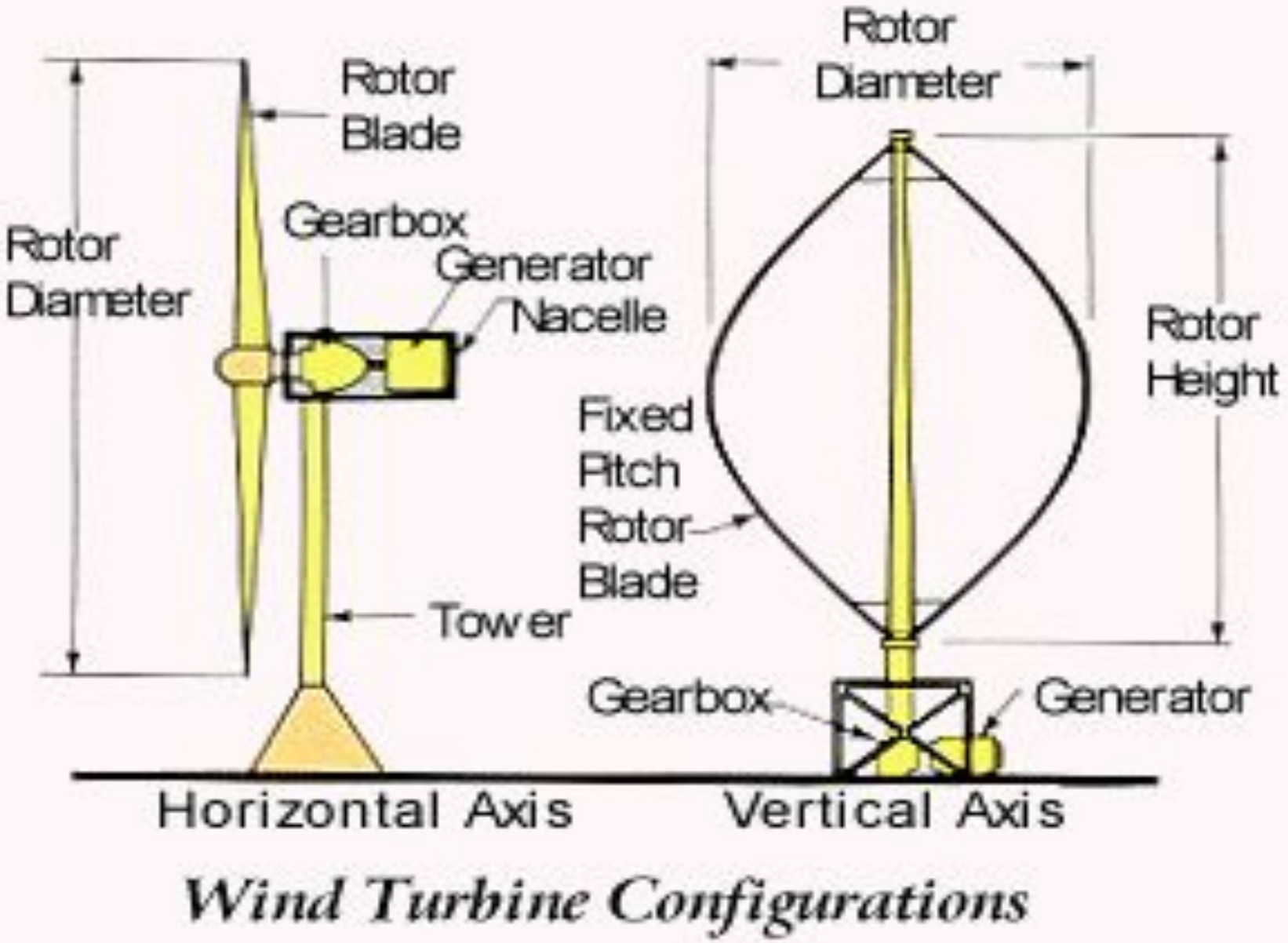
Wind turbines can be separated into two types based by the axis in which the turbine rotates.

Turbines that rotate around a Horizontal axis are more common.

Vertical-axis turbines are less frequently used.



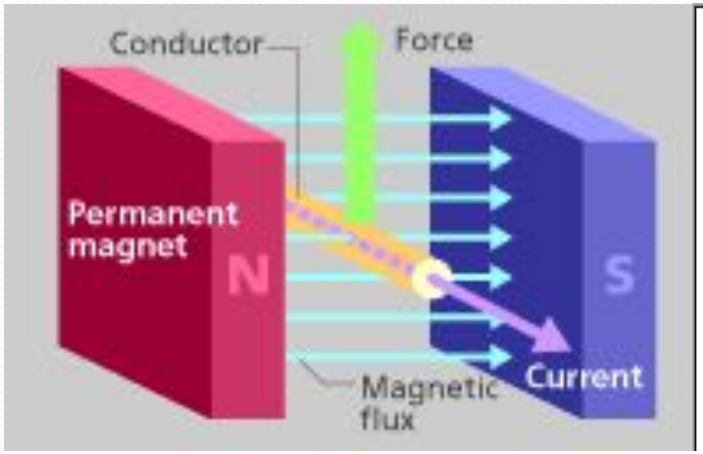
Types of Wind Turbine

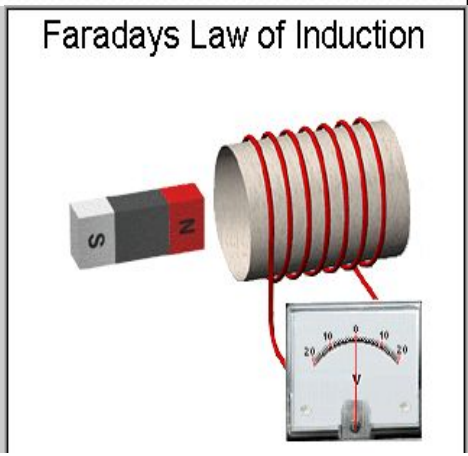


Wind Turbine Configurations

FARADAY'S LAW OF ELECTROMAGNETIC INDUCTION

Faraday's law of induction describes a basic law of electromagnetism, which is involved in the working of transformers, inductors, and many forms of electrical generators.



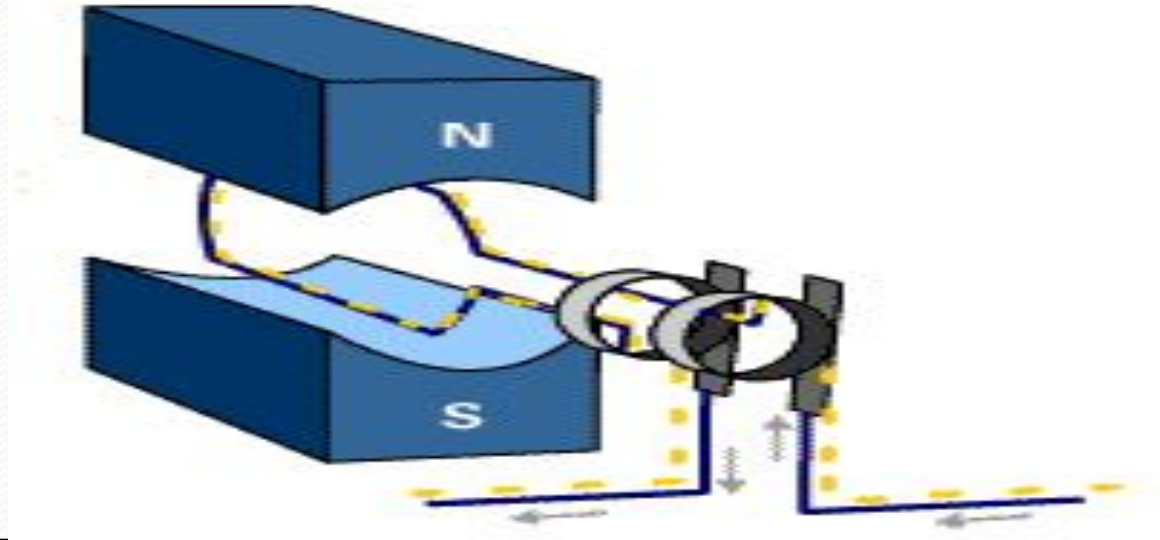


STATEMENT.

WHENEVER THERE IS VARIATION OF MAGNETIC FLUX LINKED WITH A COIL AN EMF IS INDUCED IN IT

OR

AN EMF IS INDUCED IN A CONDUCTOR WHENEVER IT CUTS THE MAGNETIC FIELD



Sizes and Applications

Small (≤10 kW)

- Homes
- Farms
- Remote Application

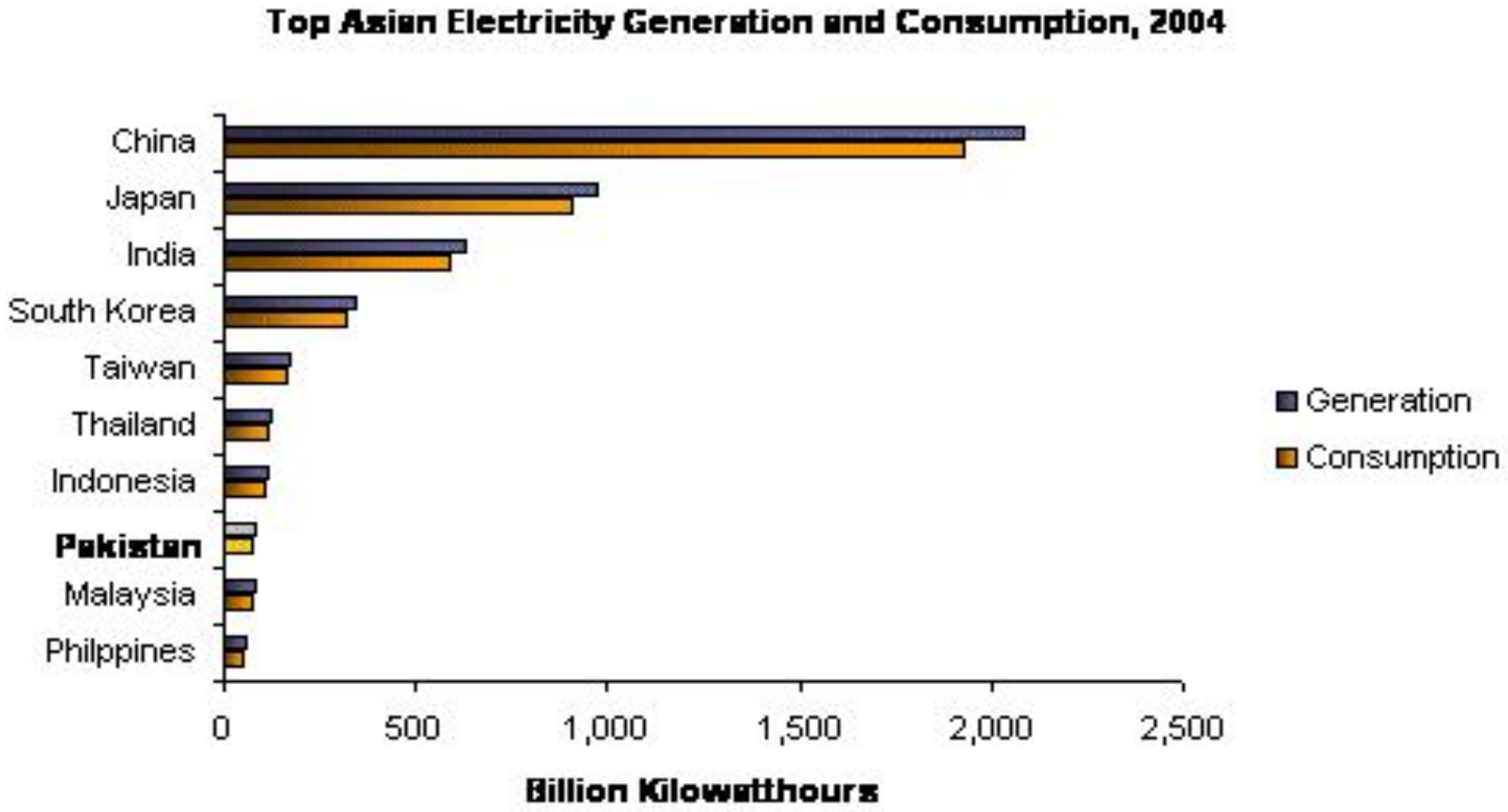
Intermediate (10-250 kW)

- Village Power
- Hybrid Systems
- Distributed Power

Large (660 kW - 2+MW)

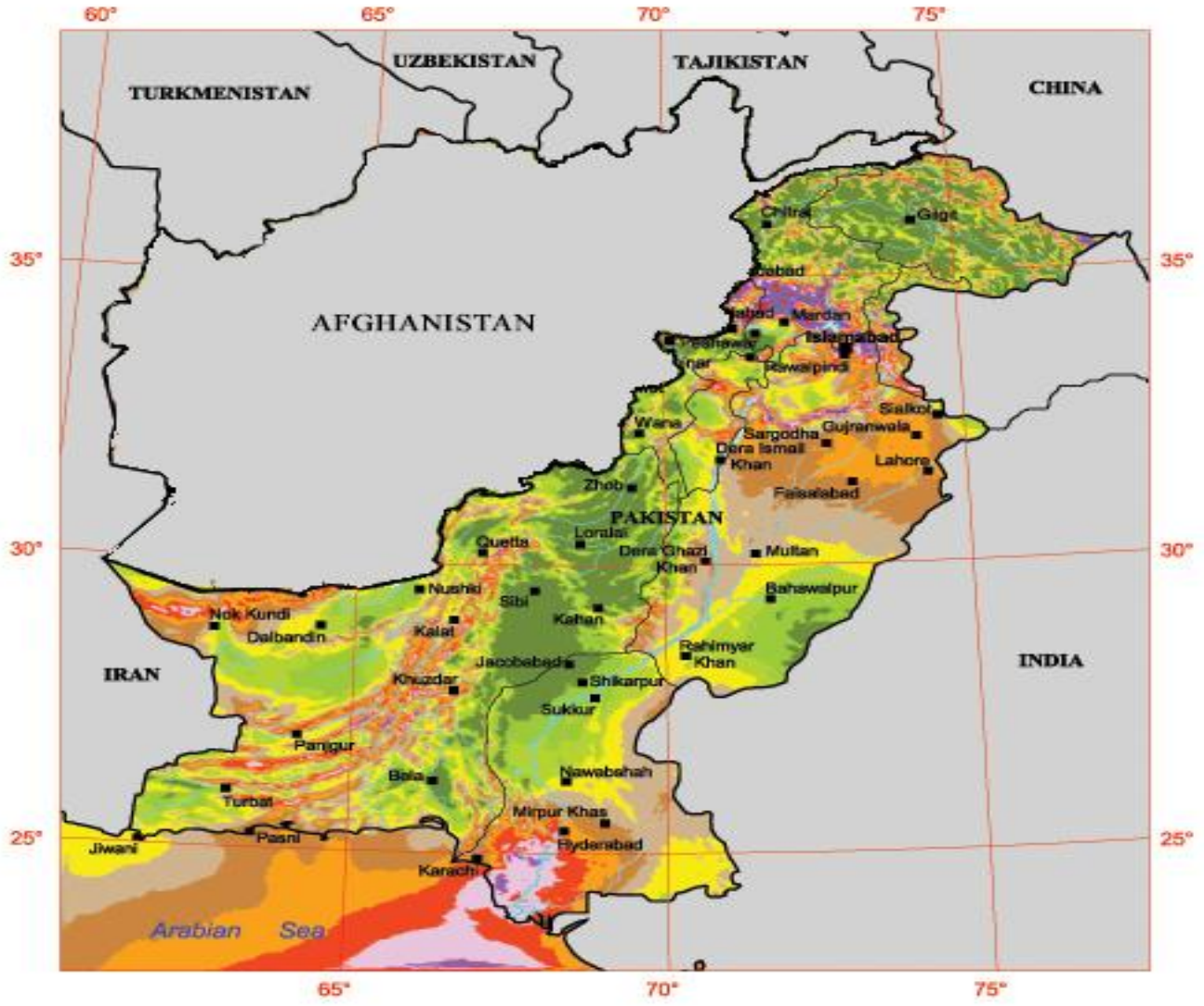
- Central Station Wind Farms
- Distributed Power
- Community Wind

Top Asian Electricity Generation And Consumption



Source: EIA *International Energy Annual 2004*

Wind Power Classification in Pakistan



Pakistan
April Average Wind Speed
50 m Height

The wind speed estimates for this map were produced by 3TIER Environmental Forecast Group using their their numerical mesoscale modeling system and historical weather data. The resolution of the gridded wind speed estimates is 2.5 km.

PMD

Wind Speed m/s

12.5
10.0
9.0
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
0

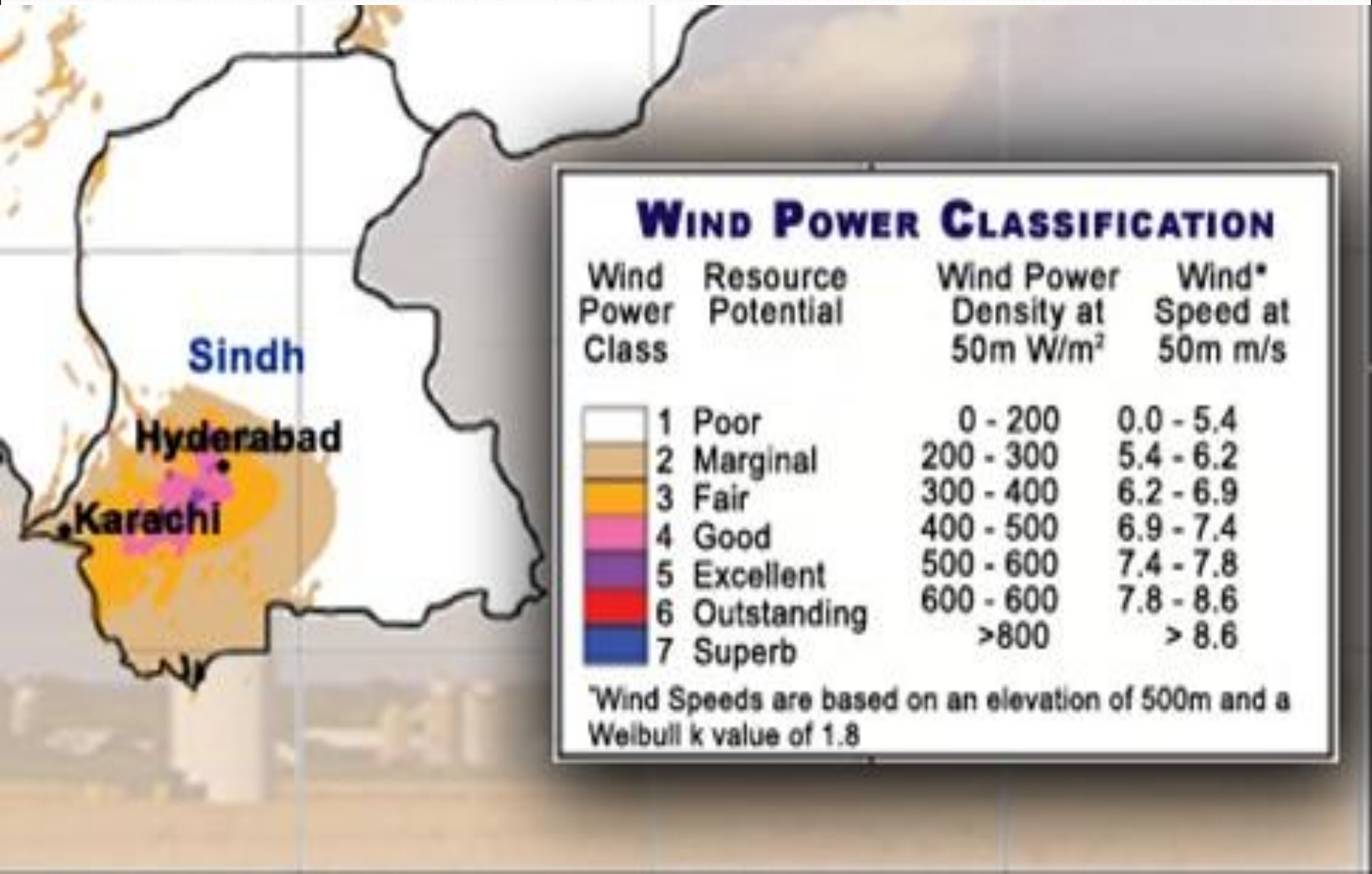
100 0 100 200 300 400 500 Kilometers

USAID
FROM THE AMERICAN PEOPLE

NREL

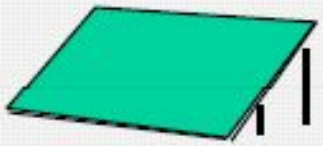
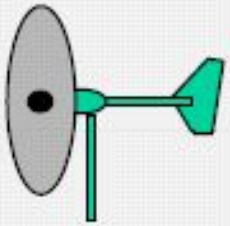
U.S. Department of Energy
National Renewable Energy Laboratory

Wind Power Classification in Karachi, Sindh



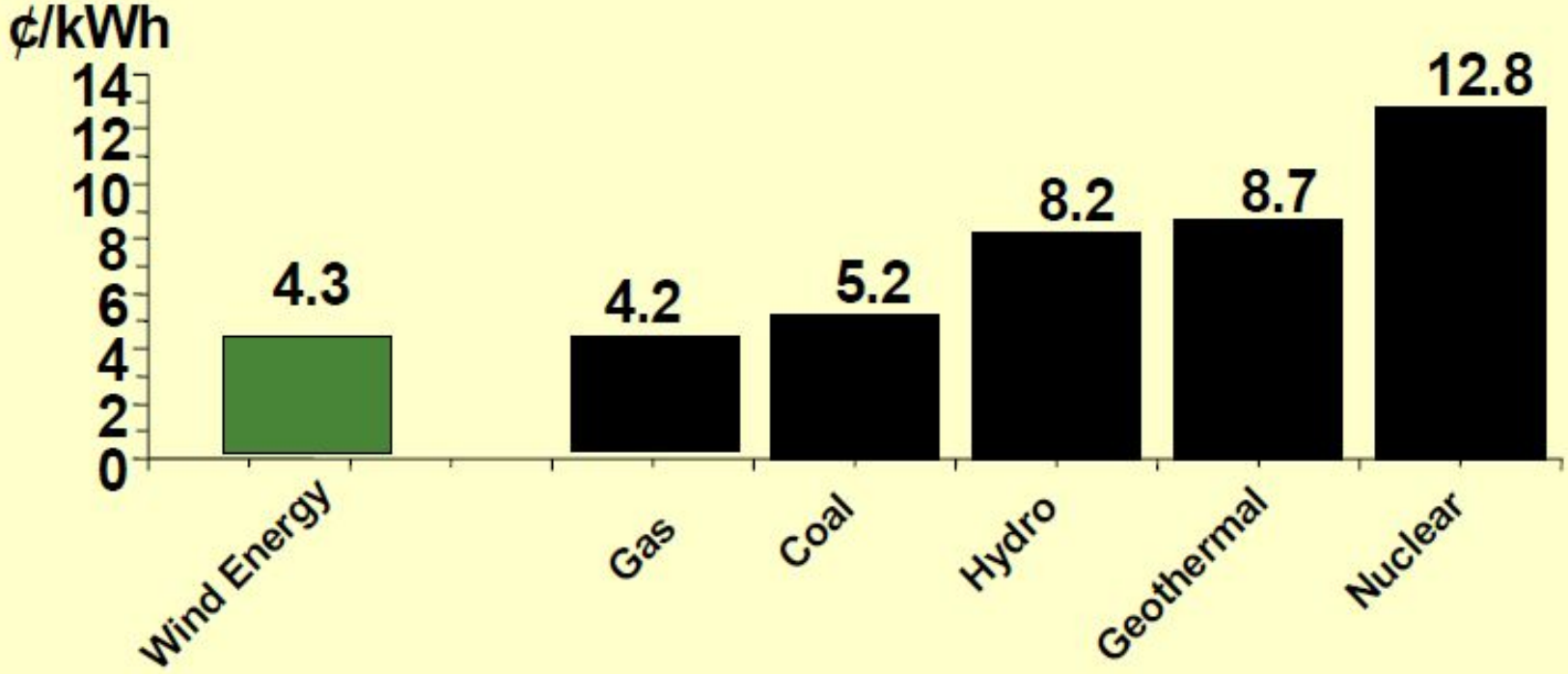
Clean Distributed Generation

Renewable for Homes, Farms, and Businesses

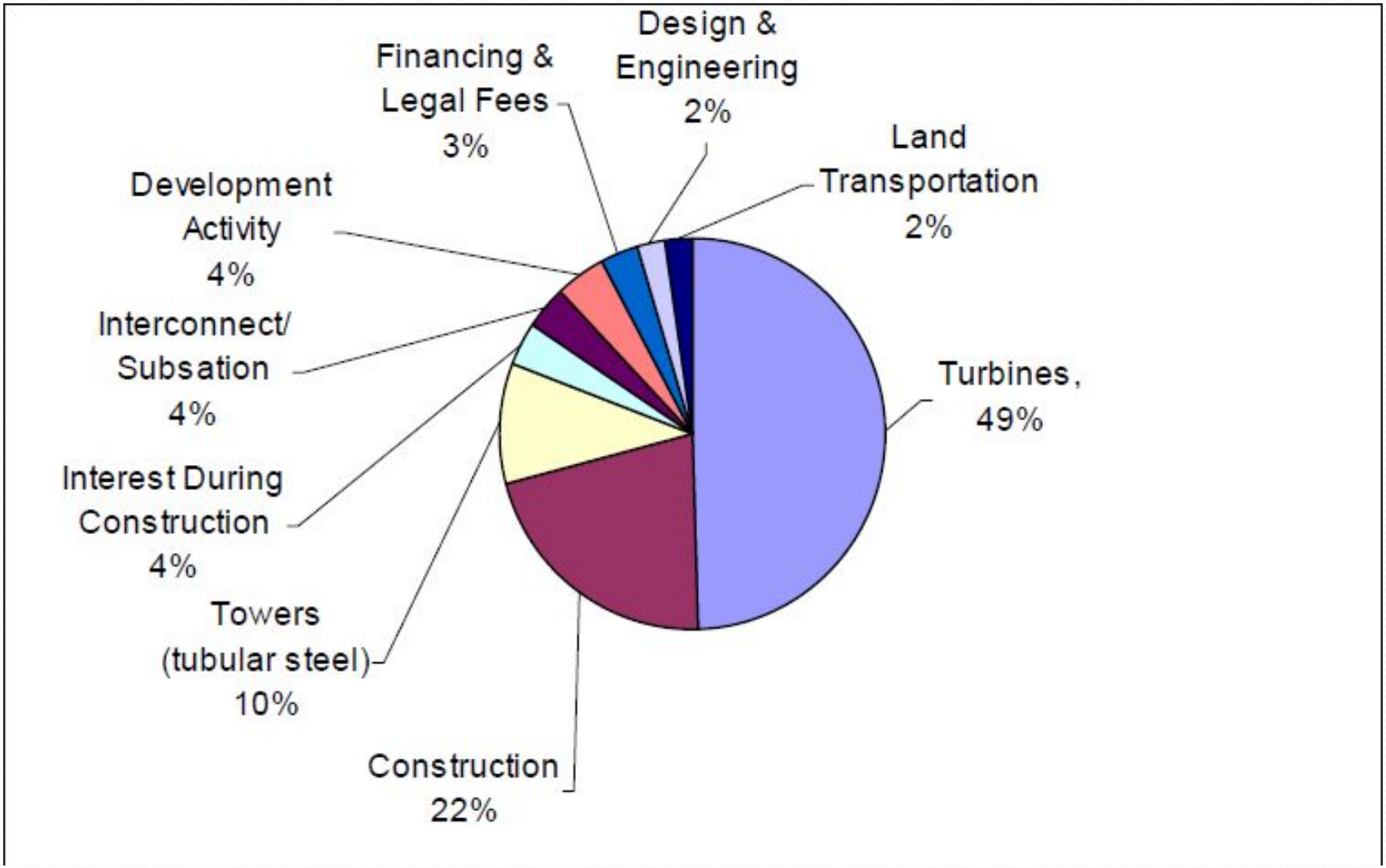
Status of the Technologies	 Photovoltaics	 Solar Thermal	 Small Wind
Status	Commercial	Demo	Commercial
Installed Cost	720 PKR / Watt	800 PKR / Watt	320 PKR / Watt
Payback Period	30 Years	30+ Years	15 Years
Cost Potential	240PKR in 2010	?	120 PKR in 2010
Typical Site	Suburban	Southwest	Rural
Available Resources	Poor - Good	Poor - Good	Poor - Great

Economics of Wind Energy

Wind Energy Cost Competitiveness



Construction Cost Of Wind Turbine Elements



What are the Advantages?

- Depending on the delivered fuel cost and the wind resource, the payback can be in the range of 2 – 4 years.
- The operating life of the wind turbine is 30+ years. A secondary benefit is a 70 – 90% drop in emissions, such as carbon dioxide and particulates.
- On a “per kWh” basis a small diesel generator produces 3 times the pollution of a coal power plant.
- Wind power has no pollution at all.

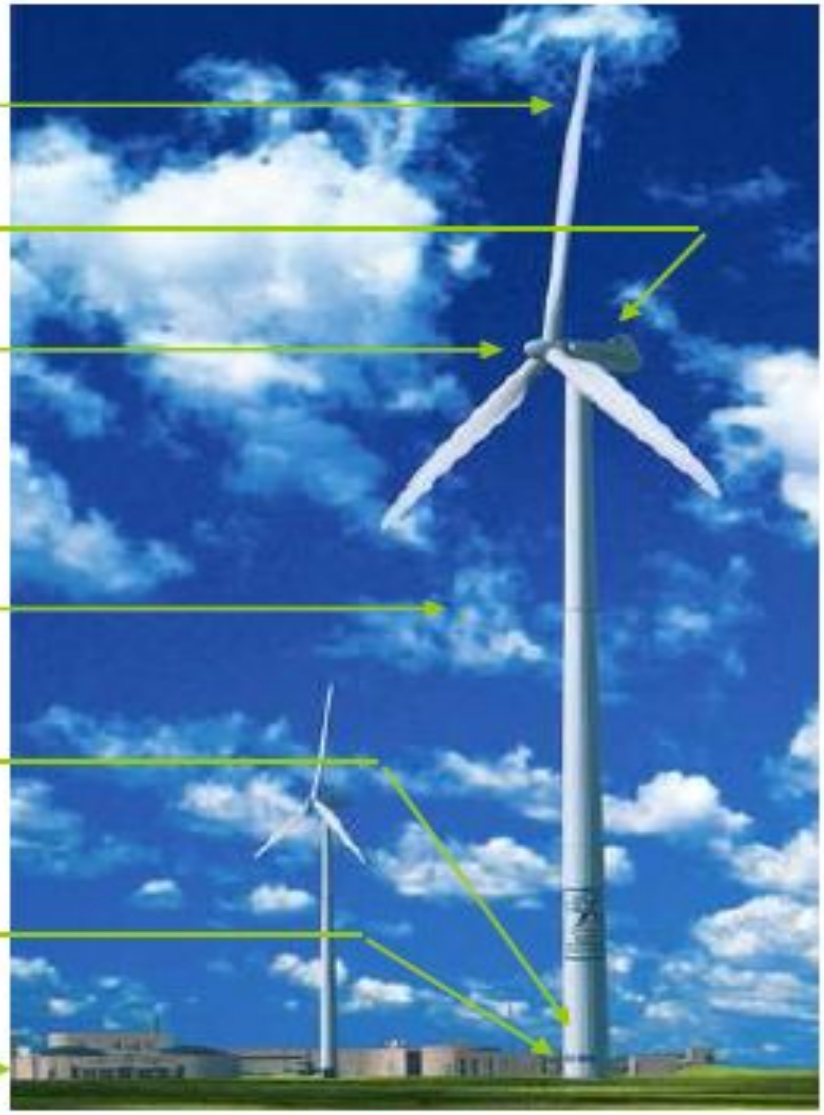
Advantages of Wind Power

- Environmental
  - –No air pollution
  - –No greenhouse gasses
  - –Does not pollute water with mercury
  - –No water needed for operations
- Resource Diversity & Conservation
  - –Domestic energy source
  - –Inexhaustible supply
  - –Small, dispersed design reduces supply risk
- Cost Stability
- Economic Development
  - –Expanding Wind Power development brings jobs to rural communities
  - –Increased tax revenue
  - –Purchase of goods & services

Free-standing Wind Turbines

Wind Turbine can be build on the sea

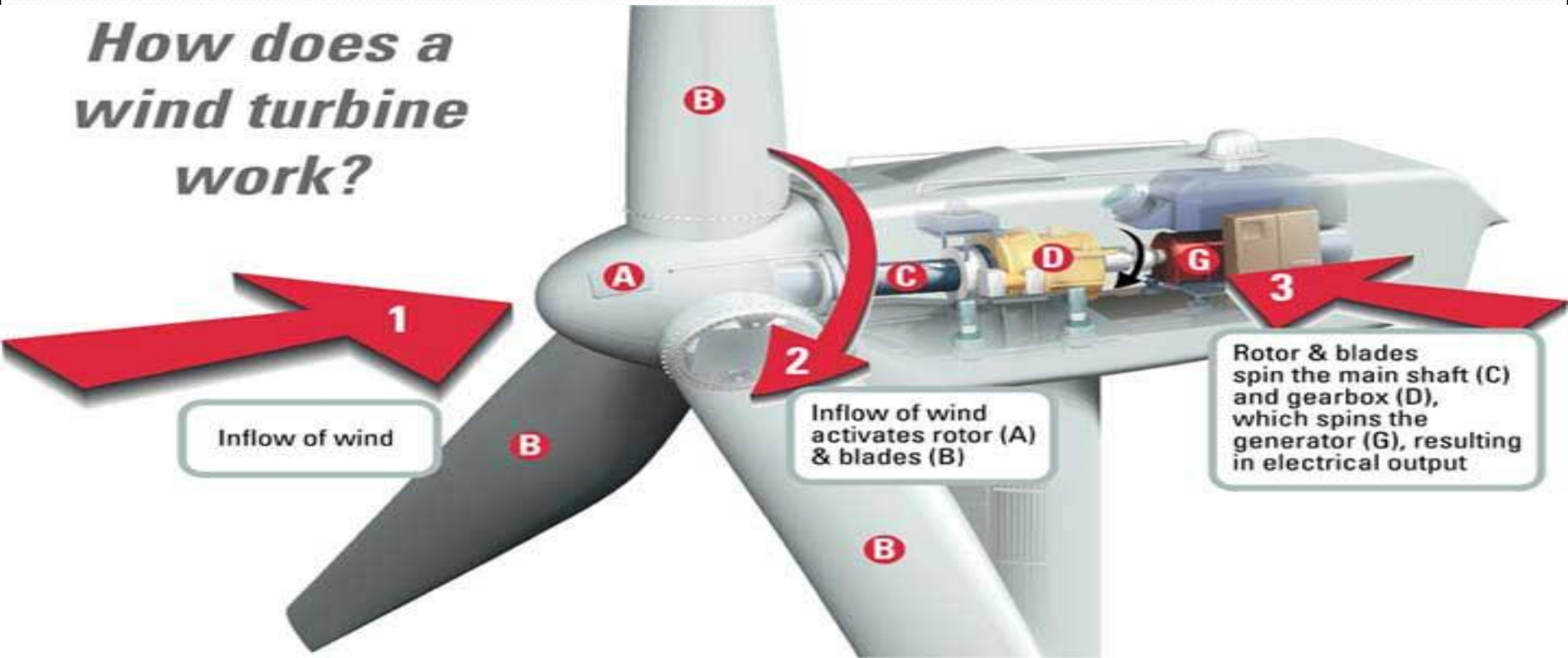
Modern Utility Scale Wind Turbines



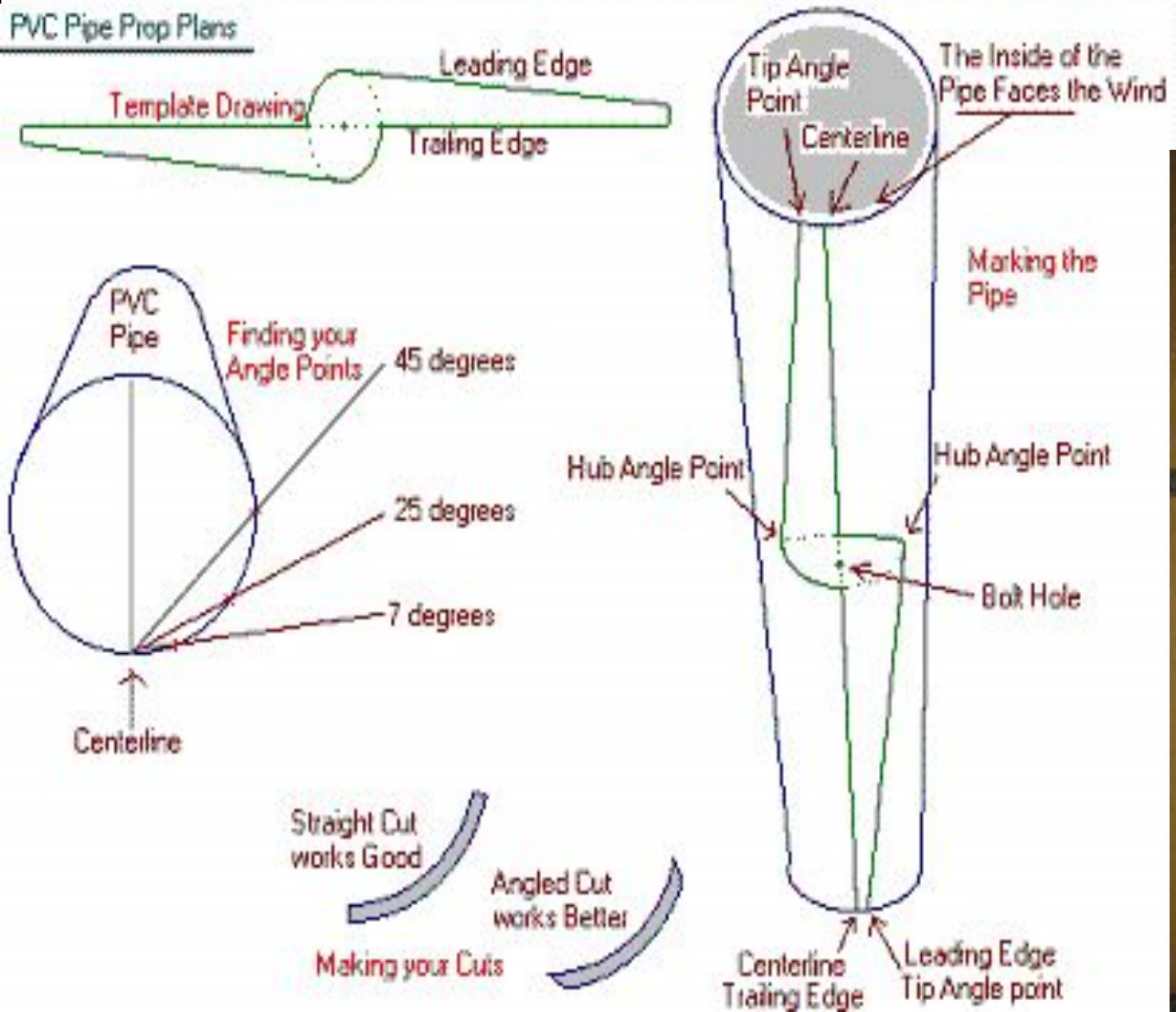
Generating Electricity

One of the most popular uses of wind turbines is to generate electricity. To make electricity, the shaft of the turbine must be connected to an electrical generator. Through gearboxes, the generator converts the mechanical energy of the spinning turbine shaft into electricity.

Generators are small and enough that they can be housed under an light aerodynamically designed cover at the top of the pole or tower. Wires running down the tower carry electricity to the grid, batteries or other appliances, where it is stored, and/or used.



Wing Structure and Designing



AFTER CUTTING THE PVC PIPE WE GET THESE WINGS

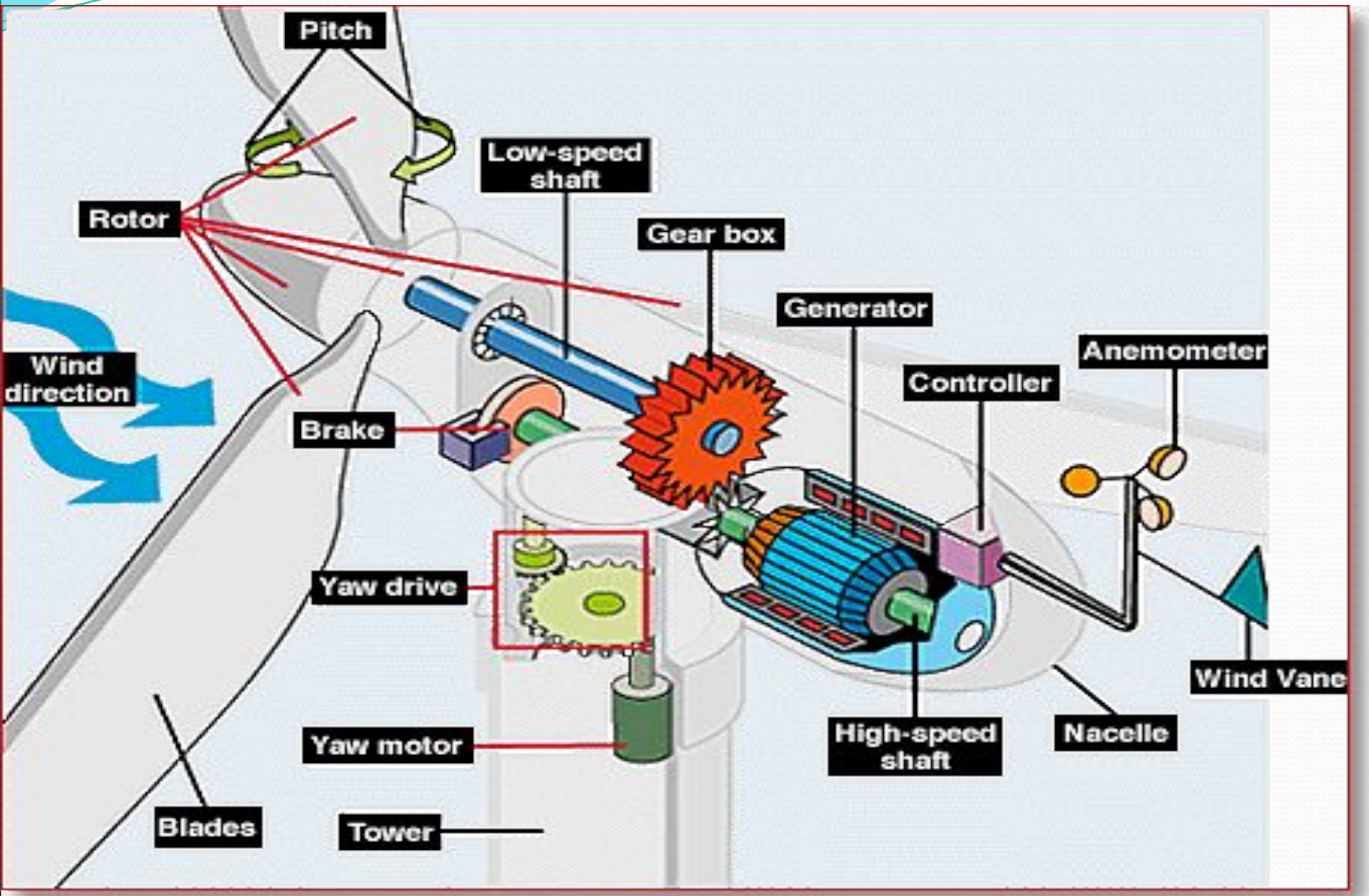
Basic Materials & *Constructional Procedure*

1 Wind Potential Material.
2 Iron pipes (for Supporting the Stand
3 Insulated Magnetic Wire.
4 Magnets.
5 Lighting Material.
6 Hardware Material.
7 Insulation Liquid

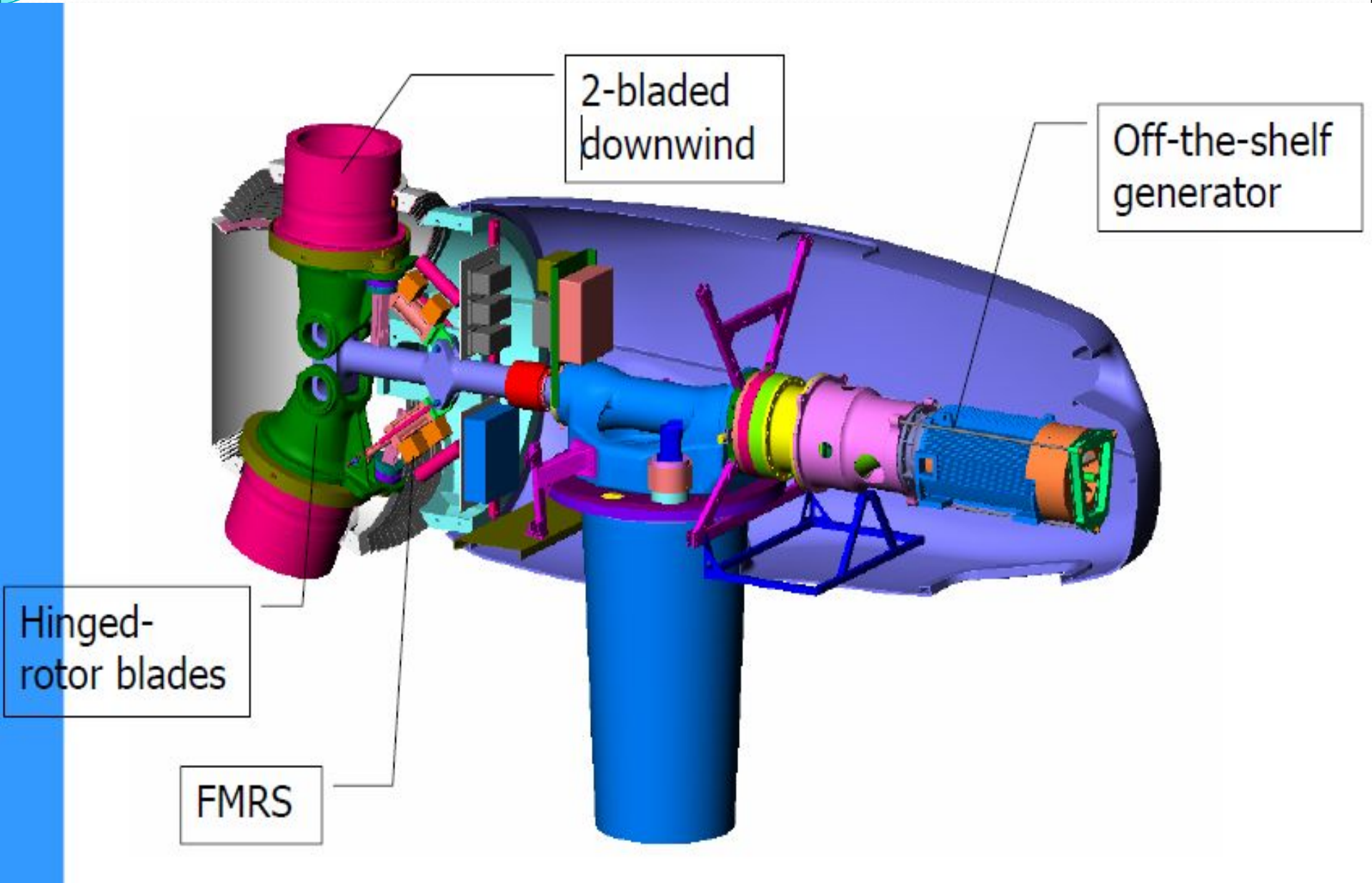
1 Making a Wind Wing with Foundation.
2 Making an Alternator for Generating a Current.
3 Making a Power Supply.

4 Distribution of Supply.

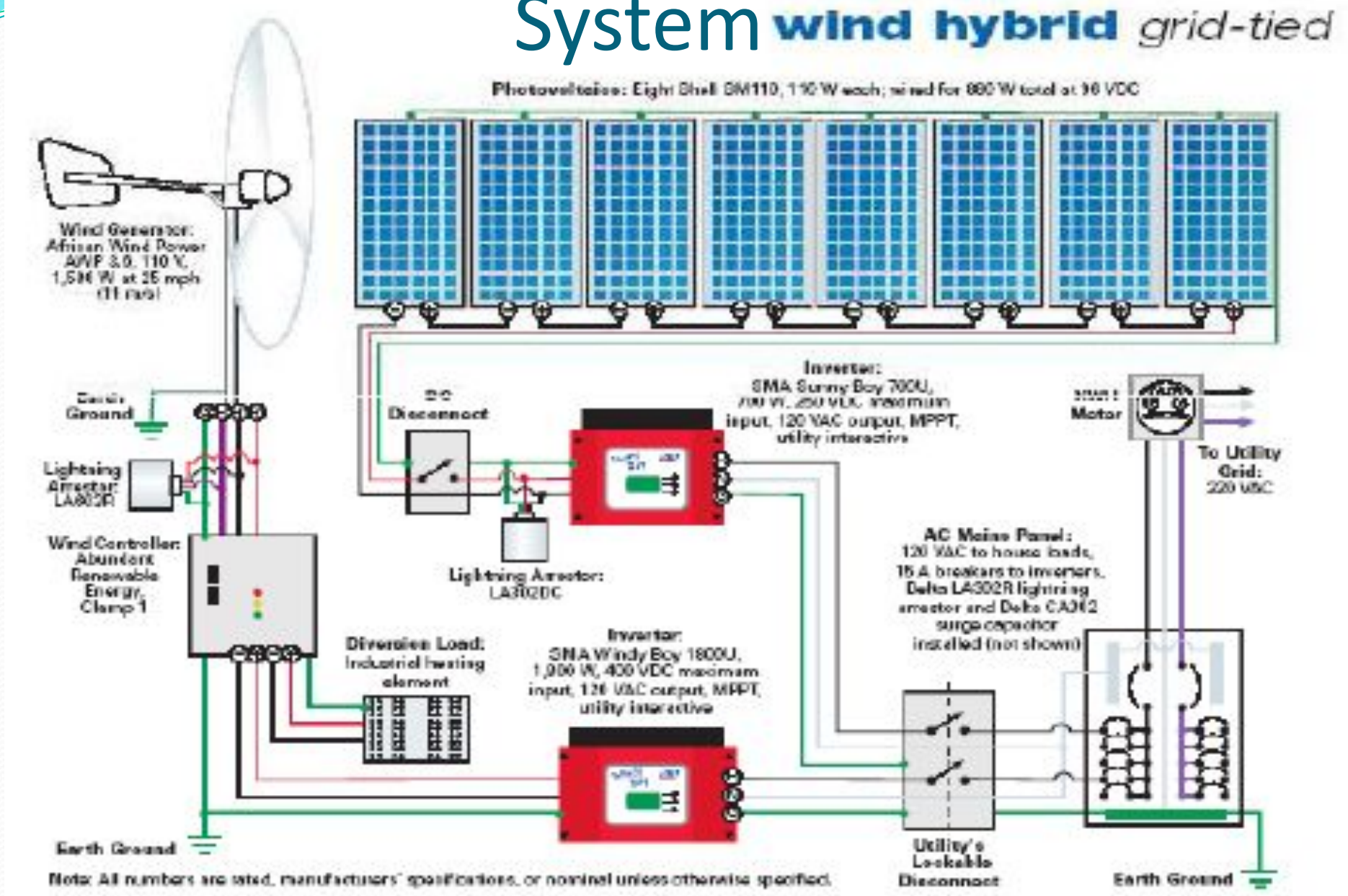
Components of Wind Turbine



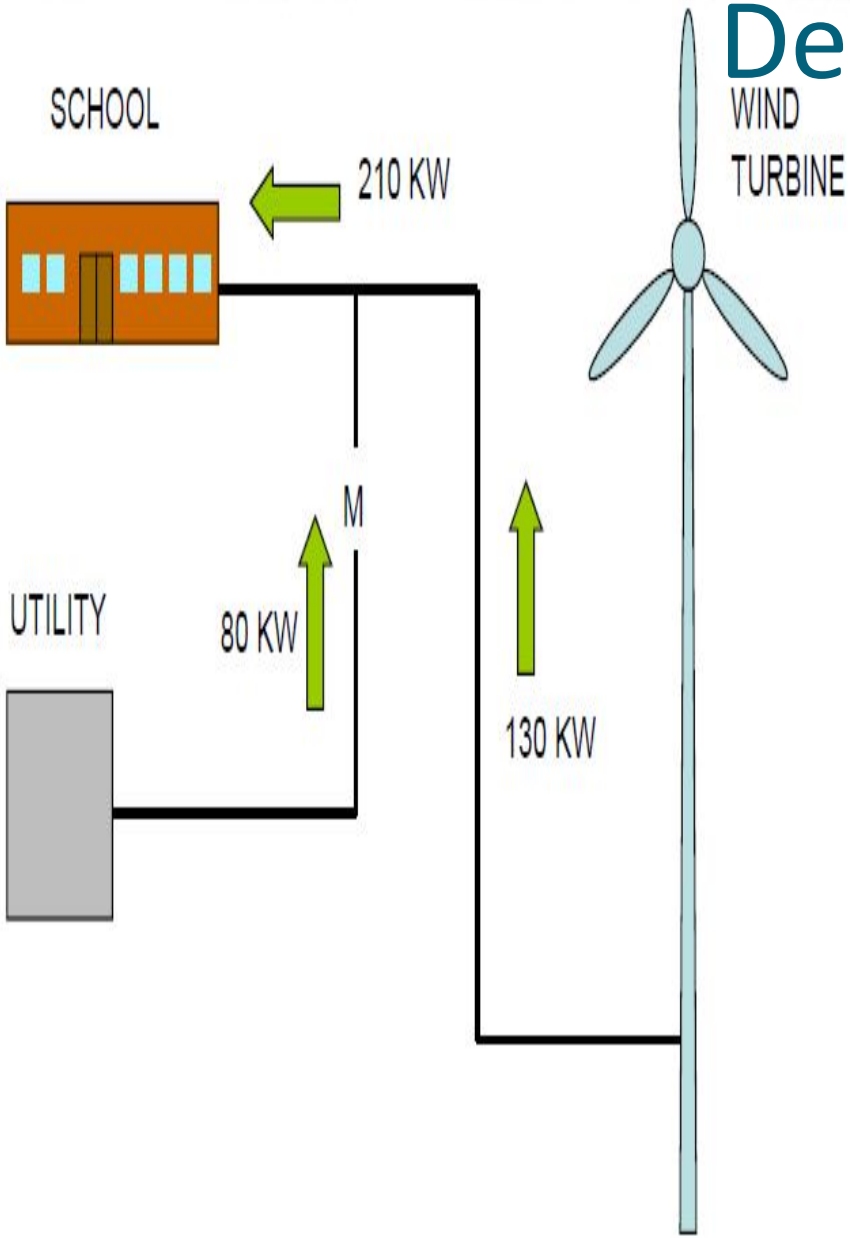
Wind Turbine Layout

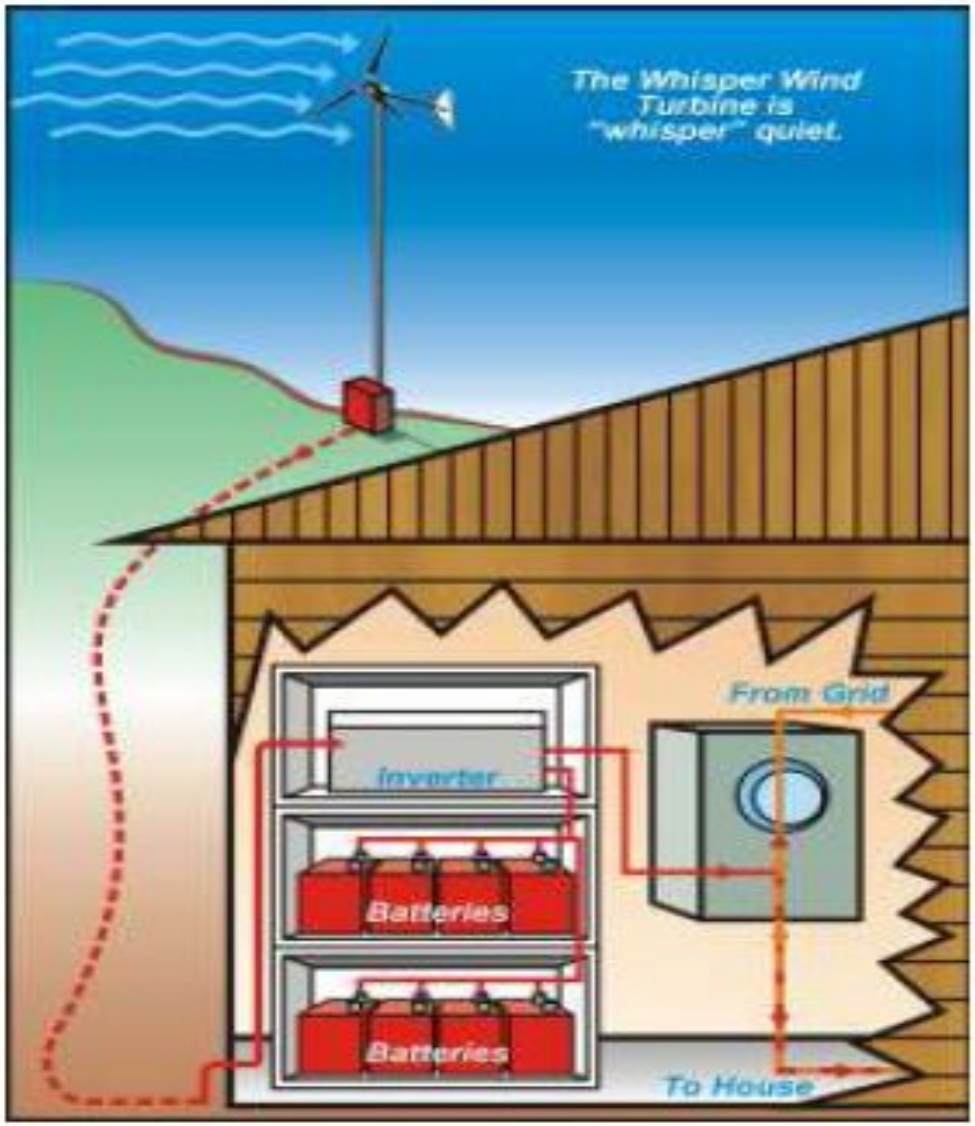


Components of a Wind Turbine System



On-site Generation to Offset Demand





Wind speed depends on following Factors

energy = power x time and density

Power in the Wind = $\frac{1}{2} \rho A V^3$

Wind Speed Can be measure by Anemometer

An Anemometer is a wind speed measuring device. For anyone interested in wind power, and using the wind to generate electricity for their home, an anemometer in an indispensable piece of equipment. Knowing the direction of the prevailing wind, the average wind speed at a particular location, and the strength of gusts is very useful when selecting and positioning a wind turbine generator optimally. For as little as £20-30 (in Pakistani rates 2500) you can purchase an accurate digital handheld anemometer that will display the wind speed in mph, kph, knots, or meters/sec.

Wind power in Pakistan

Pakistan is building wind power plants Gharo, Keti Bandar and Bin Qasim in Sindh. The government of Pakistan decided to develop wind power energy sources due to problems supplying energy to the southern coastal regions of Sindh and Balochistan, the project was undertaken with assistance from the government of China. Five wind turbines in Jhimpir, 70km from Karachi are being developed by Zorlu Enerji Pakistan.

Gharo Wind Power Plant

Gharo Wind Power Plant is planned to be built in the persistently wind-swept corridor of Gharo, Sindh, Pakistan. This will be one of the first wind power project in Pakistan.

The turbine manufacturer Fuhrländer of Germany and Access Energy Inc of United States have signed an agreement with Alternative Energy Development Board (AEDB) of Pakistan, to manufacture wind turbines in Pakistan to help establish wind power projects. US-based Access Energy would finance the project to set up a 50 MW wind power plant along the general wind corridor in Gharo, while the German Company, Fuhrländer, would transfer the technology to Pakistan for manufacturing of wind turbines along with its accessories to set up a minimum of 1000 MW power plants. Halcrow Pakistan has compiled the Environmental Impact Assessment for this project.

In Karachi Wind mill Can be built at sea areas

Thank you!

UNDER SUPERVISION

Sir ASI M RAZA
ASST.PROFESSOR B.TECH PASS AND HONS
ELECTRICAL DEPARTMENT

Sir SYED SALIM AHMED
TRAINING AND LAB INCHARGE B.TECH PASS AND HONS ELECTRICAL DEPARTMENT

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Rizwan Ahmed khan	***EP-237***
Shaikh Muhammad Atif	***EP-241***
Sheikh Muhammad Arsalan	***EP-243***