



# RENEWABLE ENERGY 101

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# Renewable Energy (RE)

- It refers to energy obtained from the **continuing** or **repetitive** currents of energy occurring in a natural environment
- There is **no specific lower or upper limit** on the total quantity of supply found in nature.
- Supply is **renewed regularly** and can supply energy requirement continuously.



# Features of RE Sources and Systems

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- **Renewable** - have **stock of supply** and can be **managed in sustainable manner**;
- **Indigenous** - **locally available** while RE devices and systems can be manufactured locally depending on the availability of the market.
- **Environment-friendly** – RE technologies have **minimal pollution emissions** and thus promote sustainable development.
- **Decentralized** – can be installed and operated singly or individually and autonomously by the user; highly applicable even in off-grid, far-flung areas of the country.
- **Modular**- exhibit extent of elasticity such as in the aspect of design and sizing; can be installed or dismantled more easily relative to conventional with very few complications



# Renewable Energy Systems

- refers to **devices or technologies** which **convert RE resources** into **useful energy** forms like heat, electrical and mechanical energy.



# Biomass Energy/Biofuels

## I. Biomass Resources

- **Agricultural Residues**
- **Animal Residues**
- **Forestry Crops and Residues**
- **Municipal Waste**
- **Industrial Waste**
- **Sewage**





## II. Biomass System

- Cookstoves



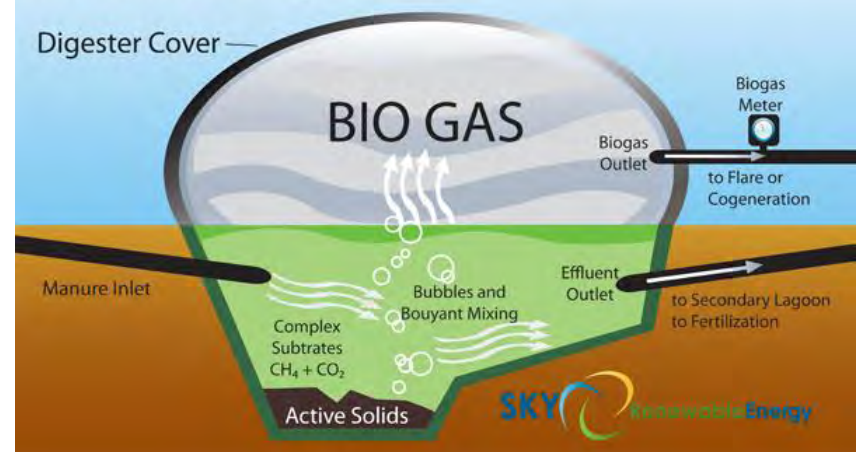
## II. Biomass System

- Biogas Digesters

The Bio-Gas Digester:



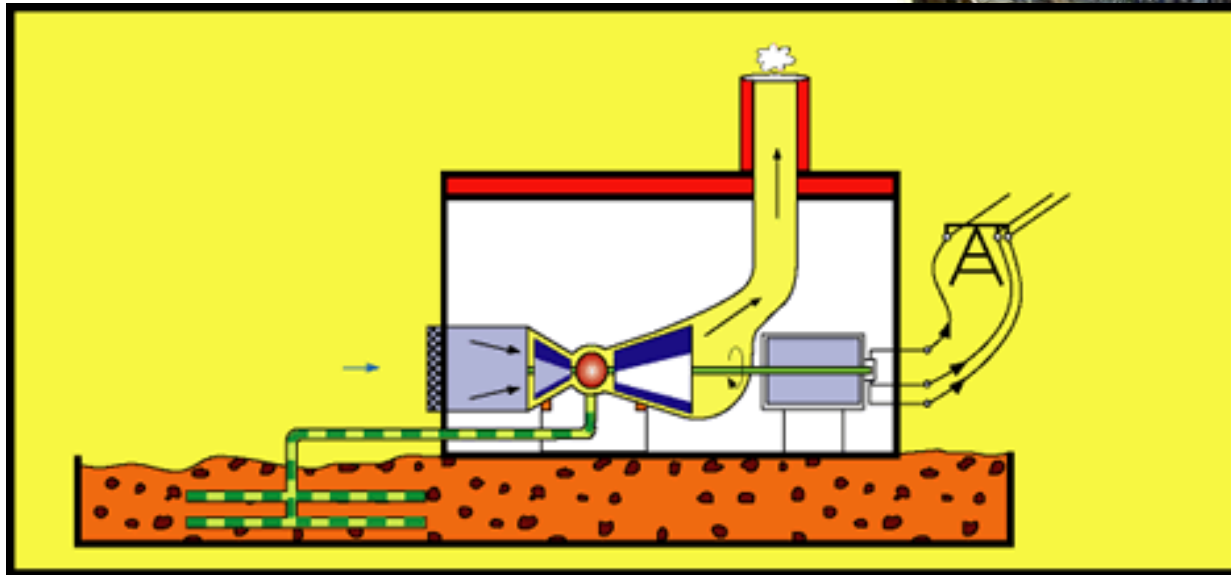
### Anaerobic Digestion



# Biomass Energy

## II. Biomass System

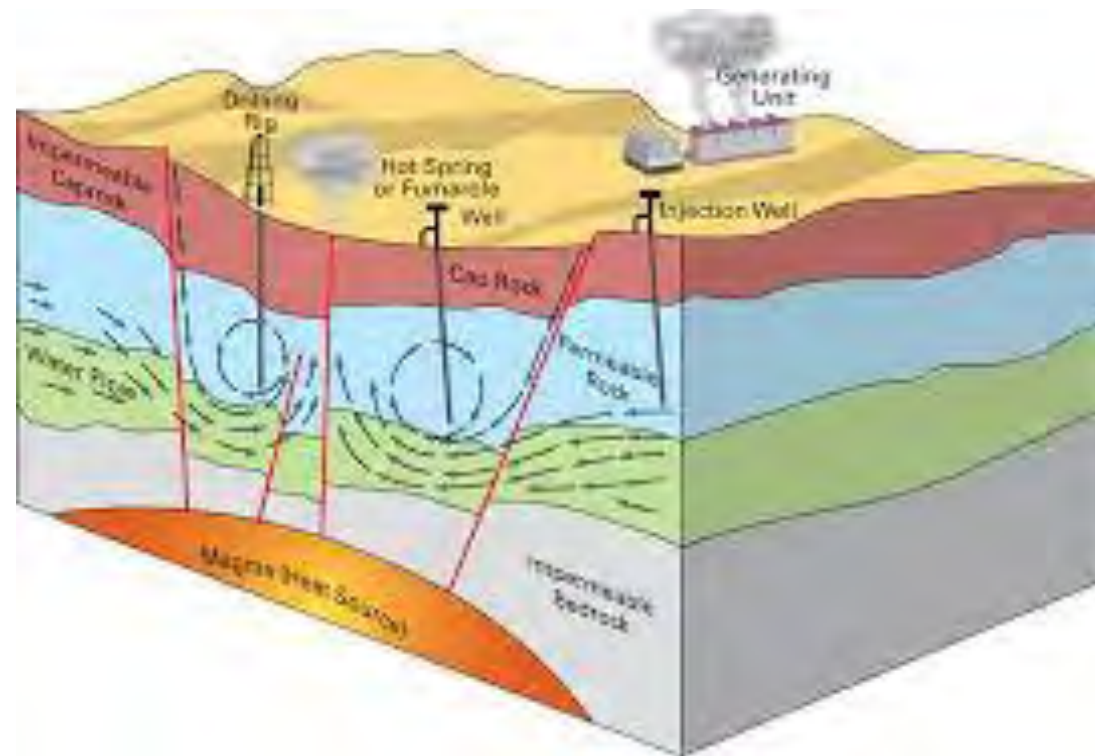
- Biomass Power Plants





# Geothermal Energy

**Geothermal Energy** - refers to the **thermal (Heat)** energy generated and stored in the **earth (Geo)**



# Geothermal Energy

## I. Uses of Geothermal Energy

### - Direct Use

- Hot Springs, SPA, etc.
- Heating Waters e.g., Fish Ponds
- Raising crops in Green houses
- Crop Drying
- Kiln, Bricks Dryiny



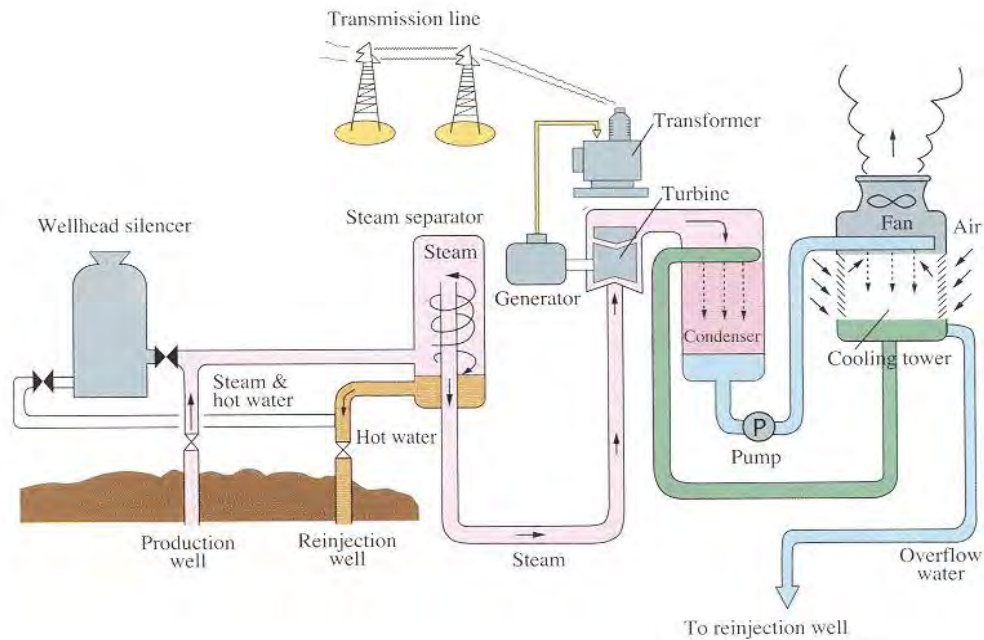


# Geothermal Energy

## I. Uses of Geothermal Energy

### - Indirect Use

#### - Electric Power Generation



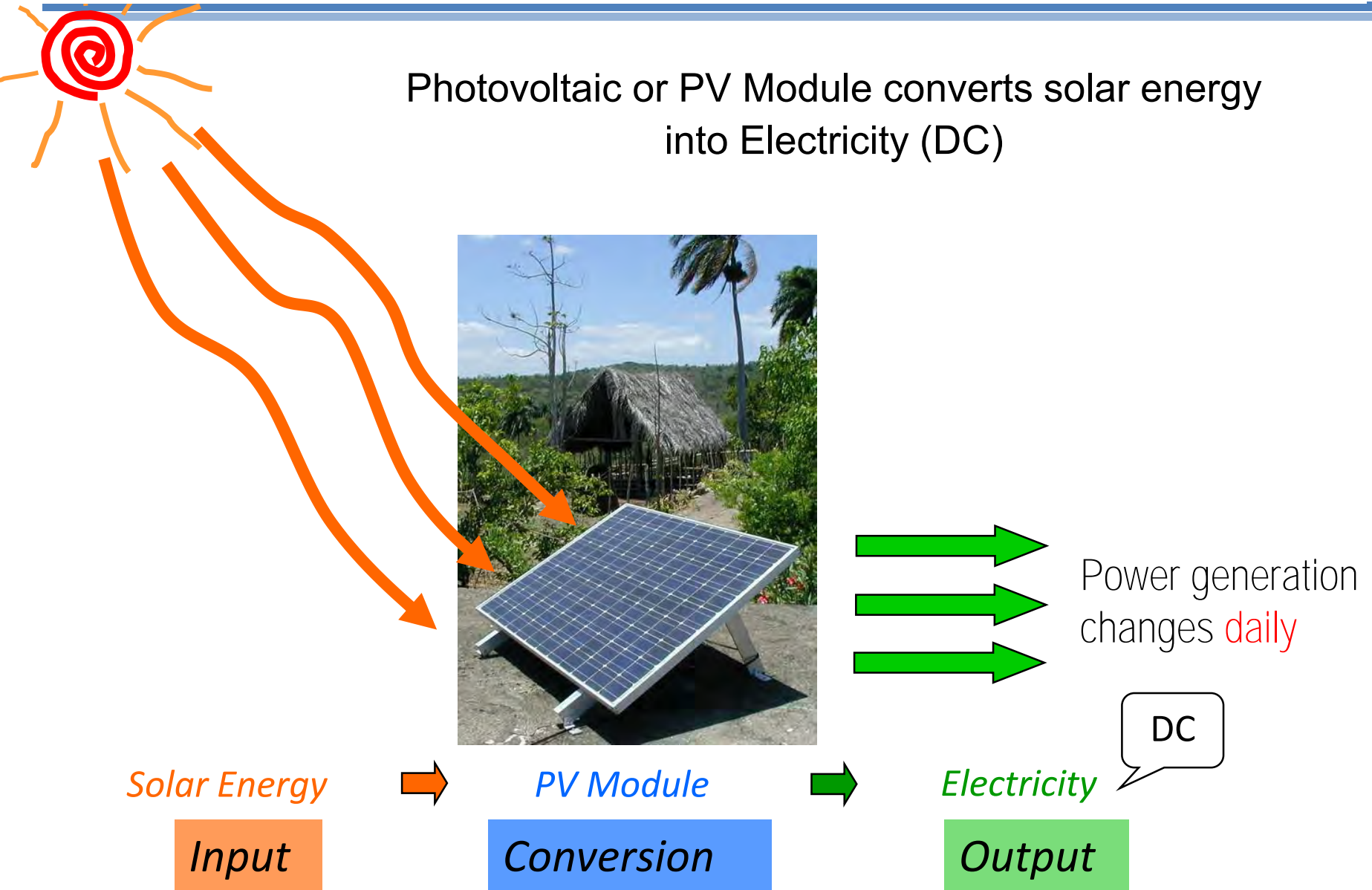
# Solar Energy

**Solar Energy** - refers to solar **radiation** which can be converted into useful energy either in the form of **thermal** or **electrical energy**





# Solar Energy



# Solar Energy

## *Photovoltaic – Electricity from the Sun* **Solar Home System (SHS)**





# Solar Energy

## *Photovoltaic – Electricity from the Sun* **Solar Power Plant**



**22 MW San Carlos Solar Project**



# Solar Energy

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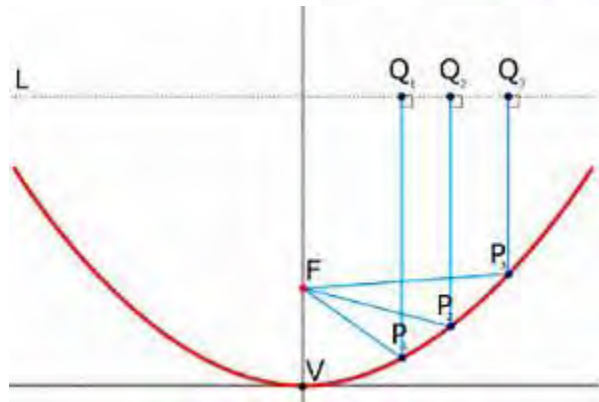
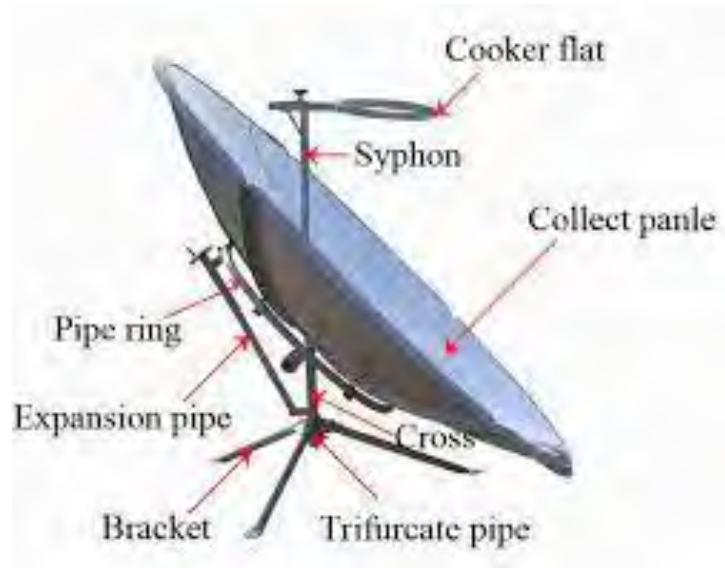
## *Solar Thermal* **Solar Water Heater**





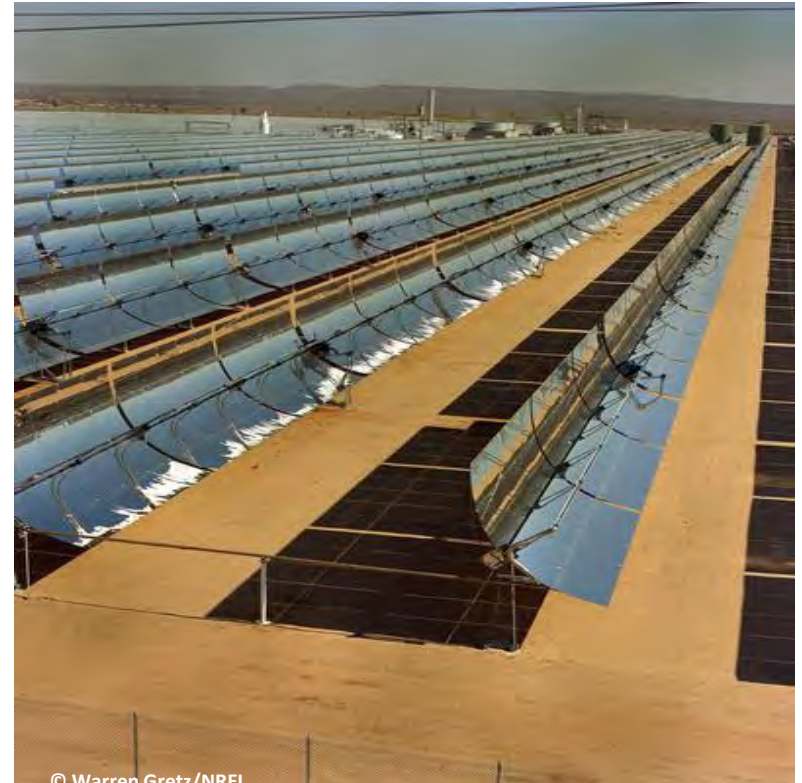
# Solar Energy

## Solar Thermal Solar Cooker



# Solar Energy

## *Solar Thermal* **Solar Thermal Power Plant**





# Hydro Energy

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**Hydro Energy** - refers to the energy of **falling or running water** which can be **converted into rotary motion** and in turn produces **mechanical or electrical energy**



# Hydro Energy

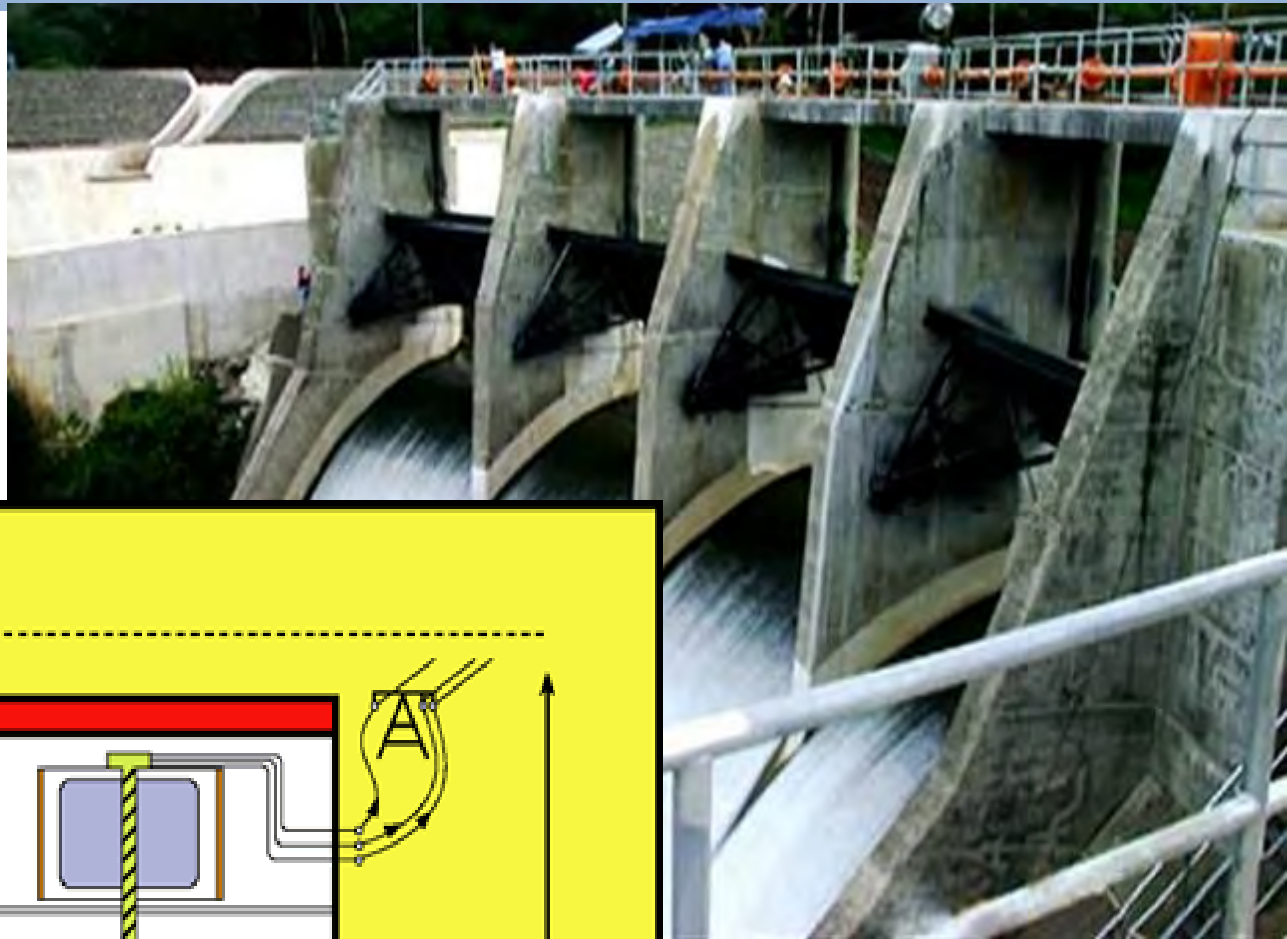
## *Hydro Energy System* **Water Mill**



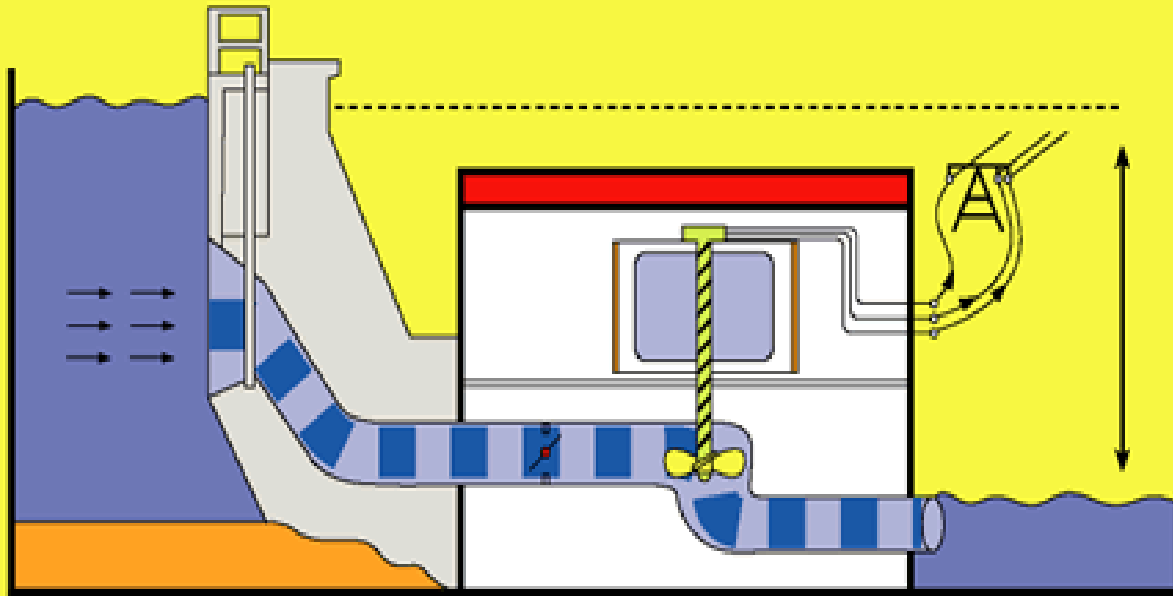


# Hydro Energy

## *Hydro Energy System* **Hydro Power Plant**

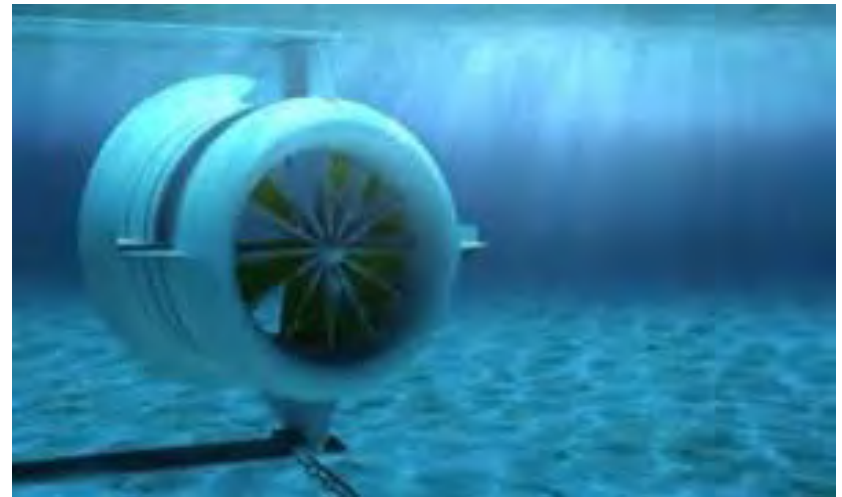


Botocan Hydro



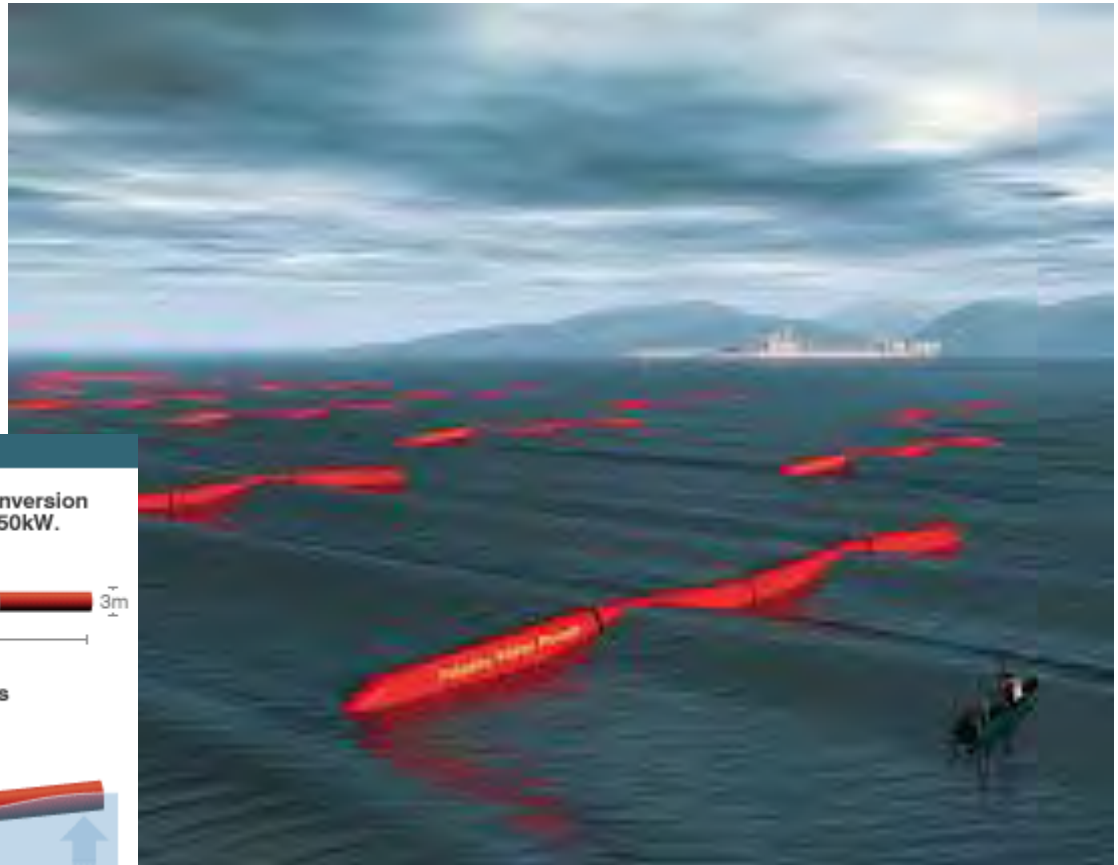
# Ocean Energy

**Ocean Energy** - includes all forms of energy that can be utilized from the bodies of oceans and seas such as: ocean thermal energy, ocean current energy, wave energy & tidal energy.

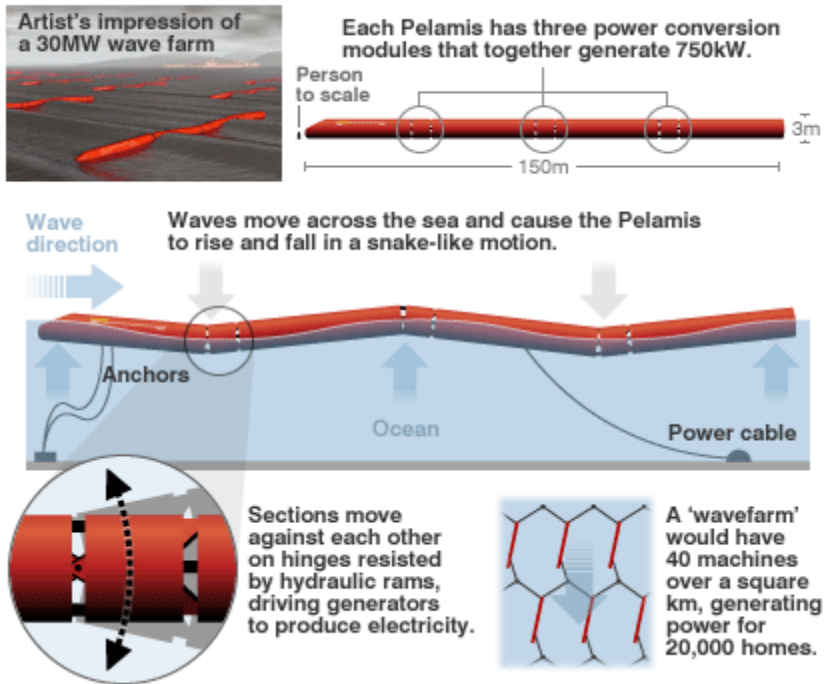


# Ocean Energy

## Ocean Energy System Wave – Pelamis Turbine in Portugal



### PELAMIS WAVE POWER GENERATOR

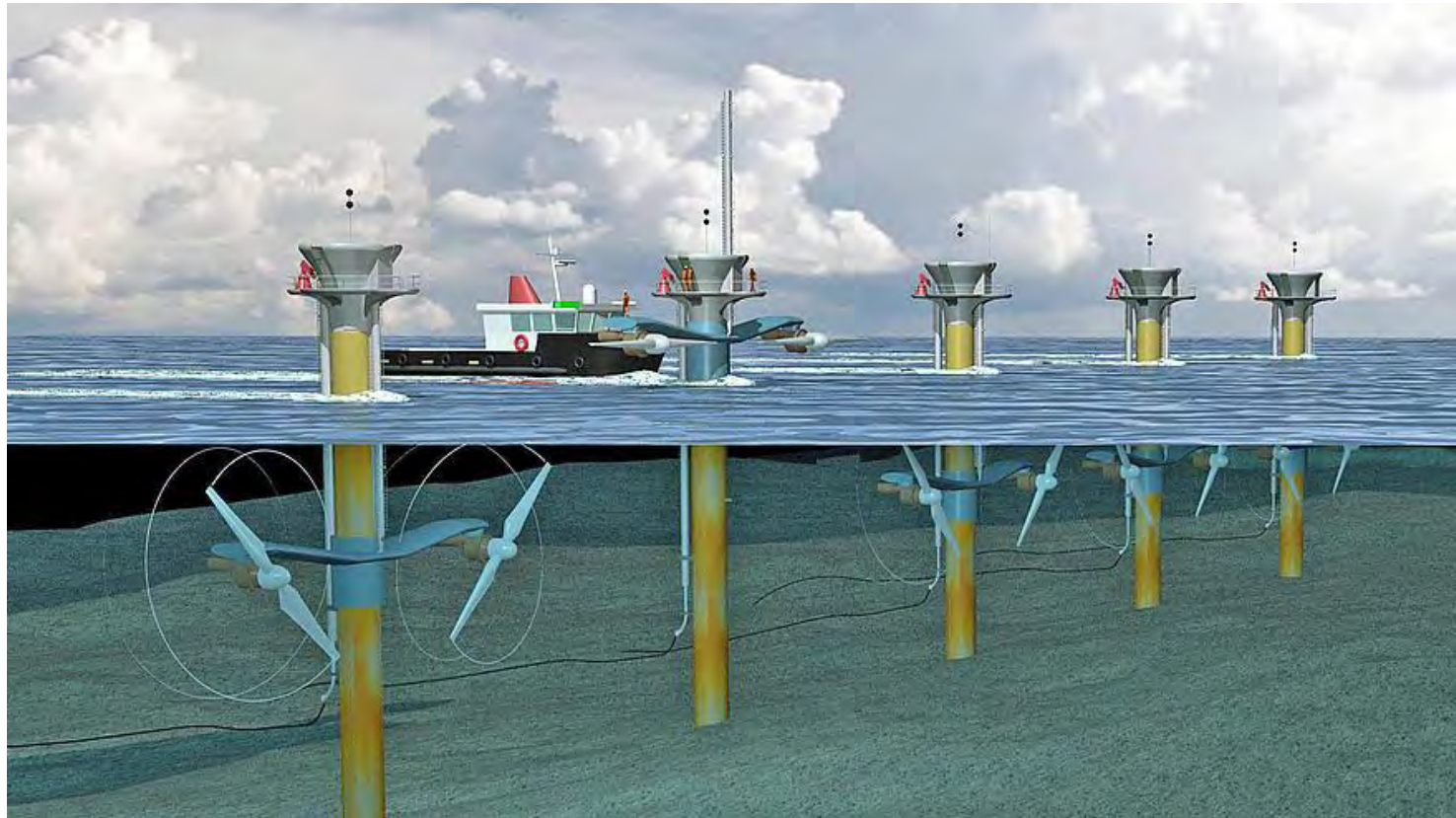


SOURCE: Ocean Power Delivery Ltd.





## *Ocean Energy System* **Marine Current Turbine**



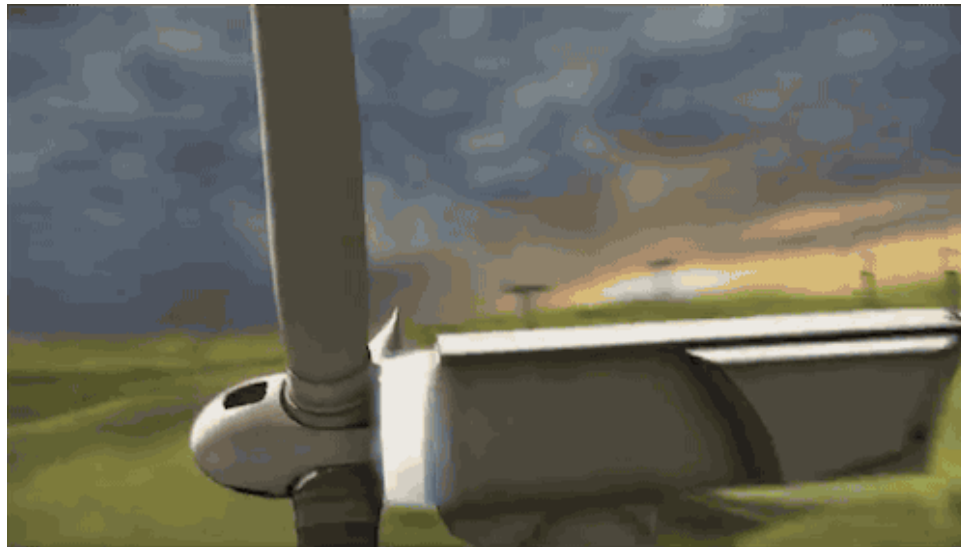


*Ocean Energy System*  
**210 kW OTEC Experimental Plant (1993-1998) in Hawaii**



# Wind Energy

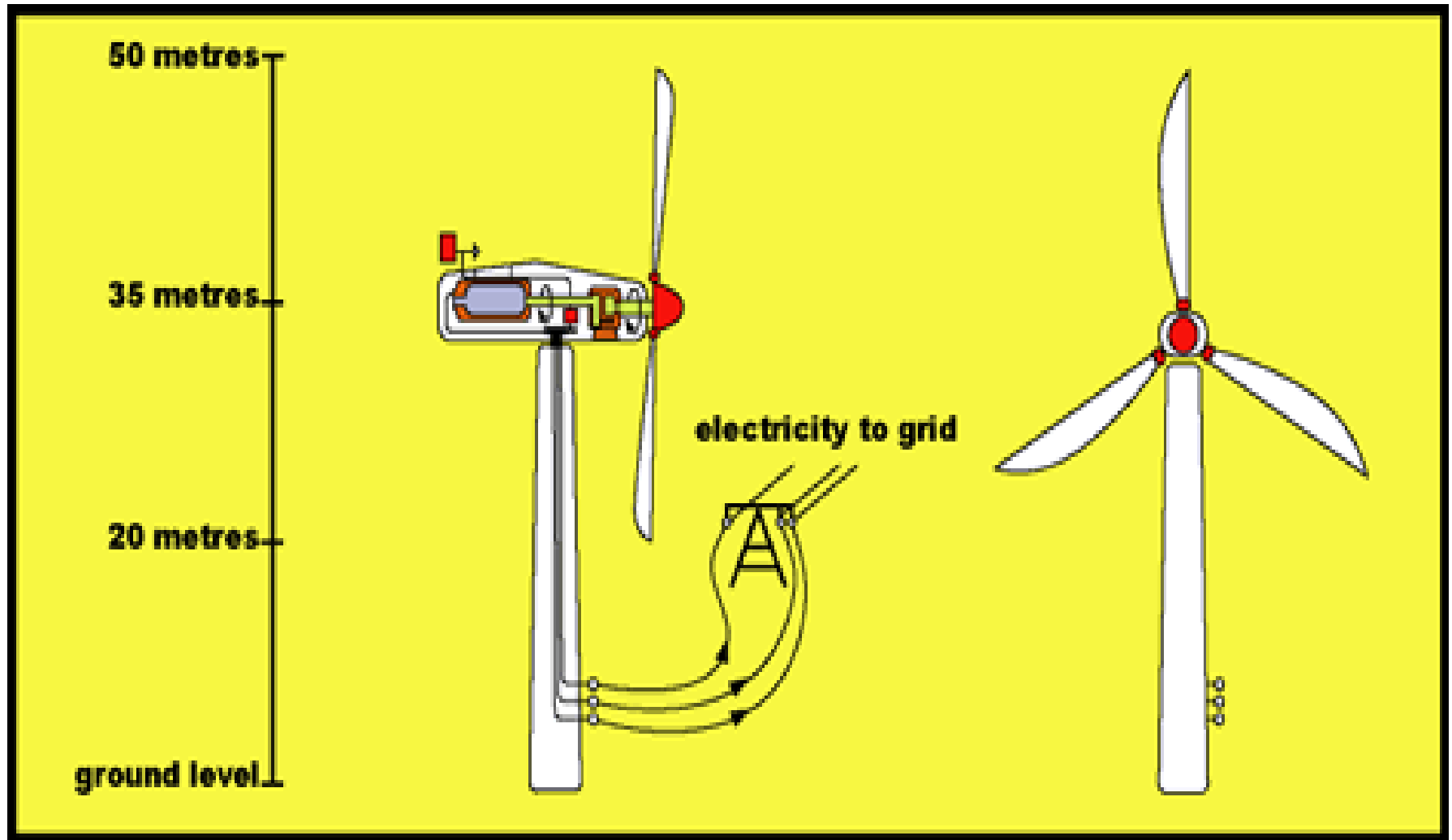
**Wind Energy** - refers to **the kinetic energy (i.e., motion energy) of the wind** that can be converted into **rotary motion** in turn produces mechanical or electrical energy



# Wind Energy

*Wind Energy System*

## Wind Turbine





## *Wind Energy System*

**Wind Turbine - 33 MW (20 WTG @ 1.65 MW per Turbine)**

**Height of hub: 70 m**



**Northwind Wind Power Project in Bangui Bay Ilocos Norte**

*Wind Energy System*  
**Wind Turbine - Small Scale (Kilowatt Level)**





# Wind Energy

## *Wind Energy System* **Windmills**



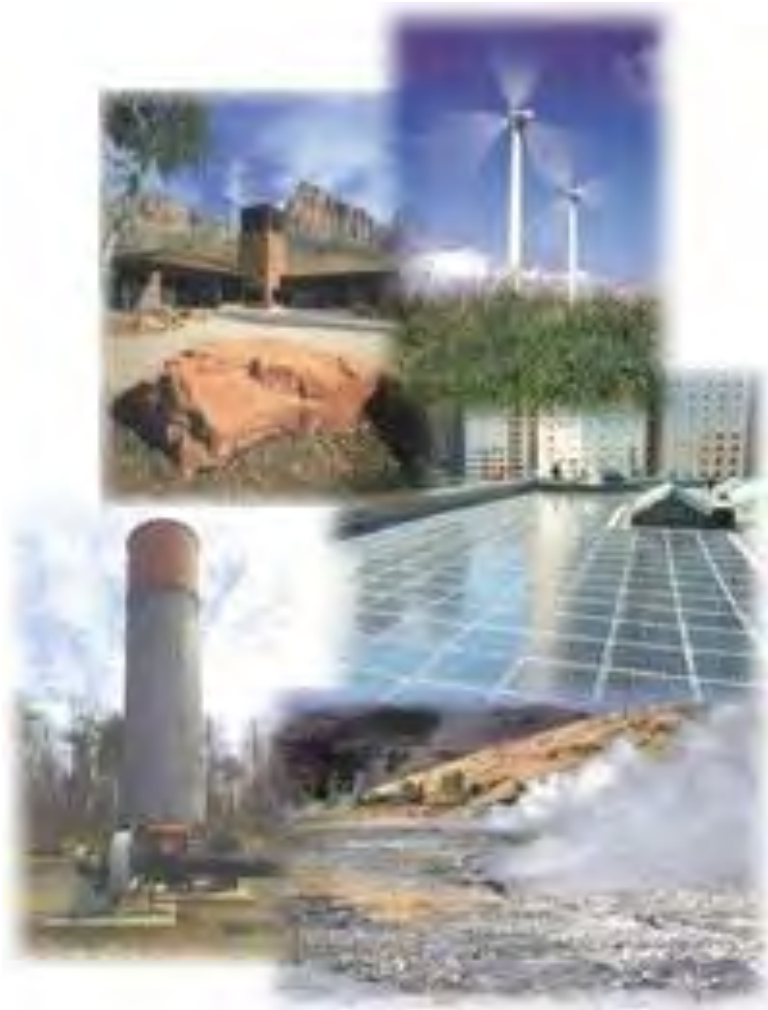


# Wind Energy

## *Wind Energy System* **Pumps**



# RENEWABLE ENERGY



**B**iomass/**B**iofuels

**G**eothermal

**S**olar

**H**ydropower

**O**cean

**W**ind



# Thank You!



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