



RENEWABLE ENERGY 101

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E-Power Mo: Energy Consumer and Stakeholders Conference
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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

- **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



Biomass Energy

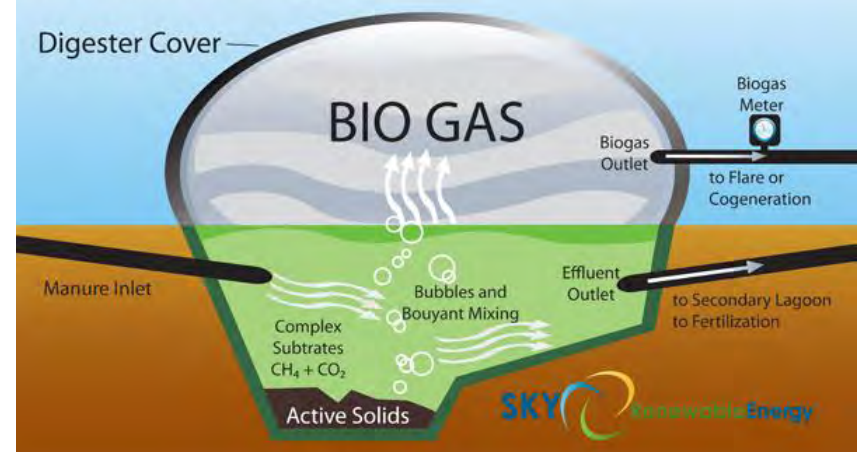
II. Biomass System

- Biogas Digesters

The Bio-Gas Digester:



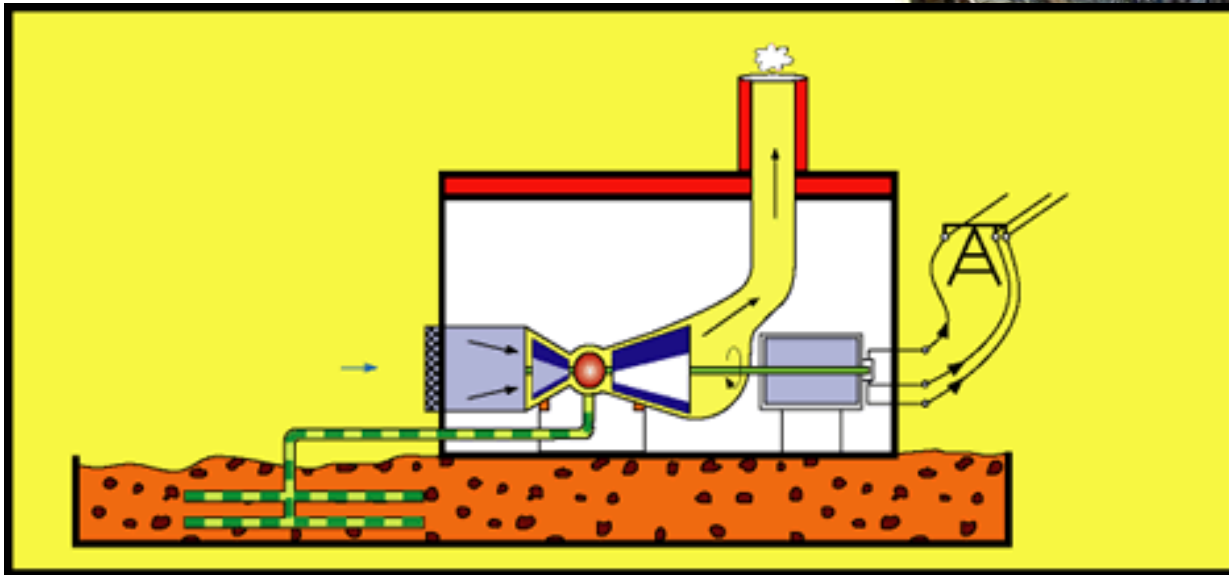
Anaerobic Digestion



Biomass Energy

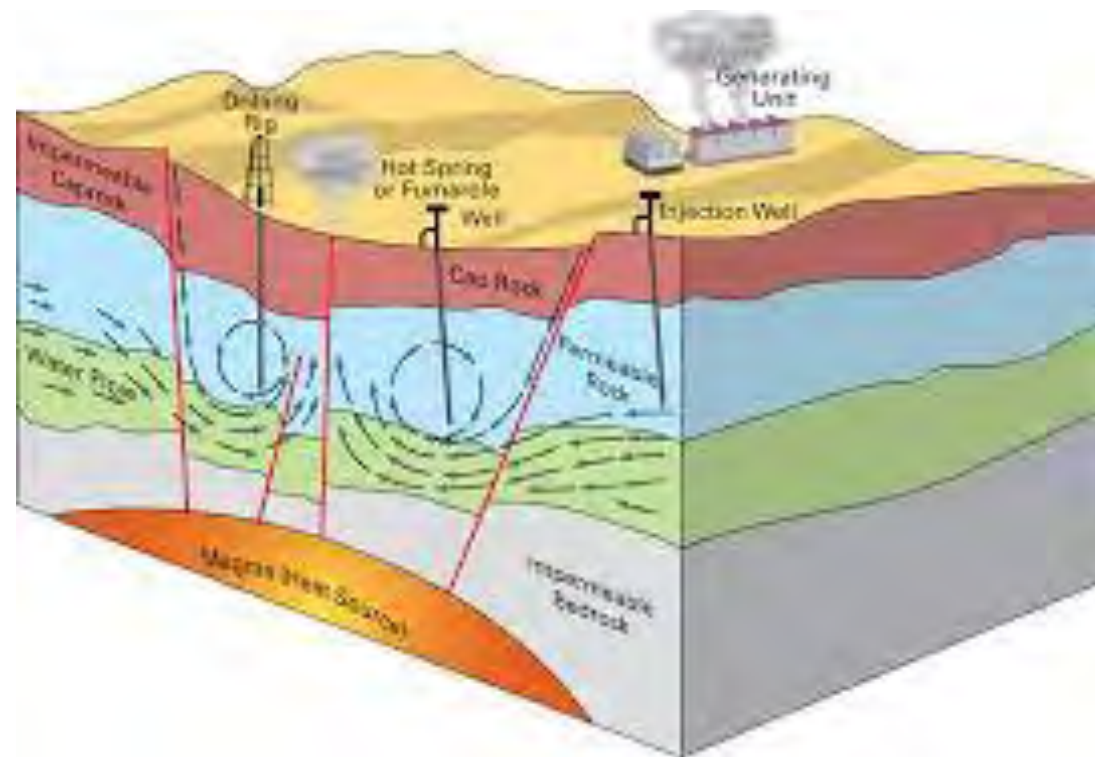
II. Biomass System

- 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

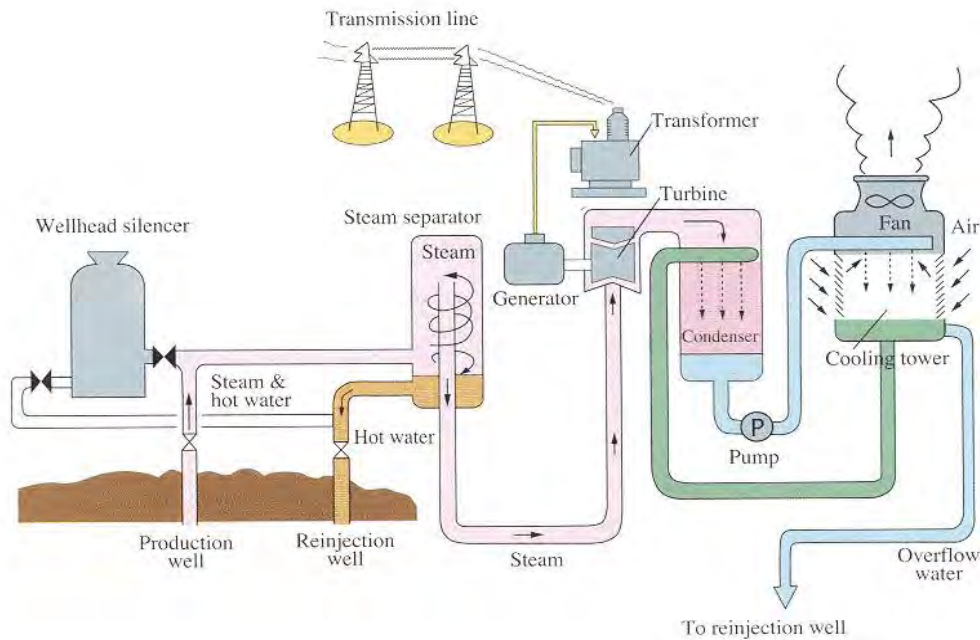


Geothermal Energy

I. Uses of Geothermal Energy

- Indirect Use

- Electric Power Generation



Solar Energy

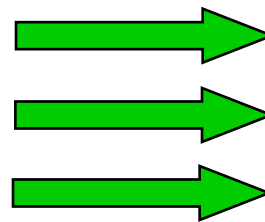
Solar Energy - refers to solar **radiation** which can be converted into useful energy either in the form of **thermal** or **electrical energy**



Solar Energy



Photovoltaic or PV Module converts solar energy into Electricity (DC)



Power generation changes **daily**

DC

Solar Energy



PV Module



Electricity

Input

Conversion

Output



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



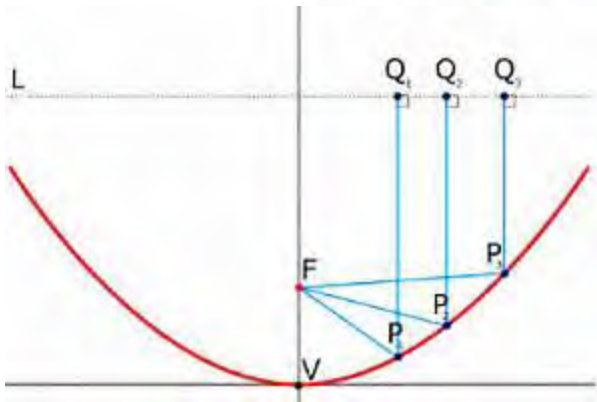
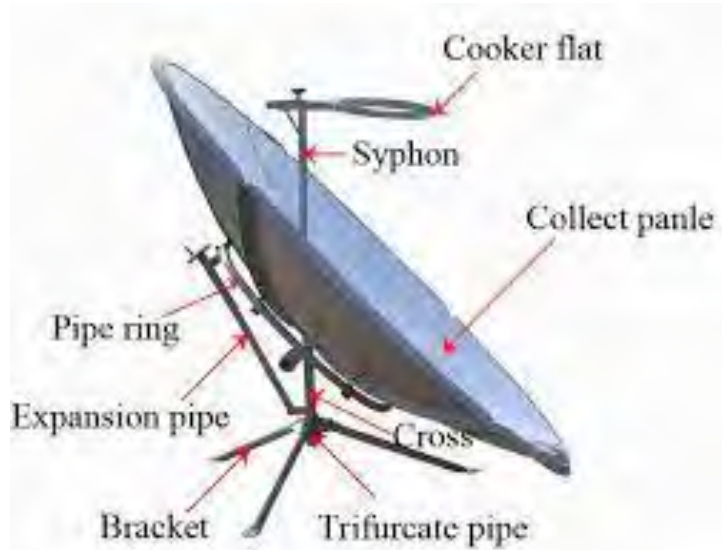
Solar Energy

Solar Thermal **Solar Water Heater**



Solar Energy

Solar Thermal Solar Cooker



Solar Energy

Solar Thermal **Solar Thermal Power Plant**



Hydro Energy

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**



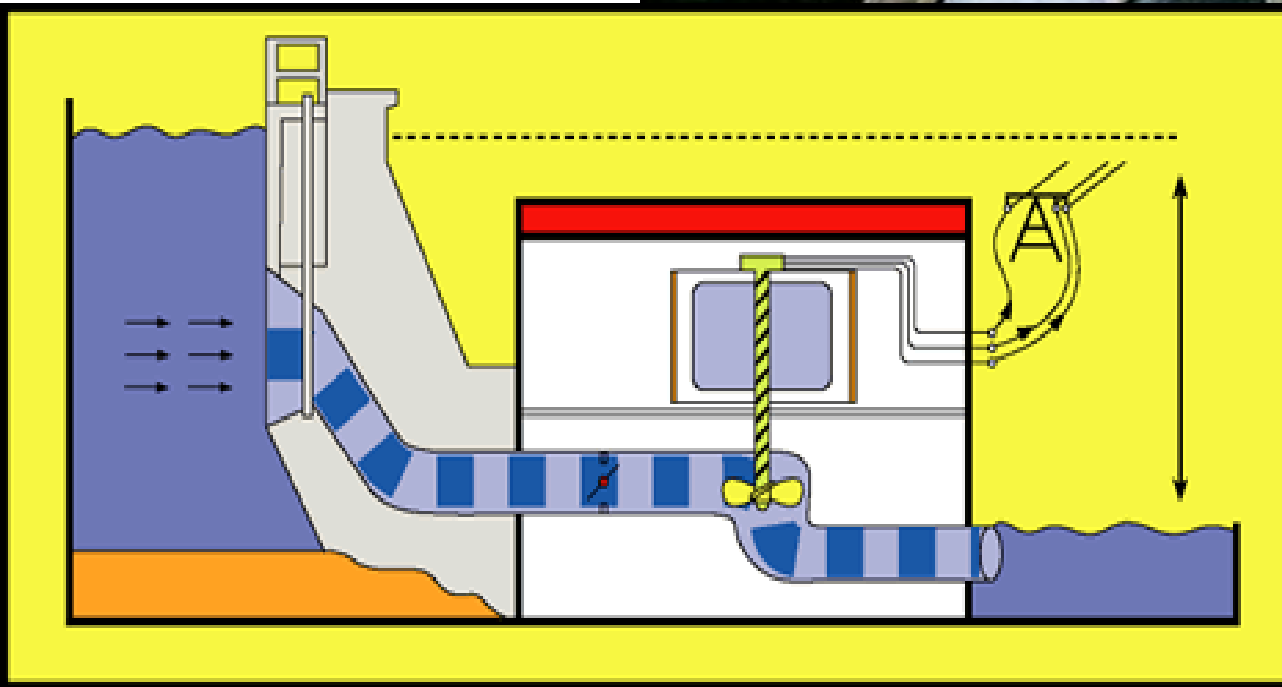
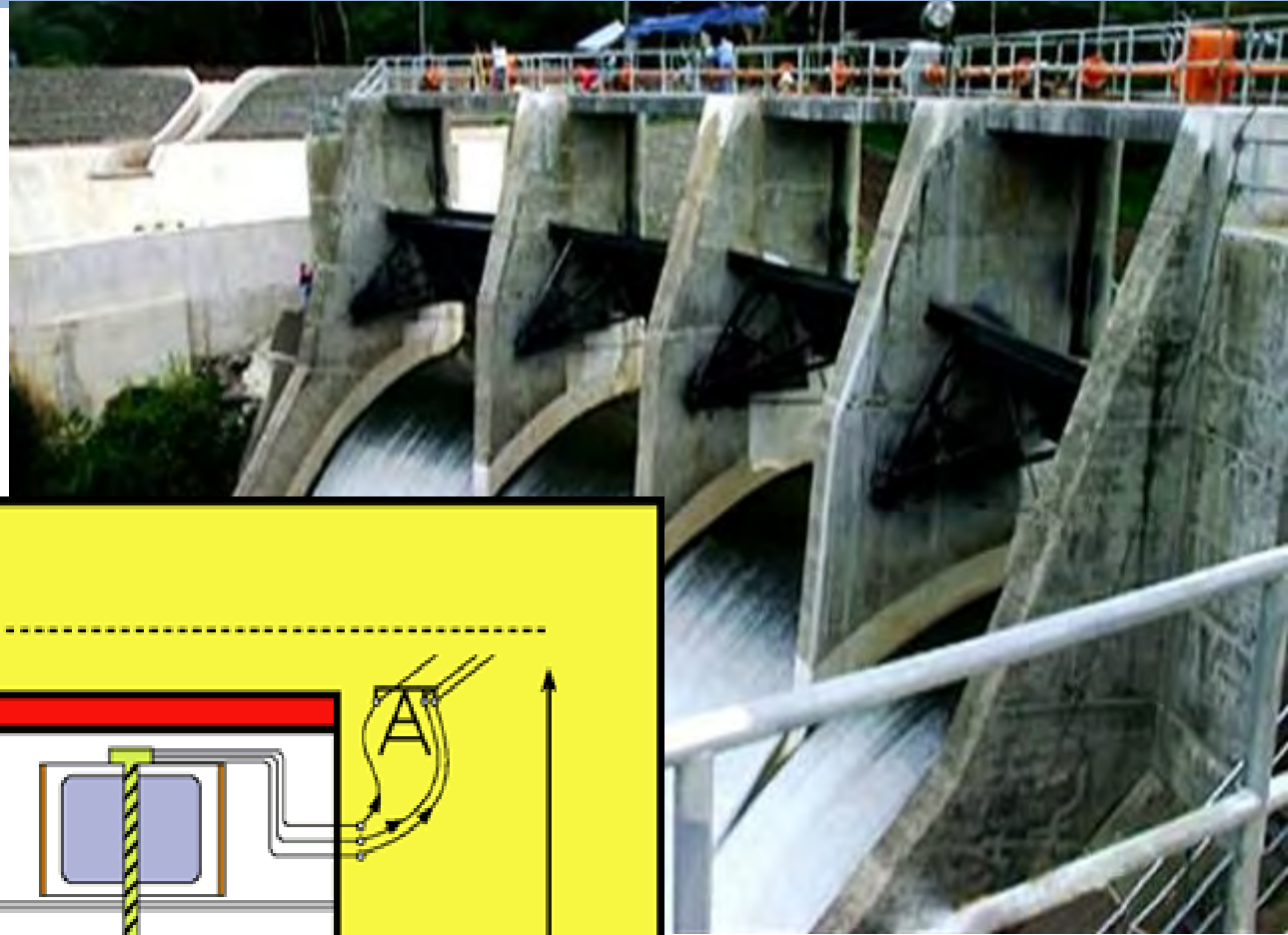
Hydro Energy

Hydro Energy System Water Mill



Hydro Energy

Hydro Energy System Hydro Power Plant

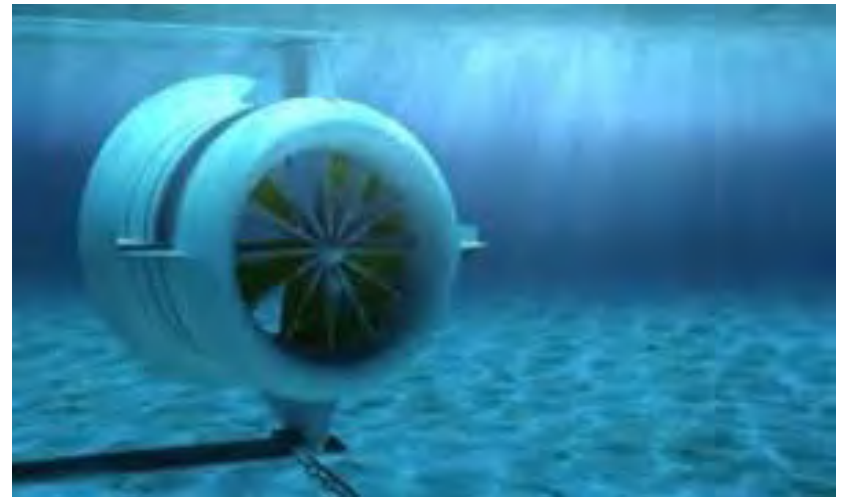


Botocan Hydro



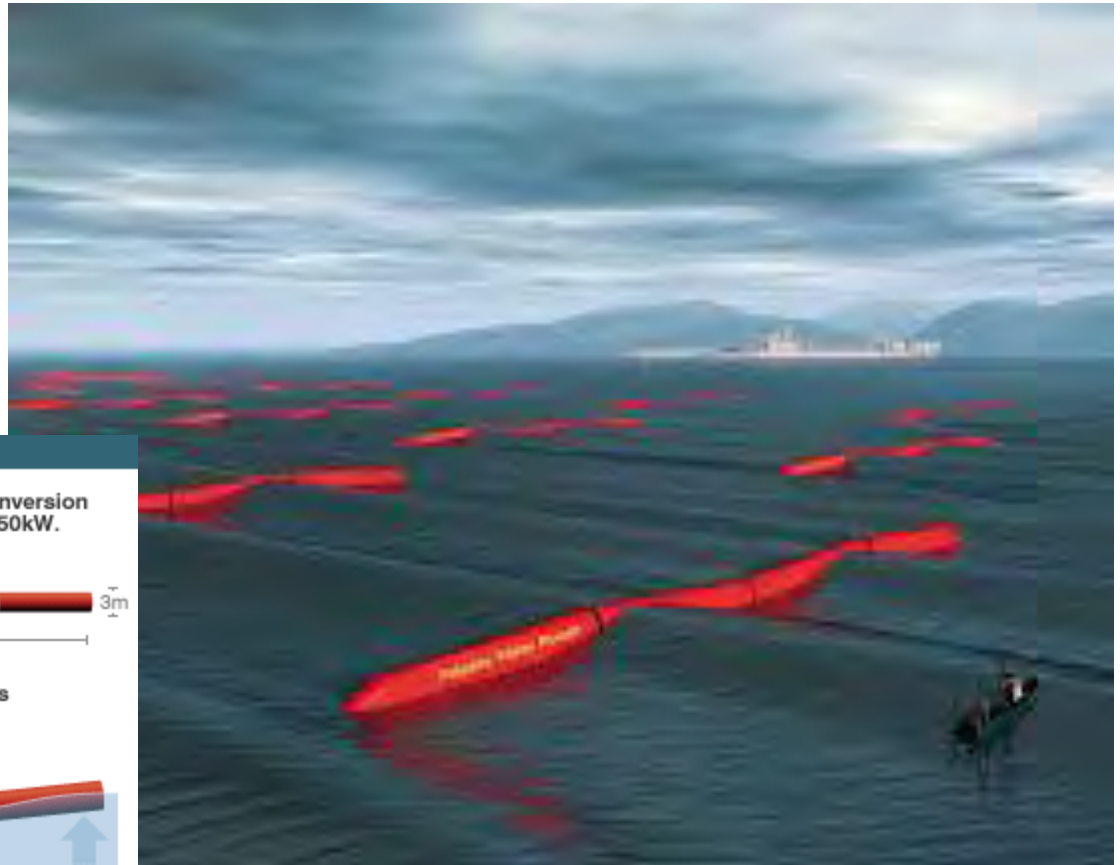
Ocean Energy

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.

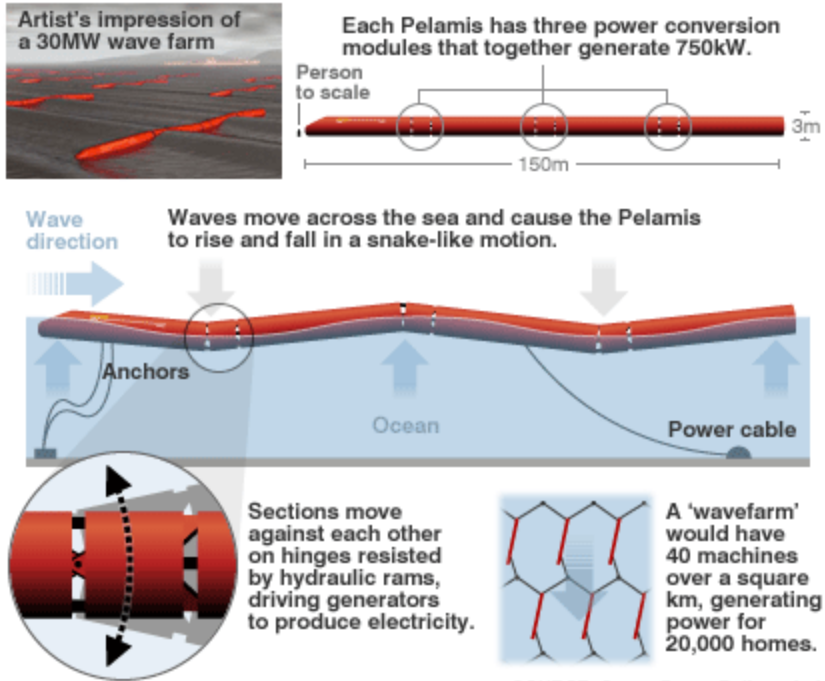


Ocean Energy

Ocean Energy System Wave – Pelamis Turbine in Portugal



PELAMIS WAVE POWER GENERATOR



SOURCE: Ocean Power Delivery Ltd.



Ocean Energy System **Marine Current Turbine**

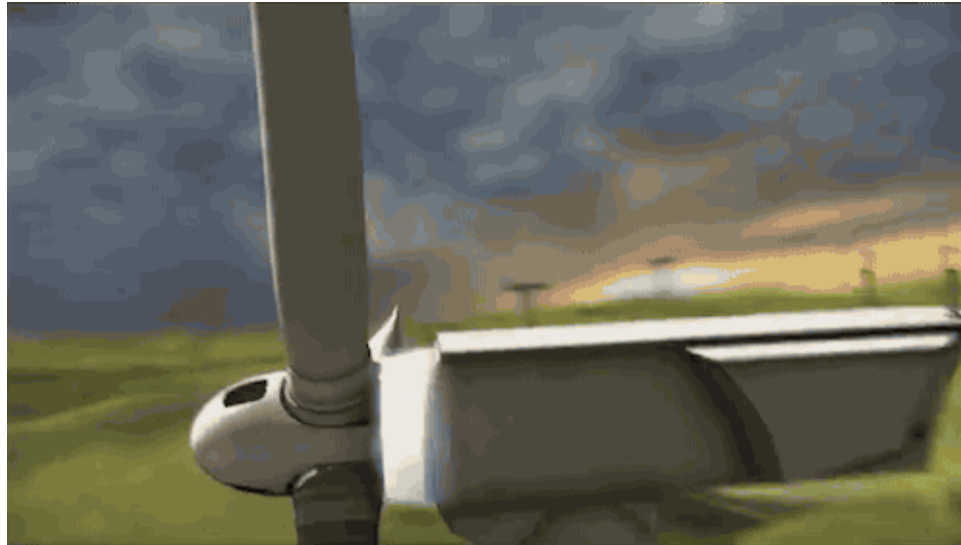


Ocean Energy System
210 kW OTEC Experimental Plant (1993-1998) in Hawaii



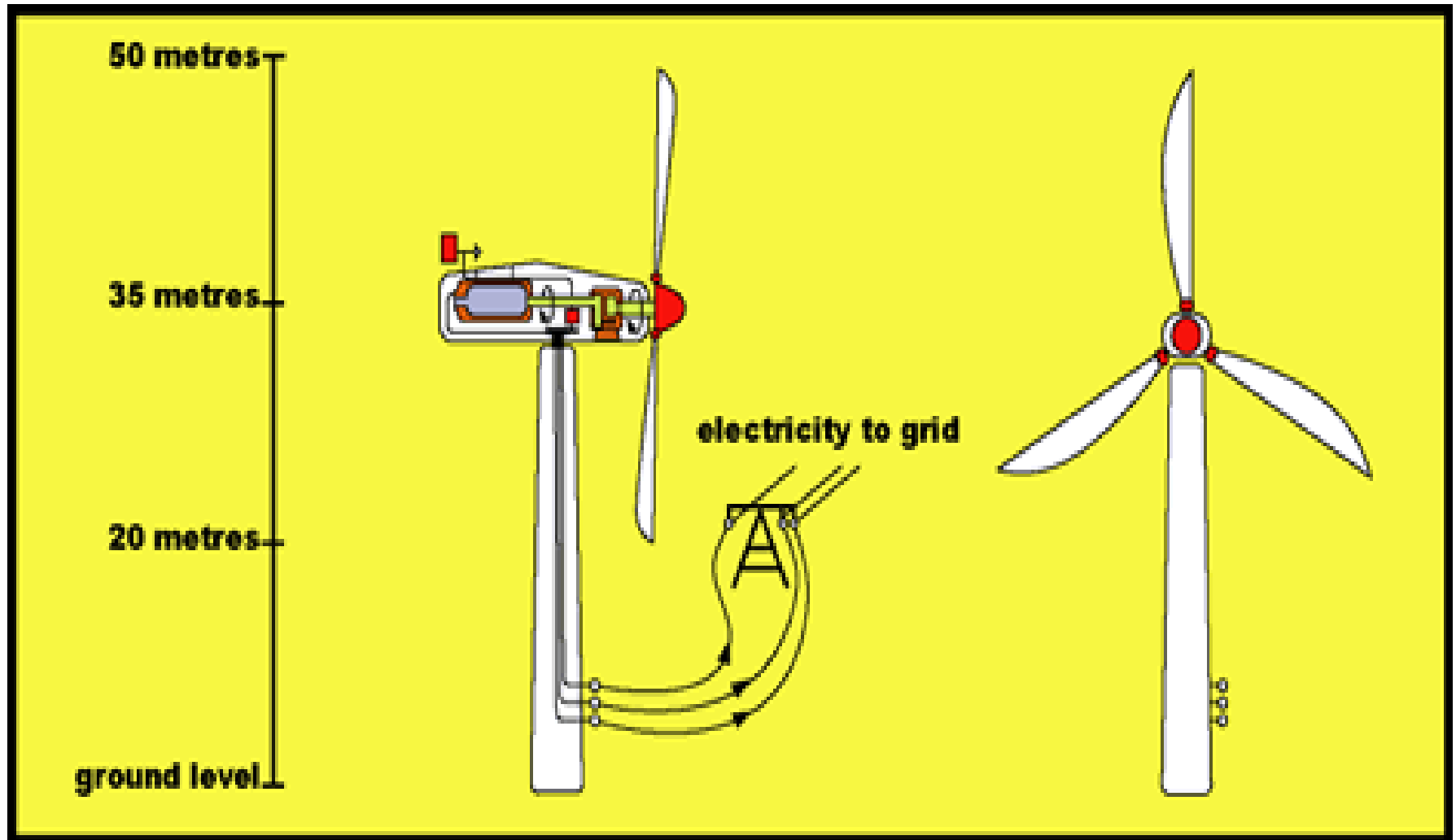
Wind Energy

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**

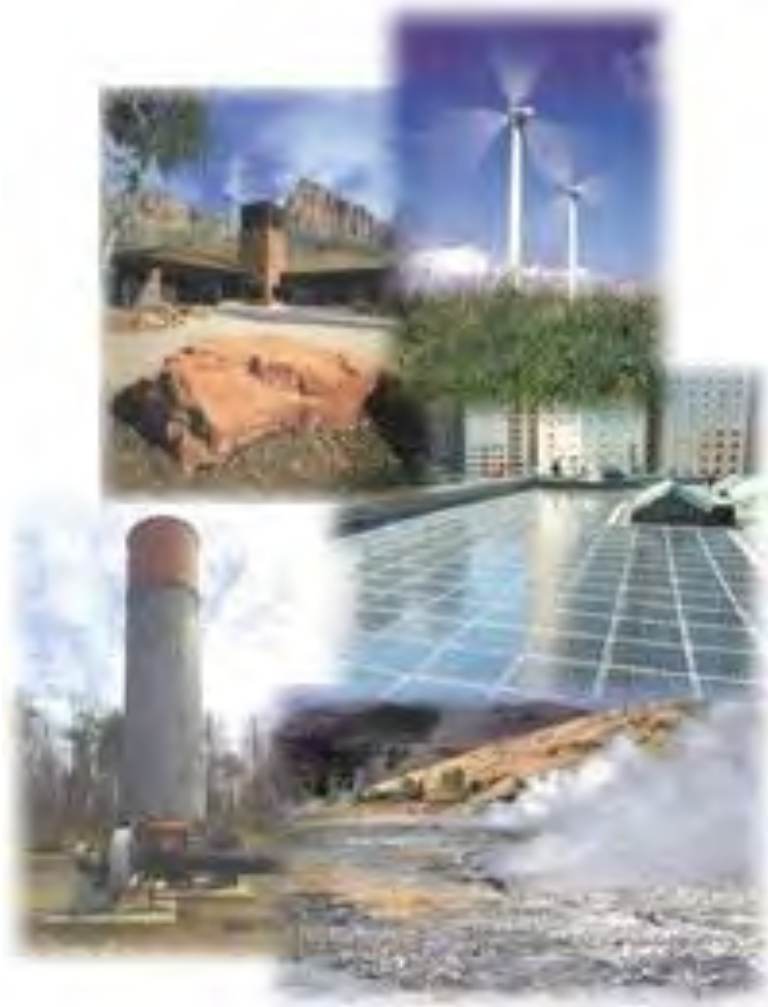


Wind Energy

Wind Energy System **Pumps**



RENEWABLE ENERGY



Biomass/**B**iofuels

Geothermal

Solar

Hydropower

Ocean

Wind



Thank You!



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