Energy Resources

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- Tidal energy

What is energy?

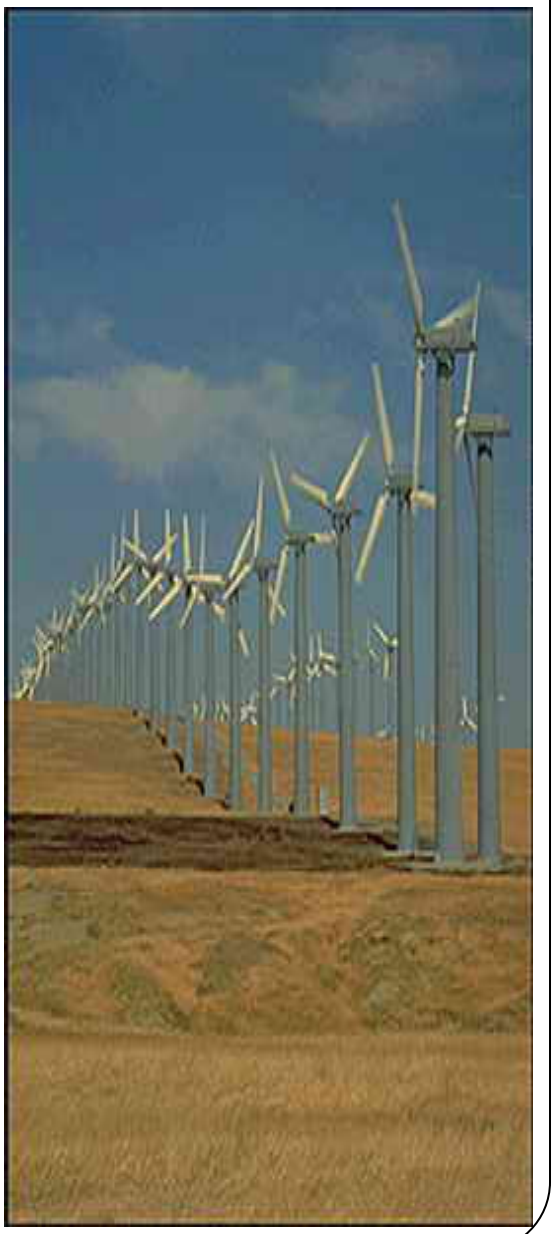
Sources of Energy

Non-Renewable

- Conventional
  - Petroleum
  - Natural Gas
  - Coal
  - Nuclear

Renewable

- Solar
- Wind
- Hydropower
- Geothermal
- Biomass
- Tidal energy

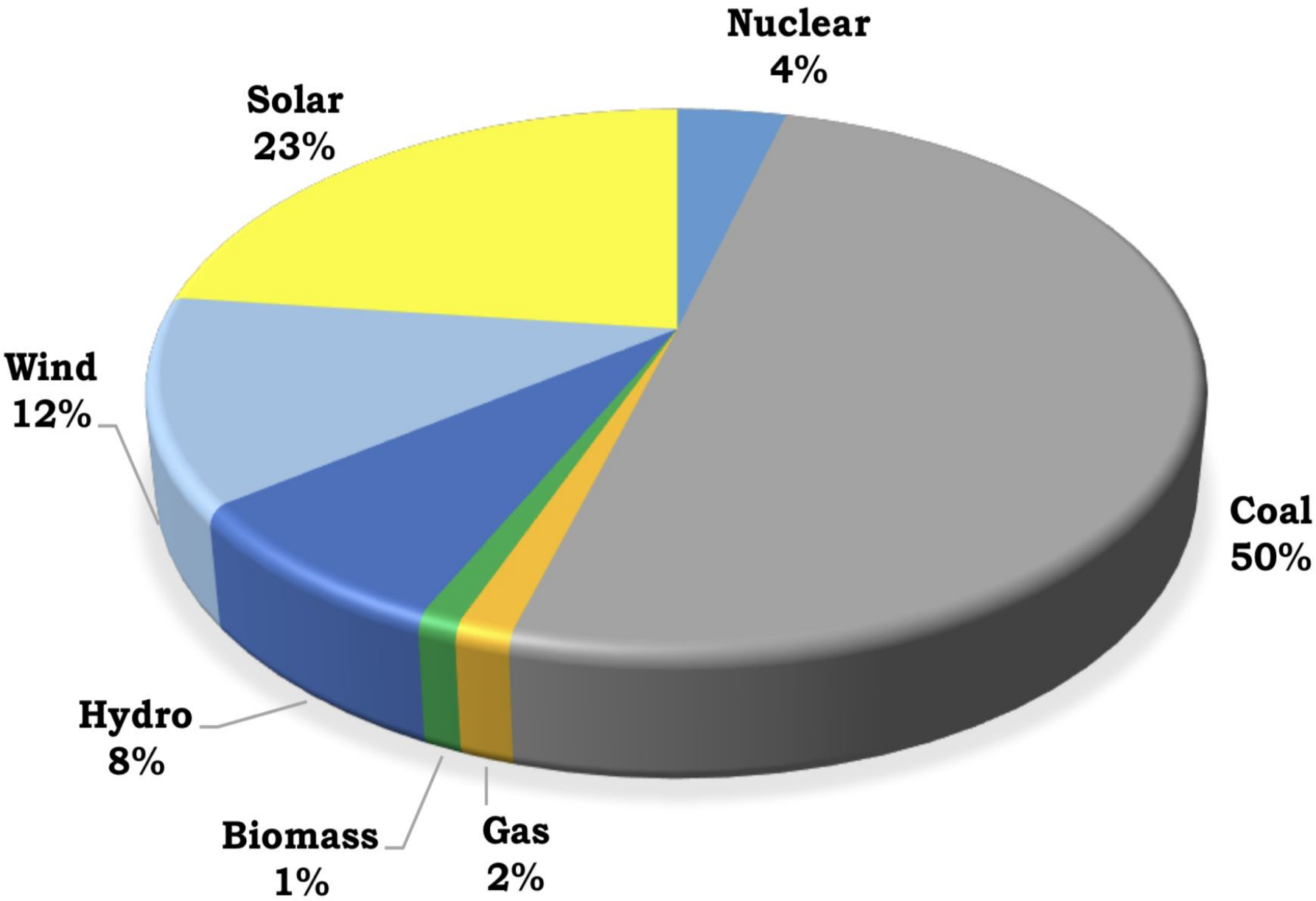


Energy Scene India

- India **4th** largest energy consumer after US, China and Russia.
- **Future challenge** - provide sustainable energy for all –accessible, clean & efficient.

Energy source	%
Coal	44
Oil	22
Biomass & Waste	22
Natural gas	7
Hydropower	3
Nuclear	1
Other renewables	1
Total	100

LIKELY GROSS GENERATION (MU) IN 2029-30



Fossil Fuels

- **Coal, Oil and Gas** - Formed from fossilized plants & animals.
  - ✔ **Electrical power**: 66%
  - ✔ **Total energy demands**: 95%
- **Fairly cheaply**.
- **Transporting** oil and gas to the power stations is easy.
- **Gas-fired power stations** are very efficient.
- A fossil-fuelled power station can be built almost **anywhere**.

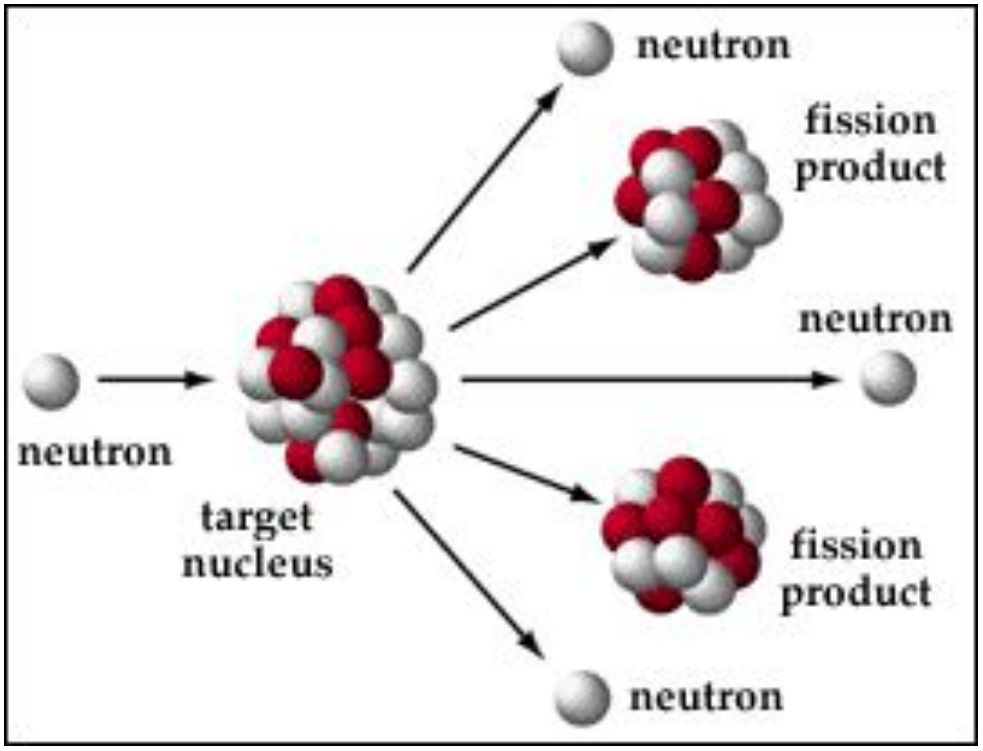
Environmental Cost

- **Air pollution** – COx, SOx, NOx, HC's, & SPM
- '**Green House Effect**' & **Climate Change**.
- **Oils spills** - damage marine life.
- Early resource depletion
- Coal burning produce SO_2 **-Acid Rain**.
- **Strip mining** destroys large areas of the landscape.
- Thermal pollution of water.

What is green house effect?

Nuclear Energy

- Nuclear power is generated using **Uranium** metal.
- **Uranium rods** as fuel, and the heat is generated by **nuclear fission**.
- **Neutrons** smash into the nucleus of uranium atoms, which split and release energy as heat.
- **Nuclear fission** makes heat > heated water makes steam > steam turns turbines > turbines turn generators > electrical power.



Advantages & Disadvantages

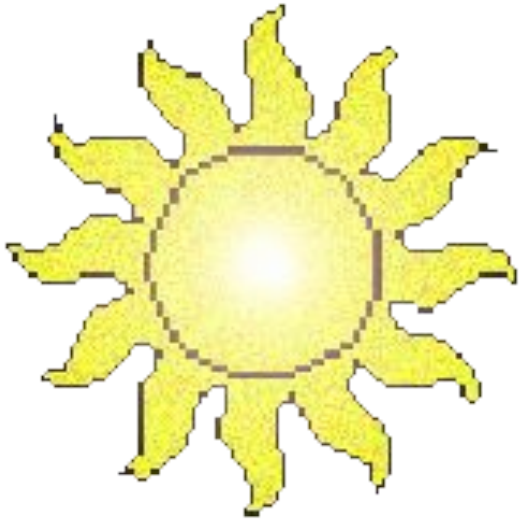
- Nuclear power **costs** about the **same as coal**.
- **No pollution emissions**.
- **Huge** amounts of **energy** from small amounts of fuel.
- Produces **small** amounts of **waste**.
- Nuclear power is **reliable**.

Very, very dangerous.

Waste must be sealed and buried for many years (**100-500**) to allow the radioactivity to die away.

Solar Energy

- **Photovoltaic cells** – viable alternative in remote areas.
- **Solar water heater, Solar cooker, Space heating, street lights.**
- Produces no waste or pollution.
- Doesn't work at **night**.
- **High installation cost**
- Need a very **sunny climate**.



Wind Power

- **Energy from the wind**.
- **Pump water, Sailing boats** & **Grind corn**.
- Suitable where steady winds, usual on coasts.
- No **GHG** emissions.
- Wind farms can be **tourist attractions**.
- Energy to **remote areas**.
- **High** installation **cost**
- Wind is **unpredictable**.
- **Noise** pollution.
- Can kill **migratory birds**.
- Can interfere in **radio communication**.
- **Unsightly**

- **Sun heats earth and atmosphere unevenly**.
- **Wind** – Warm air rise and cool air from other areas blows in to replace it.
- Use energy in the wind to move **propeller** of **Wind mill**.

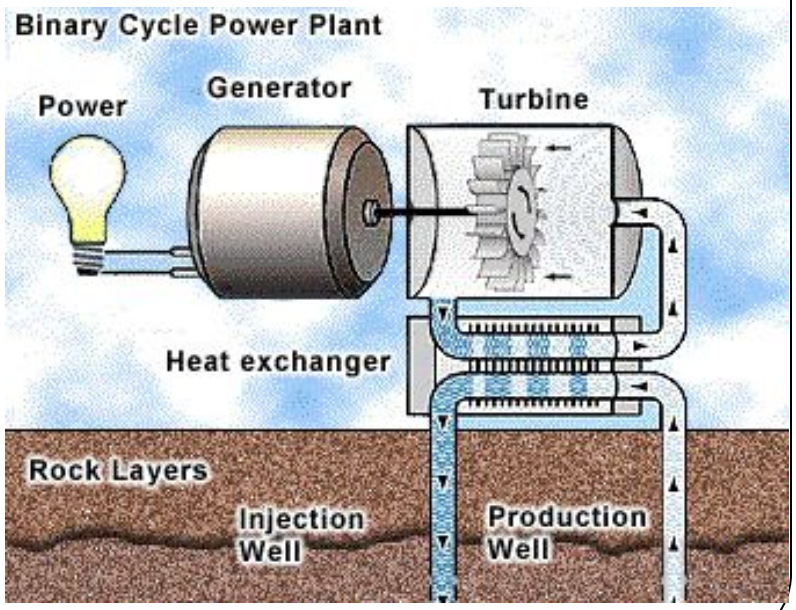
Hydropower

- **Energy from the flow of water.**
- Produces **20%** of world's electricity.
- **Cheap electricity** with **no emissions**.
- Water is allowed to flow through tunnels to **turn turbines** and drive generators.
- **Dam** - water for **irrigation**, **drinking**, **recreation** and **fishing**.
  - Cost a lot of **money** and **time**.
  - Drowns **forests & wildlife habitats**.
  - Prevent **fish migration** and reduce **silt flow** downstream which reduces dams life.
  - **Resettlement** of tribal.
- **Micro hydropower** is **eco-friendly** and does not affect river flow.
- **More reliable** than wind & solar power.
- Electricity can be generated **constantly**.

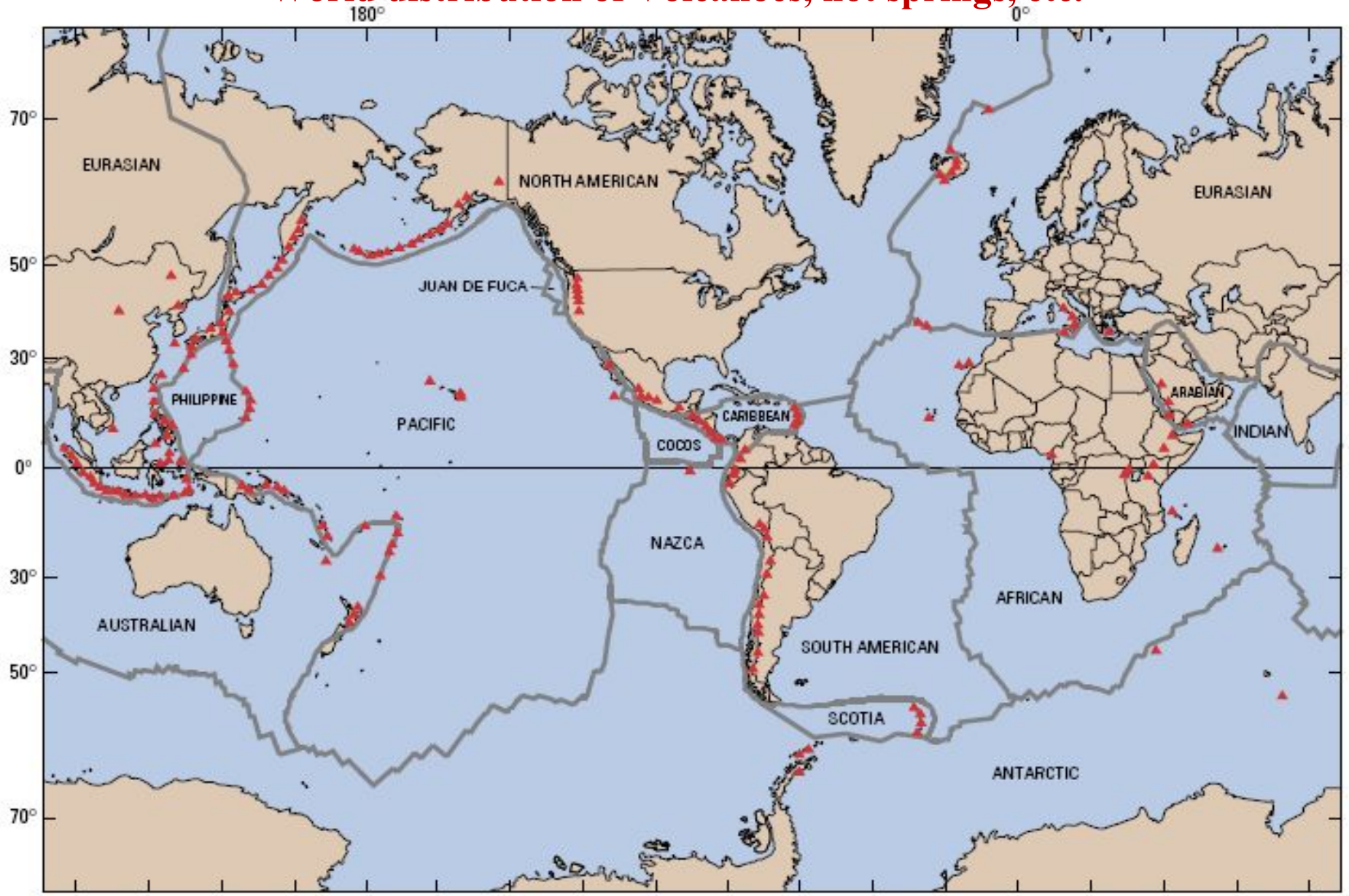
HOOVER DAM

Geothermal

- **Energy from Earth's heat.**
- **Radioactive** materials disintegrate to produce heat.
- **Hot rocks** underground heat water to produce steam.
- **Drill holes** down to hot region, steam comes up, and used to drive turbines, which drive electric generators.
- Not available at all places.
- Site may **"run out of steam"**.
- Hazardous gases and minerals may come up.



World distribution of Volcanoes, hot springs, etc.



Japan, Iceland, New Zealand big users of geothermal.

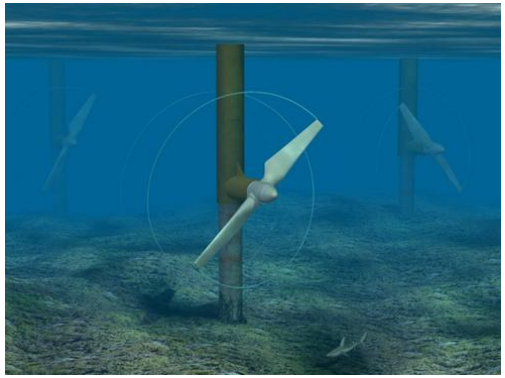
Biomass

- Energy from burning organic or living matter.
- Plant and animal waste is used to produce fuels such as **methanol**, **natural gas**, and **oil**.
- We can use **rubbish**, **animal manure**, **woodchips**, **seaweed**, **corn stalks, bagasse,** and other wastes.
- **Solid waste management**
- **Resource conservation**

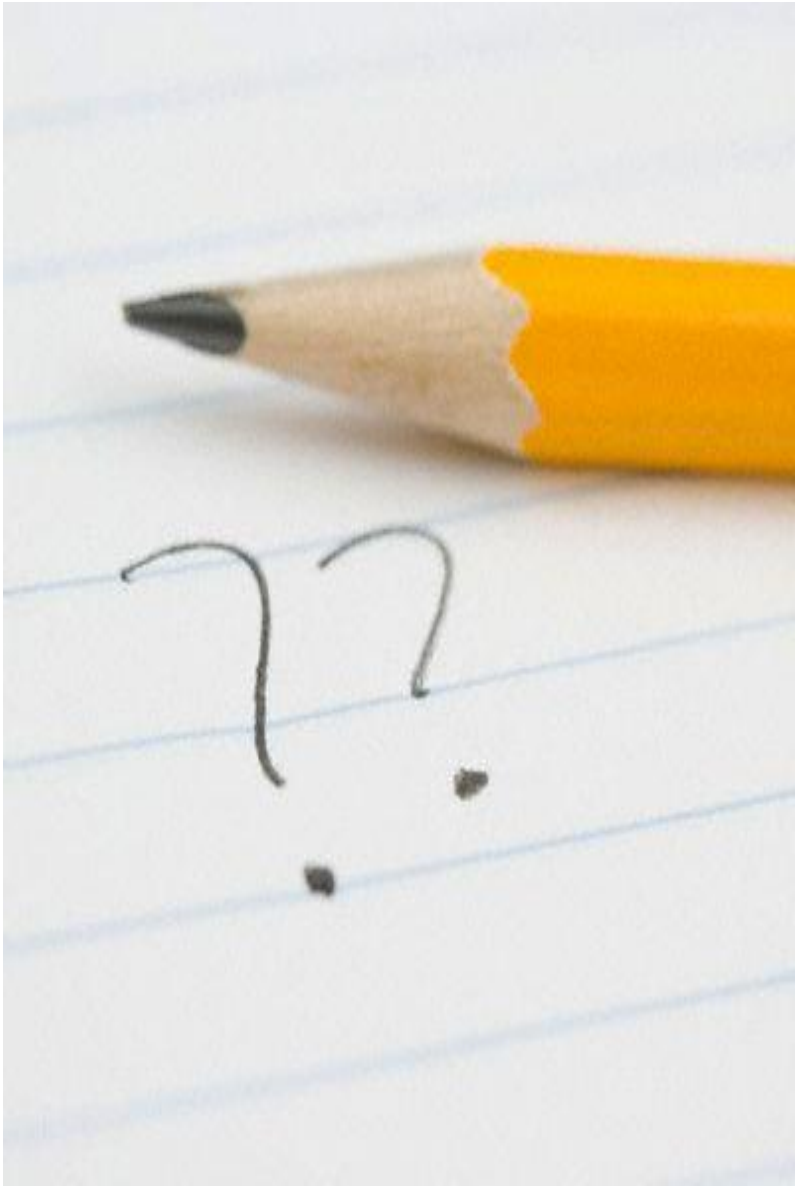
Burn fuel > heat water to make steam > steam turns turbine > turbine turns generator > electrical power

Tidal Power

- **Dam** is **much bigger** compared with hydropower.
- A **"barrage"** is built across a **river estuary**. When the **tide** goes in and out, the water flows through tunnels in the dam. which then turns a turbine.
- Only around **20 sites** in the world as possible tidal power stations.
- Once you've built it, tidal power is free.
- No greenhouse gases emission.
- Produces electricity reliably.
- Not expensive to maintain.
- Tides are totally predictable.
- Expensive and can affect ecosystems



What are the differences between nonrenewable and renewable resources?




Thank you for attention!!!

Recall Questions

Q1. What is ultimate source of energy on Earth:

a) Sun light
b) Coal
c) Volcanoes
d) Wind

Q2. Energy source in Sun is:

a) Nuclear fission
b) Nuclear fusion
c) Nuclear diffusion
d) None

Q3. Problem with non-renewable resources is:

a) Climate change
b) Limited amount
c) Air pollution
d) All

Q4. What is biomass?

a) Tree
b) Human waste
c) Polythene
d) All
e) a & b

Q5. Mojor source of energy today is:

a) Oil
b) Coal
c) Renewables
d) a & c

Q6. Acid rain contains:

a) Sulphuric acid
b) Nitric acid
c) Both
d) Only sulphuric acid

Q7. Which is example of solar thermal technology:

a) Solar cell
b) Solar cooker
c) Solar calculator
d) a & b

Q8. Wind originate due to:

a) Humidity change
b) Calm condition
c) Pressure change
d) a & c

Q9. Which renewable source of energy is more expanding in future in India:

a) Hydropower
b) Wind
c) Solar
d) Biomass

Q10. How to conserve energy resources:

a) Wise use
b) Go green
c) Public transport
d) Efficient devices
e) All