Renewable Energy Alternatives

Alternative energy needed to...

1) Replace fossil fuels
2) Reduce air pollution
3) Reduce emission of greenhouse gases

4 Natural Sources for Alternative Energy

Wind

Water

Wood

Sun

Types of Alternative Energy

- Solar Energy
- Wind Energy
- Water Energy
- Nuclear Energy
- Geothermal Energy
- Biomass Energy
- Methane Capture and Use
- Carbon Capture and
- Underground Storage
- Green Vehicles
- Energy-Efficient Buildings

Solar Energy

Light and heat that comes from the sun

Harnessing Sun’s Energy

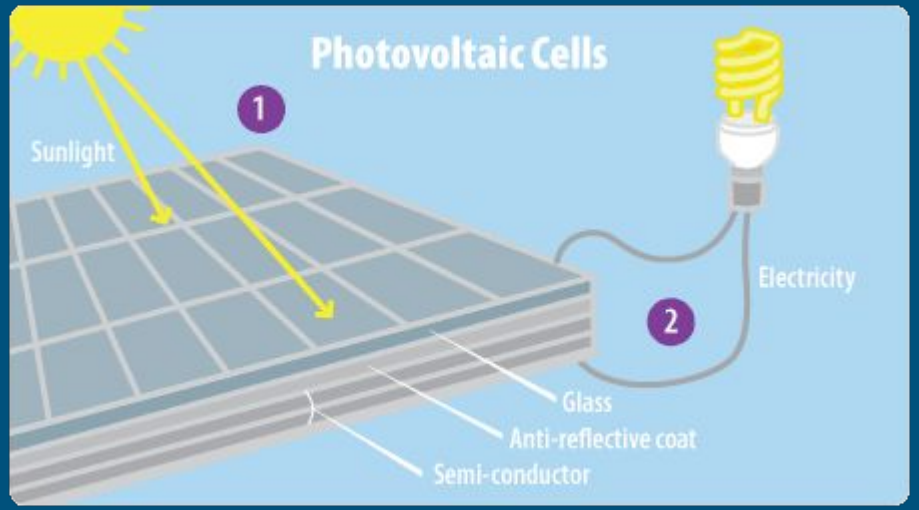
Photovoltaic cells, which convert sunlight into electricity

Solar thermal technology, where heat from the sun is used to make hot water or steam

Passive solar heating, which can be as simple as letting the sun shine through windows to heat the inside of a building.

Photovoltaic Cells (PVs)

Absorbs light and converts it directly into electricity



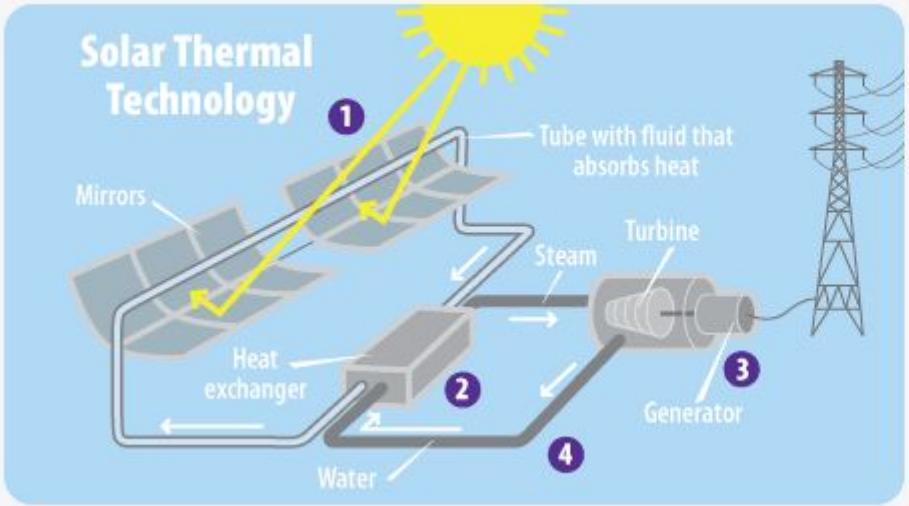
https://youtu.be/0elhIcPVtKE (2mins)

Solar Thermal Technology

Solar thermal power plants use heat from the sun to create steam, which can then be used to make electricity

Solar Thermal Technology: How it works?

How It Works



1. Mirrors or reflectors concentrate the sun's rays to heat a special kind of liquid.
2. The heat from this liquid boils water to create steam.
3. Steam spins a turbine that is connected to a generator, which creates electricity.
4. The steam cools and condenses back to water, which is recycled, reheated, and converted into steam again.

Watch a video to learn more about how these systems work.

EXIT Disclaimer

Passive Solar Heating

The natural collection, storage, and distribution of the sun’s energy

Design or remodel buildings to take advantage of heat from the sun during winter

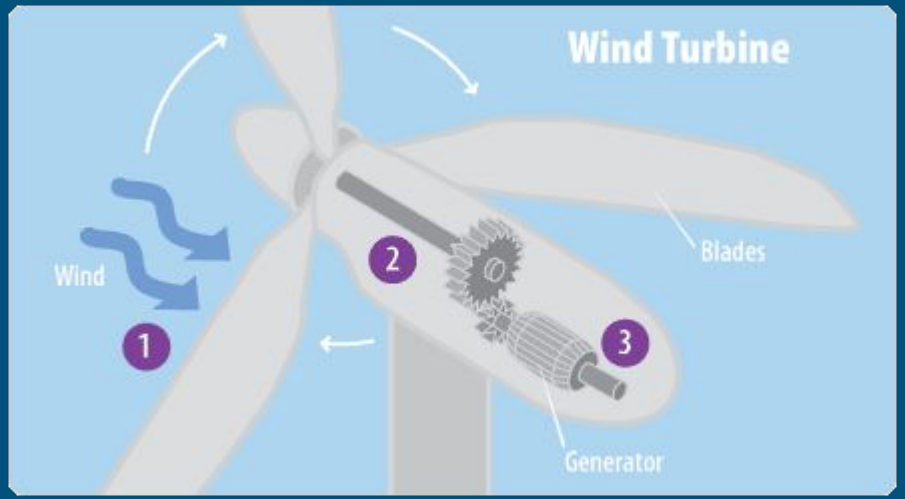
Cool facts

A town in Wisconsin is using solar panels to charge hybrid electric school buses.

In 2010, China unveiled the first solar-powered air conditioner. If mass–produced, these devices could help reduce energy use and greenhouse gas emissions in China and other countries.

Taiwan's National Stadium is being touted as the world's largest sports stadium. It's nicknamed the “flying dragon” after its silver–blue canopy, which coils like a tail and contains nearly 9,000 solar panels. When it's not in use, the stadium powers homes and businesses.

Wind Energy: How it works?



1. As the wind blows over the blades of a wind turbine, it causes the blades to lift and rotate
2. The rotating blades turn a shaft that is connected to a generator
3. The generator creates electricity as it turns

Interesting facts about Wind Energy

Denmark gets one–fifth of its energy from wind power, the highest percentage of any country in the world.

The United States and China are the largest producers of wind power in the world.

In the United States, wind energy now produces enough electricity to power more than 9 million homes.

Water Energy

Energy from moving water:

1) Hydroelectric Dam
2) Wave Power
3) Tidal Power

Water Energy: Hydroelectric Dam

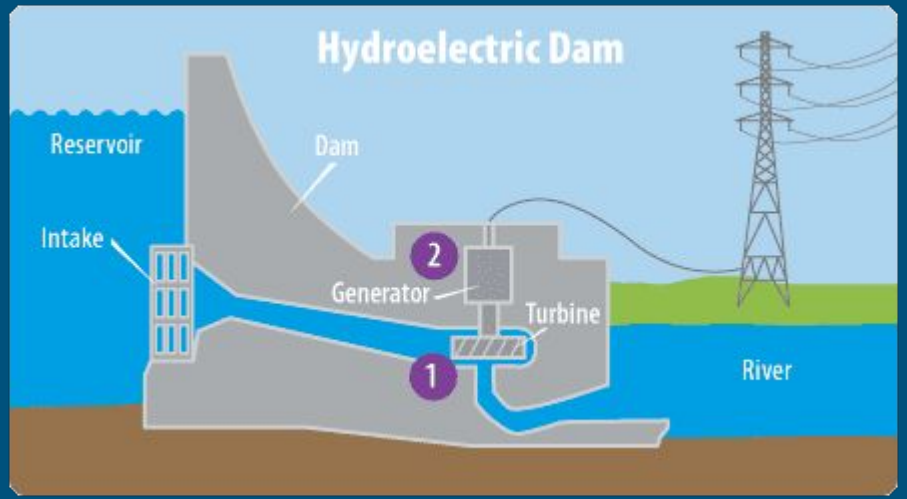
Captures energy from the movement of a river.

Dam operators control the flow of water and the amount of electricity produced.

Dams create reservoirs (large bodies of calm water) behind them, which can be used for recreation, wildlife sanctuaries, and sources of drinking water.

Dams can harm ecosystems and disrupt people’s lives

Hydropower: How it works



1. Flowing water turns a wheel or turbine
2. A generator attached to the turbine produces electricity

Water Energy: Wave Power

captures energy from waves on the surface of the ocean using a special buoy or other floating device.

Cool fact:

The first commercial U.S. power station using ocean waves to generate electricity is in the works in Oregon. When finished, 10 “powerbuoys” in the ocean will generate enough electricity to power 1,000 homes.

Water Energy: Tidal Power

The use of the movement of tidal water to generate electricity

captures the energy of flowing waters with the help of turbines as tides rush in and out of coastal areas.

Biomass Energy

Definition:

Energy that is produced from the material that makes up living organisms or comes from them

Biomass energy cont.

Example: Wood

Wood contains stored energy

Plants absorb energy from the sun through process called _____?

When biomass (eg. wood) is burned, stored energy is released by heat.

Biomass examples

wood chips, corn, and some types of garbage

Biofuel

Definition:

A liquid fuel, such as ethanol or diesel, that comes from biomass

Note- bio refers to life, So biofuels are fuels that came from living or once living materials.

Geothermal Energy

Definition:

Heat from deep beneath Earth’s surface that is produced by high pressure and the breakdown of radioactive elements

https://youtu.be/mCRDf7QxjDk

Geothermal Energy

Hot mineral springs...

Used by ancient Romans, Chinese, and Native Americans for bathing, cooking and eating

Currently used by most people in Iceland

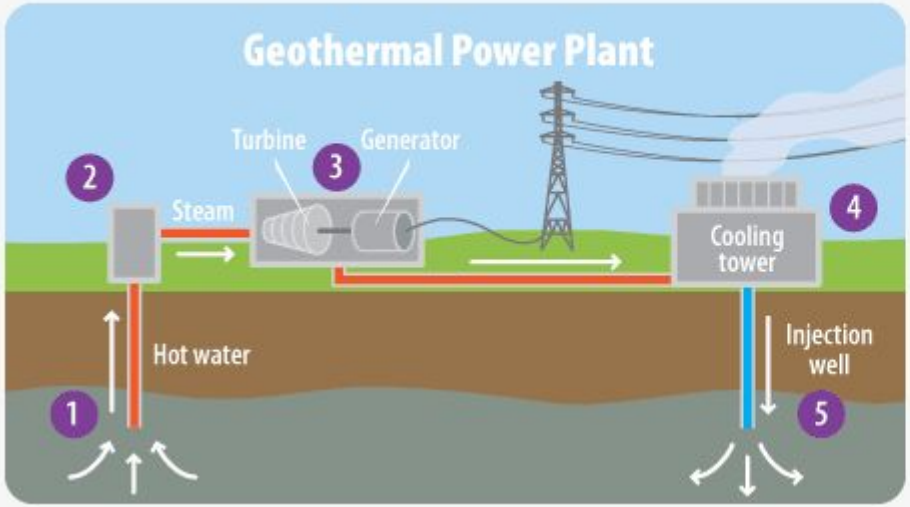
Geothermal Power Plants

wells are drilled 1 or 2 miles deep into the Earth to pump steam or hot water to the surface.

power plants found in areas that has a lot of hot springs, geysers, or volcanic activity, because these are places where the Earth is particularly hot just below the surface.

Geothermal Energy: How it works?

How It Works



1. Hot water is pumped from deep underground through a well under high pressure.
2. When the water reaches the surface, the pressure is dropped, which causes the water to turn into steam.
3. The steam spins a turbine, which is connected to a generator that produces electricity.
4. The steam cools off in a cooling tower and condenses back to water.
5. The cooled water is pumped back into the Earth to begin the process again.

https://youtu.be/mCRDf7QxjDk

Geothermal Source Heat Pump

Definition:

A device that uses the steady temperature of soil underground to control the temperature of water; heats buildings in winter and cools them in summer

Geothermal Heat Pump

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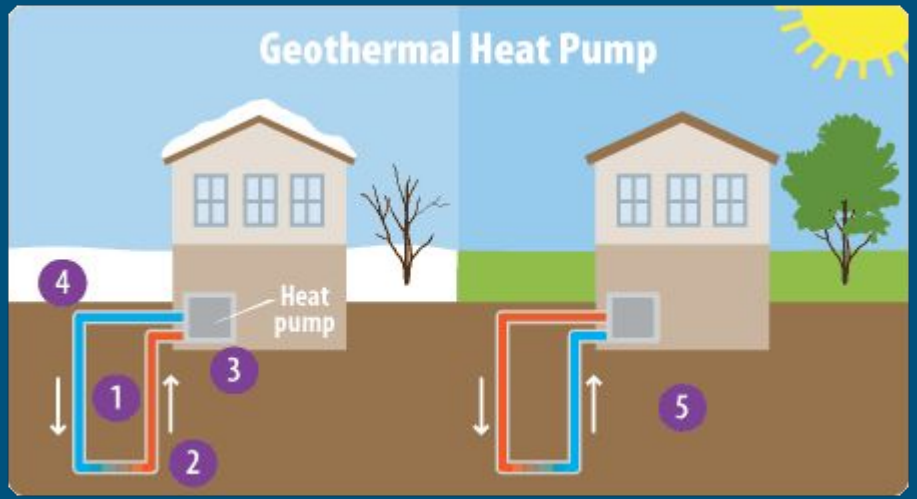
(2:31s)



Hydrogen Fuel

Definition:

Electrolysis: A process that releases hydrogen; water molecules are broken down into oxygen gas and hydrogen gas by an electric current that runs through the water.

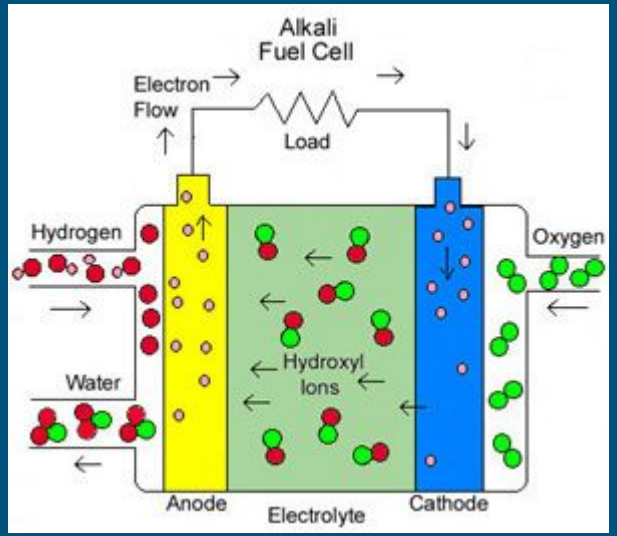
Fuel Cell

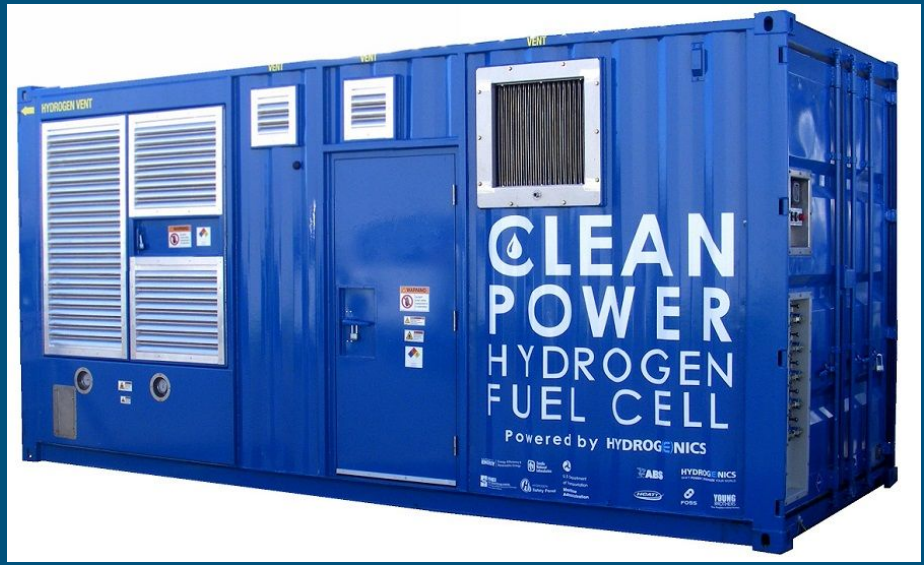
Fuel Cell: A device that produces electricity through using hydrogen gas.

Chemical reaction in a fuel cell: $2H_2 + O_2 \rightarrow 2H_2O$

https://youtu.be/QFQGXei47c0

Fuel Cell


Alkali
Fuel Cell
Electron
Flow
Load
Hydrogen
Oxygen
Water
Hydroxyl
Ions
Anode
Electrolyte
Cathode


HYDROGEN VENT
VENT
VENT
CLEAN
POWER
HYDROGEN
FUEL CELL
Powered by HYDROGENICS

Fuel Cell: How it works

Hydrogen gas enters where the negative electrode is, splitting two positively charged ions. Oxygen gas enters on the other side where the positive electrode is creating a series of reactions:

Electric current flows from the negative terminal to the positive terminal

Oxygen and hydrogen ions combine to form water molecules.

Sustainable Public Transportation

https://youtu.be/M5OldGoNeMs