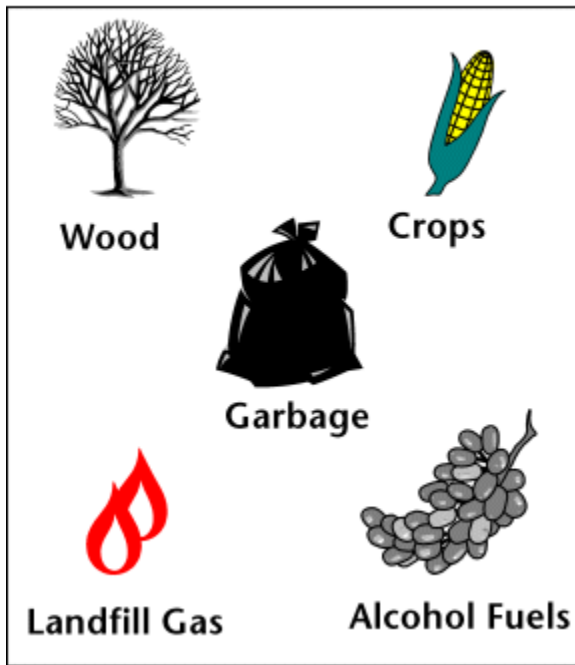
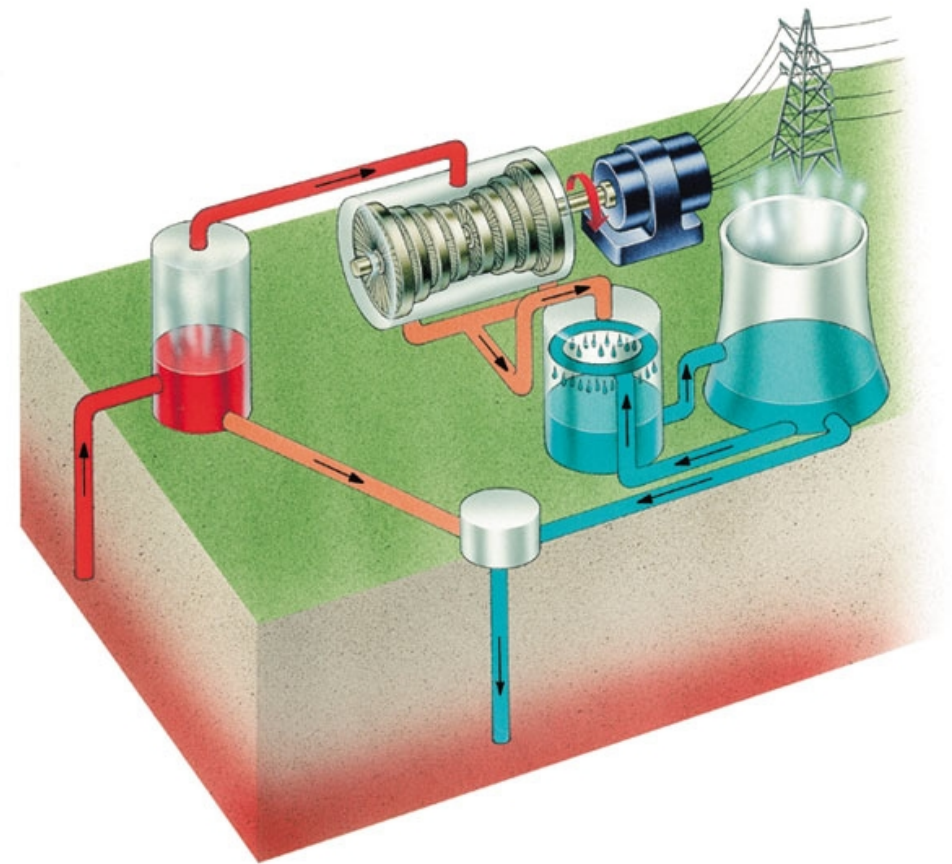


## Types of Biomass



## Geothermal and Biomass Energy



# Brief History

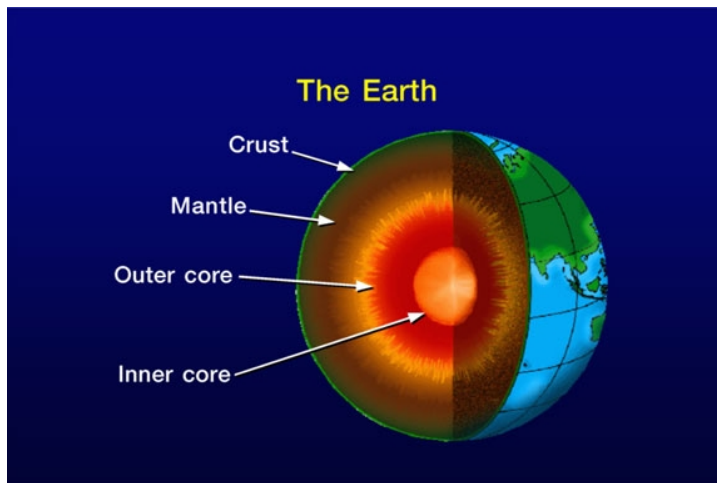
- ▶ The history of geothermal power can be traced back to over 10,000 years ago to the American Paleo-Indians at their settlement in hot springs.
- ▶ This history has been uncovered through the use of archeology and shows the Indians used the hot springs for activities including, bathing and heating.
- ▶ It is believed that the first geothermal energy use in industry was during the late 18th century near Pisa, Italy.
- ▶ A history of the first geothermal power plant relates to the Larderello Fields, when in 1904 the steam was successfully used to generate power for the first time.
- ▶ In 1922 the U.S.A's first geothermal power plant went down in history in producing kilowatts which could light the streets and buildings in the area.



# Geothermal Energy Background

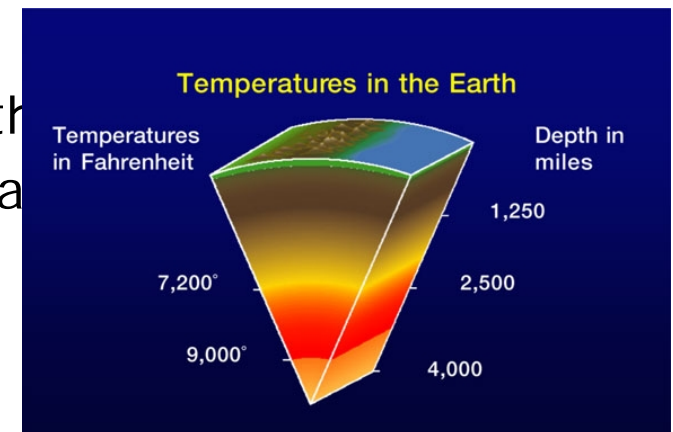
Geothermal energy is a renewable and sustainable power source that comes from the heat generated by the earth.

"Geo" means earth and "thermal" means heat.



The Earth has four main layers:  
Mantle, Outer Core, Inner

The lower you go into the Earth, the hotter the temperature gets, and in the inner core, it can reach as hot as 9,000 degrees Fahrenheit.



## How it works

1. When water precipitates, and is infiltrated into underground reservoirs it is held deep within the Earth.



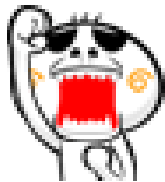
2. This water gets heated by magma.



3. In order to obtain the "superheated fluid" we drill 5,000-10,000 feet into the ground through production wells.



4. Because of its extreme heat, the pressure forces the heated fluid up naturally.



5. As it rises the fluid begins to produce or "Flash" into steam.



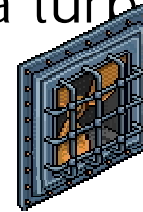
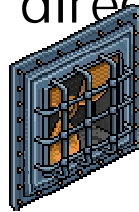
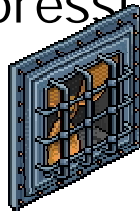
6. Once piped into a holding tank, the pressure is reduced which causes a large amount of the hot fluid to flash into steam, this steam is separated from the fluid.



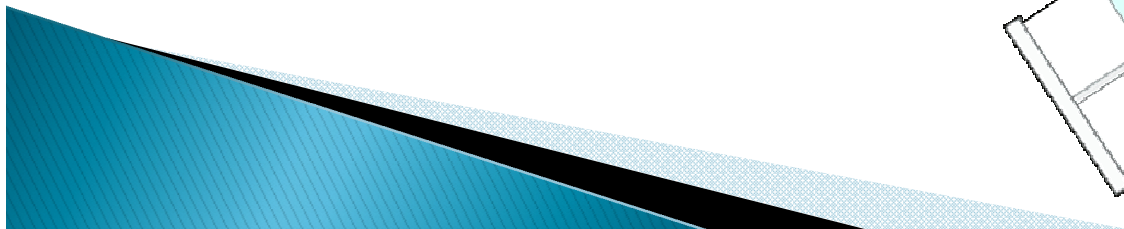
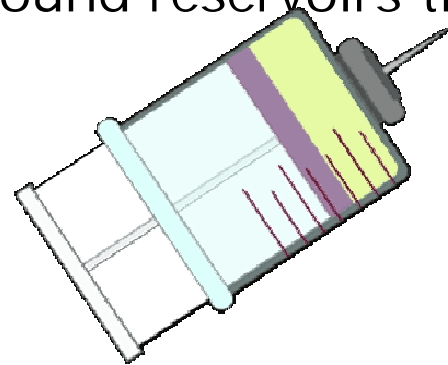
7. The geothermal fluid is then taken to another holding tank where the pressure is decreased yet again to separate any more steam, and even a third time to extract as much steam as possible.



8. These three steams (low pressure, standard pressure, and high pressure) are then directed towards a turbine

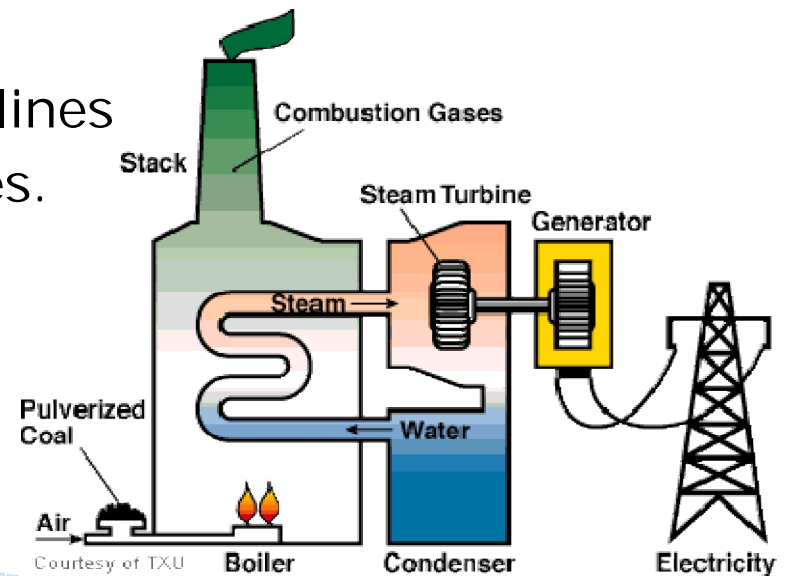
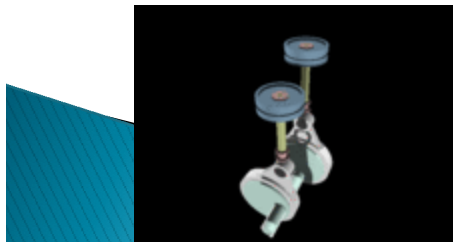


9. The left over fluid is sent to the reactor clarifier system and is returned to the underground reservoirs through injection wells.



## Making the Turbine Run

1. Turbines are used to turn geothermal energy into mechanical, or usable, energy.
2. The pressurized steam from the superheated fluid is forced into the turbine at such velocity, that it is used to spin the turbines blades naturally.
3. These blades are attached to a shaft, which are connected to an electrical generator.
4. The electric charge we get is from magnets in the generator are turned at such a rapid speed.
5. The charge is carried by large copper bars to transformers, which increase the voltage.
6. This energy is then sent to power lines and carry it to our homes and cities.



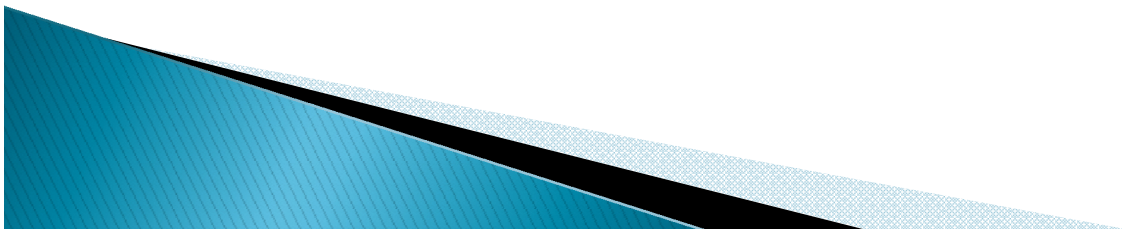
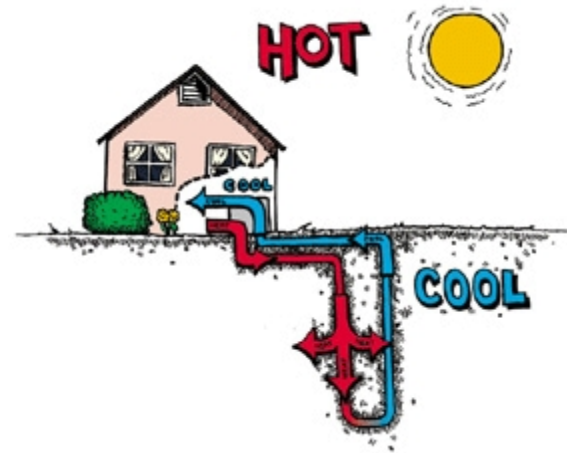
# Weighing Our Options

## Geothermal Pros:

- Less environmental pollution
- Is renewable and sustainable
- Avoids importing energy resources
- Benefits remote areas
- Adds to energy source diversity
- Creates less waste disposal
- Has a long life span

## Geothermal Cons:

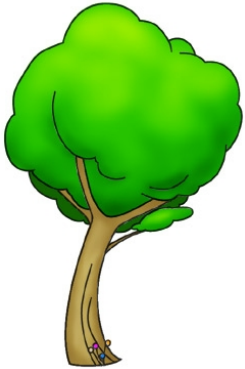
- May cause small after-shock earthquakes
- Minor damage may take 1000 years to recover
- Best supplies limited to certain areas of the world
- Start-up costs are expensive
- Corrosion of pipes can be a problem





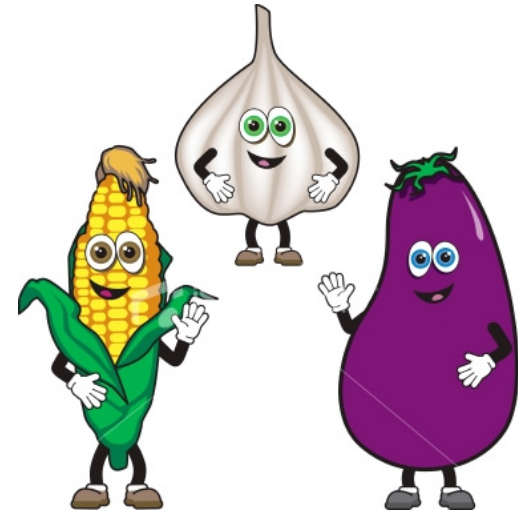
# Different Types of Fuel

Wood



Garbage/Waste

Crops/Plants



Landfill Gas



Ethanol/Alcohol



## Biomass Fuels and Energy

- ▶ The first biomass plants began producing electricity in 1982-83, wood-fired generation rapidly expanded throughout California.
- ▶ Instead of burning non-renewable fuels such as coal, petroleum and natural gas, biomass power plants combust wood waste to generate electricity.
- ▶ The biomass industry annually consumes 7 million tons of organic waste.
- ▶ Biomass means "natural material." When biomass energy is burned, it releases heat – just like the wood logs in your campfire.
- ▶ Biomass is the second-most common form of renewable energy we use in the United States, providing enough electricity to power more than two million homes.



## How it Works

The waste wood, tree branches and other scraps are gathered together in big trucks.

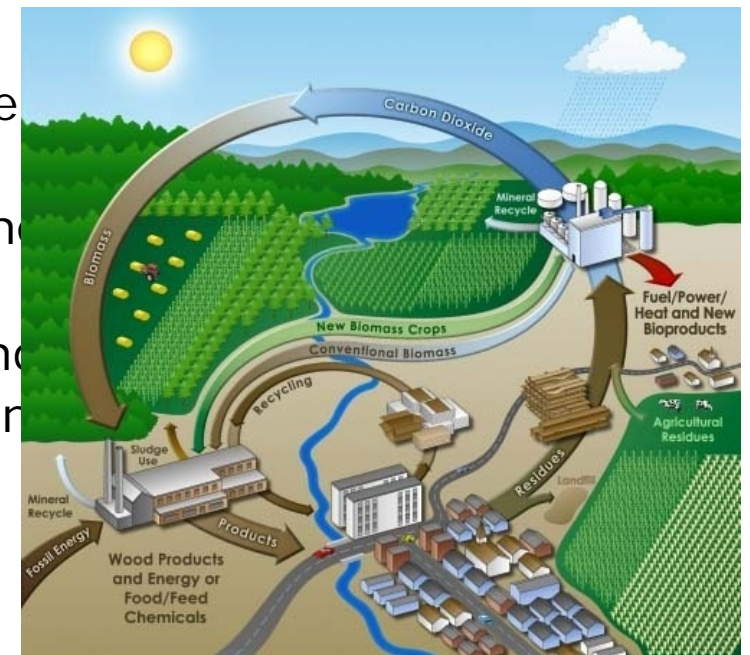
The trucks bring the waste from factories and from farms to a biomass power plant.

Here the biomass is dumped into huge hoppers

This is then fed into a furnace where it is burned

The heat is used to boil water in the boiler, and energy in the steam is used to turn turbines and generators.

It is very much like geothermal energy, but it recycles the plants waste, rather than tapping into the earth.



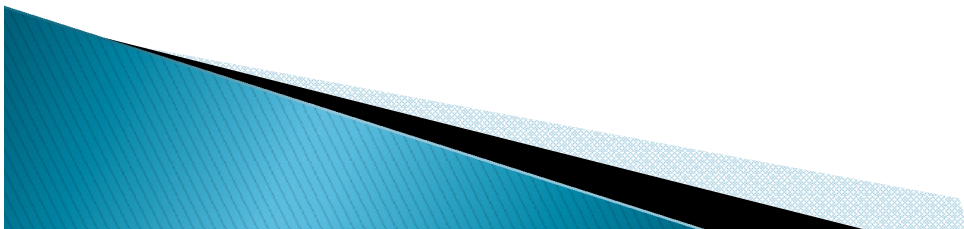
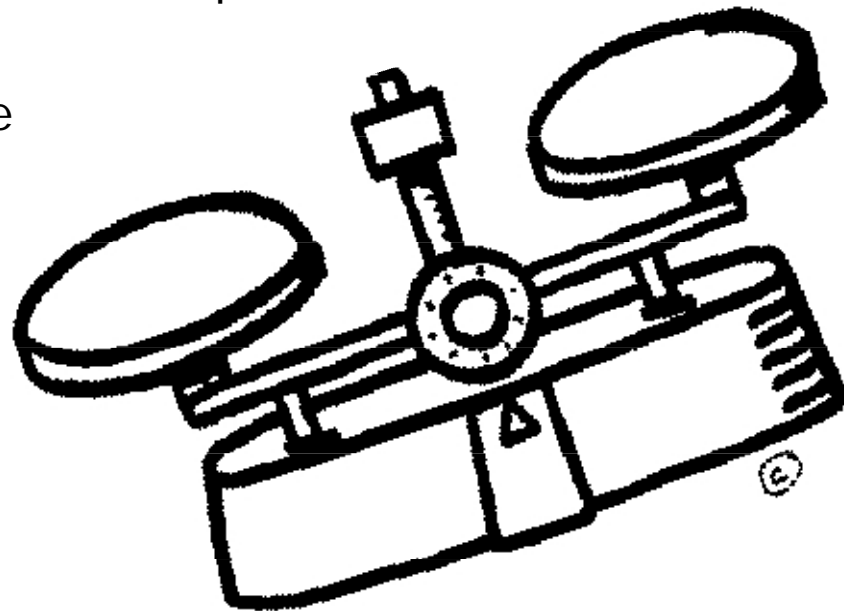
# Weighing Our Options

## Biomass Pros:

- Abundant and renewable
- Can be used to burn waste products

## Biomass Cons:

- Burning biomass can result in air pollution
- May not be cost effective

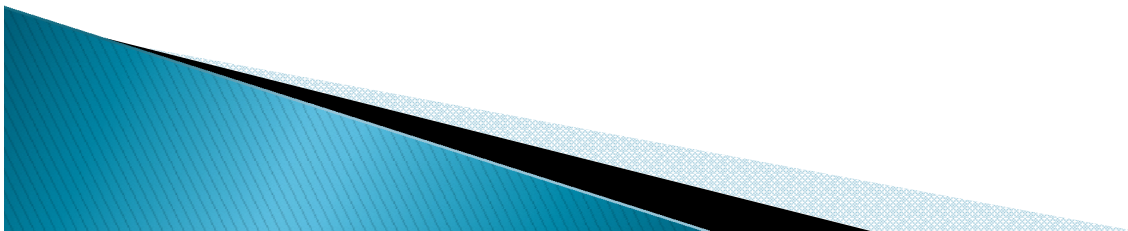


# Some Examples

## ▶ Geothermal Energy:

- This is being used mostly in empty dry areas, where there is not a large amount of people.
  - Such as deserts, and farming areas.

There has been a recent decline in the use of geothermal energy however, because plants are being shut down for repair and debt. These are very expensive to start up, and only pay for themselves several years down the road.



# Some Examples

## ▶ Biomass:

- There has been a recent surge in trying to find new ways of using biomass.
- It is the exact same situation as the oil supply.
- There is an effect that our current electrical ways is having on the Earth, it pollutes much more then need be, and so we are trying to find cleaner, longer lasting ways to light our lives.

