
Renewable and Non-renewable energy Resources and Energy conservation

Energy

Meaning

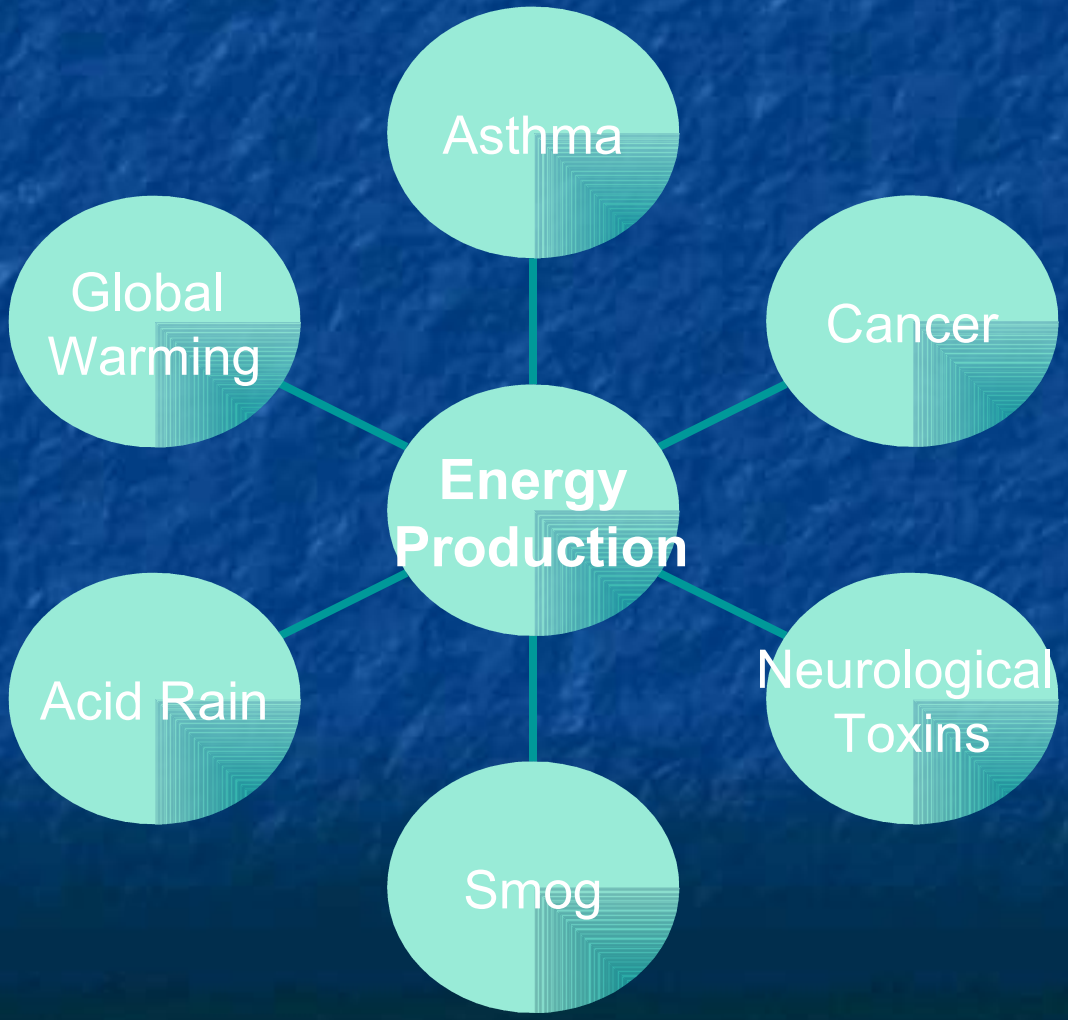
- Energy is the amount of force or power when applied can move one object from one position to another.
- Energy defines the capacity of a system to do work.
- Energy exists in everybody whether they are human beings or animals or non living things. e g: Jet, Light, Machines etc..
- Energy is intimately related to power.

- According to the law of conservation of energy, any form of energy can be converted into another form, the total energy will remain the same.
- For example: when you charge your mobile phone the electrical energy is converted into the chemical energy which gets stored inside the battery

Energy and Environment

- Energy and environment have a strong relationship. The production and consumption of energy is one of the biggest causes of environmental damage on earth.
- It leads to large amounts of destruction of natural landscapes and habitants through the process of fuel extraction, pollution of soil, climate change
- Energy is at the heart of many of the world's current environmental problems, and posses many problems for the sustainable development

- Energy production includes environmental and human health costs.

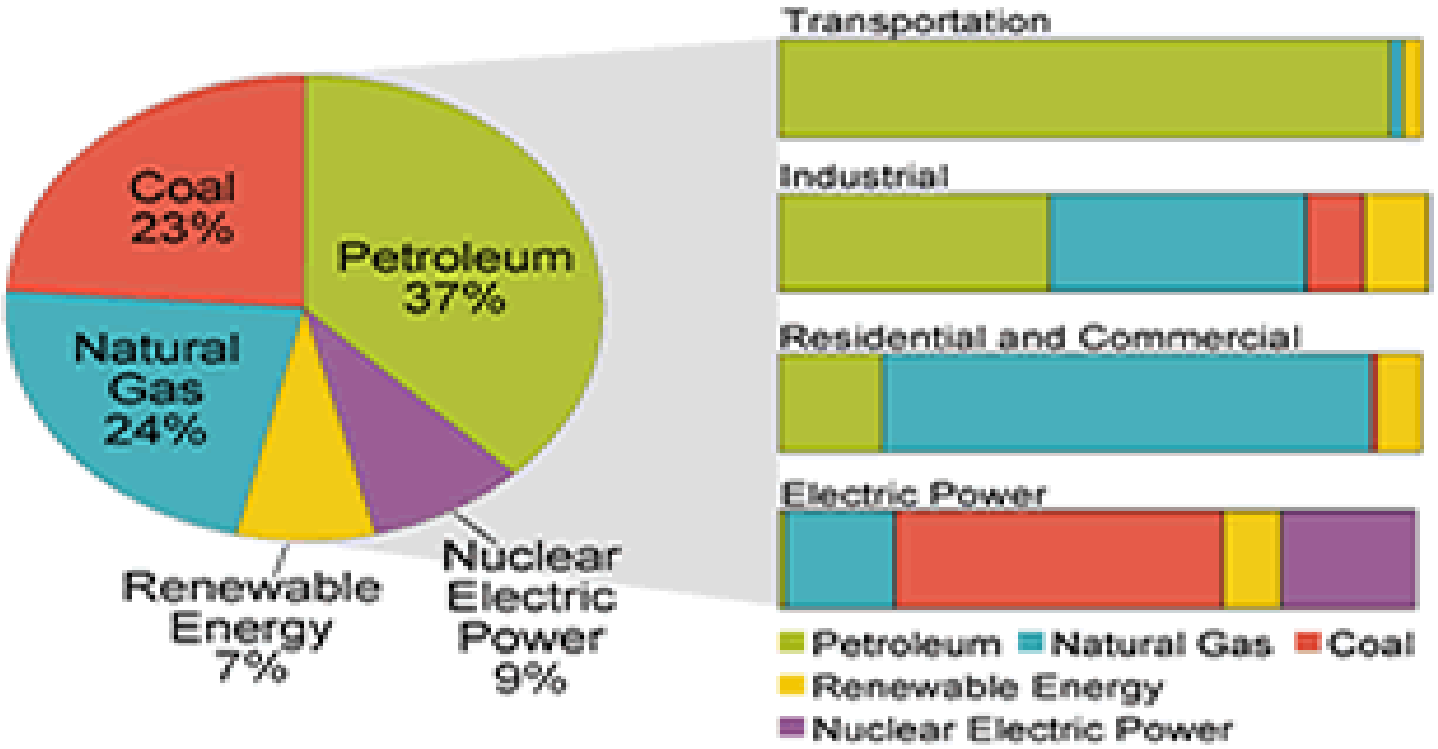


- Energy can have many forms: kinetic, potential, light, sound, gravitational, elastic, electromagnetic or nuclear.
- Energy are broadly classifies into two main groups:

  Renewable Energy

  Non-renewable Energy

U.S. Primary Energy Consumption by Source and Sector, 2008



Total U.S. Energy = 99.3 Quadrillion Btu

Source: Energy Information Administration, *Annual Energy Review 2008*, Tables 1.3, 2.1b-2.1f.

Renewable Energy

- Renewable energy is energy which is generated from natural sources i.e. sun, wind, rain, tides and can be generated again and again as and when required.
- They are available in plenty and by far most the cleanest sources of energy available on this planet.
- Renewable technologies are suited to
  - large-scale production
  - small off grid applications

- Main forms of renewable energy
  - Wind energy
  - Hydro energy
  - Solar energy
  - Bio-fuel
  - Geothermal energy

Wind Power

- Airflows can be used to run wind turbines.
- Areas where winds are stronger and more constant, such as offshore and high altitude sites, are preferred locations for wind farms.

- wind energy is believed to be five times total current global energy production, or 40 times current electricity demand.
- This could require large amounts of land to be used for wind turbines, particularly in areas of higher wind resources. Offshore resources experience wind speeds of ~90% greater than that of land.
- Wind power produces no greenhouse gases during operation, and power is growing at the rate of 30% annually, with a worldwide installed capacity of 157,900 MW.

Hydropower

Hydroelectric energy is a term usually reserved for large-scale hydroelectric dams.

- Micro hydro systems are hydroelectric power installations that typically produce up to 100 kW of power. They are often used in water rich areas as a remote-area power supply (RAPS).
- Damless hydro systems derive kinetic energy from rivers and oceans without using a dam.
- Ocean energy describes all the technologies to harness energy from the ocean and the sea. This includes marine current power, ocean thermal energy conversion, and tidal power.

Solar energy

- Solar energy is the energy derived from the sun through the form of solar radiation.
- Solar powered electrical generation relies on photovoltaics and heat engines. A partial list of other solar applications include daylighting, solar hot water, solar cooking and high temperature process heat for industrial purposes.
- Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy.
  - Active solar techniques include the use of photovoltaic panels and solar thermal collectors to harness the energy.
  - Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air.

Bio-fuel

- Liquid bio-fuel is usually either bio-alcohol such as bio-ethanol or an oil such as bio-diesel.
- Bio-ethanol is an alcohol made mostly from sugar and starch crops. With advanced technology being developed, celluloic biomass, such as trees and grasses, are also used as feed stocks for ethanol production.
- Ethanol can be used as a fuel for vehicles in its pure form, but it is usually used as a gasoline additive to increase octane and improve vehicle emissions.
- Bio-ethanol is widely used in USA and in Brazil.

- Bio-diesel is made from vegetable oils, animal fats or recycled greases. Bio-diesel can be used as a fuel for vehicles in its pure form, but it is usually used as a diesel additive to reduce levels of particulates, carbon monoxide, and hydrocarbons from diesel-powered vehicles.
- Bio-diesel is produced from oils or fats and is the most common bio-fuel in Europe. Bio-fuels provided 1.8% of the world's transport fuel in 2008

Geothermal energy

Geothermal energy is energy obtained by tapping the heat of the earth .Earth's crust in some places of the globe or from some meters in geothermal heat pump in all the places of the planet , this energy derives from heat in the Earth's core.

There is also the potential to generate geothermal energy from hot dry rocks . Holes at least 3 km deep are drilled into the earth. Some of these holes pump water into the earth, while other holes pump hot water out.

- Three types of power plants are used to generate power from geothermal energy: dry steam, flash, and binary.
- ✓ Dry steam plants take steam out of fractures in the ground and use it to directly drive a turbine that spins a generator.
- ✓ Flash plants take hot water, usually at temperatures over 200 °C, out of the ground, and allows it to boil as it rises to the surface then separates the steam phase in steam/water separators and then runs the steam through a turbine.
- ✓ In binary plants, the hot water flows through heat exchangers, boiling an organic fluid that spins the turbine. The condensed steam and remaining geothermal fluid from all three types of plants are injected back into the hot rock to pick up more heat.

- There are two types of geothermal energy deposits .
  Hydro – geothermal enery resources
  Petro – geothermal energy deposits
- Hydro – geothermal energy resources are the deposits of hot water and steam at relatively lesser depths (3000 m) .Hot water and steam can be extracted from such deposits by means of the production wells.
- Petro – geothermal energy resources are the hot dry rocks around 200 degree centigrade and depth about 2000 m from important deposits of geothermal energy.

Estimated Renewable Energy Potential and Cumulative Achievements in India, 2007

Connected to grid	Est. potential (MW)	Online (2007)
bioenergy	66,881	1,255
wind power	45,195	7,660
small hydro (25MW)	15,000	2,014
waste-to-energy (urban & industrial)	2,700	56
large-scale solar	-	2
Decentralised		
household biogas (cooking, lighting)	1.2 million units	394,000 units
home photovoltaic	-	2,2MW (peak)

Source: Ministry of New and Renewable Energy, India

Advantages

- Wide availability
- Lower running cost
- Decentralized power production
- Low pollution
- Available for the foreseeable future

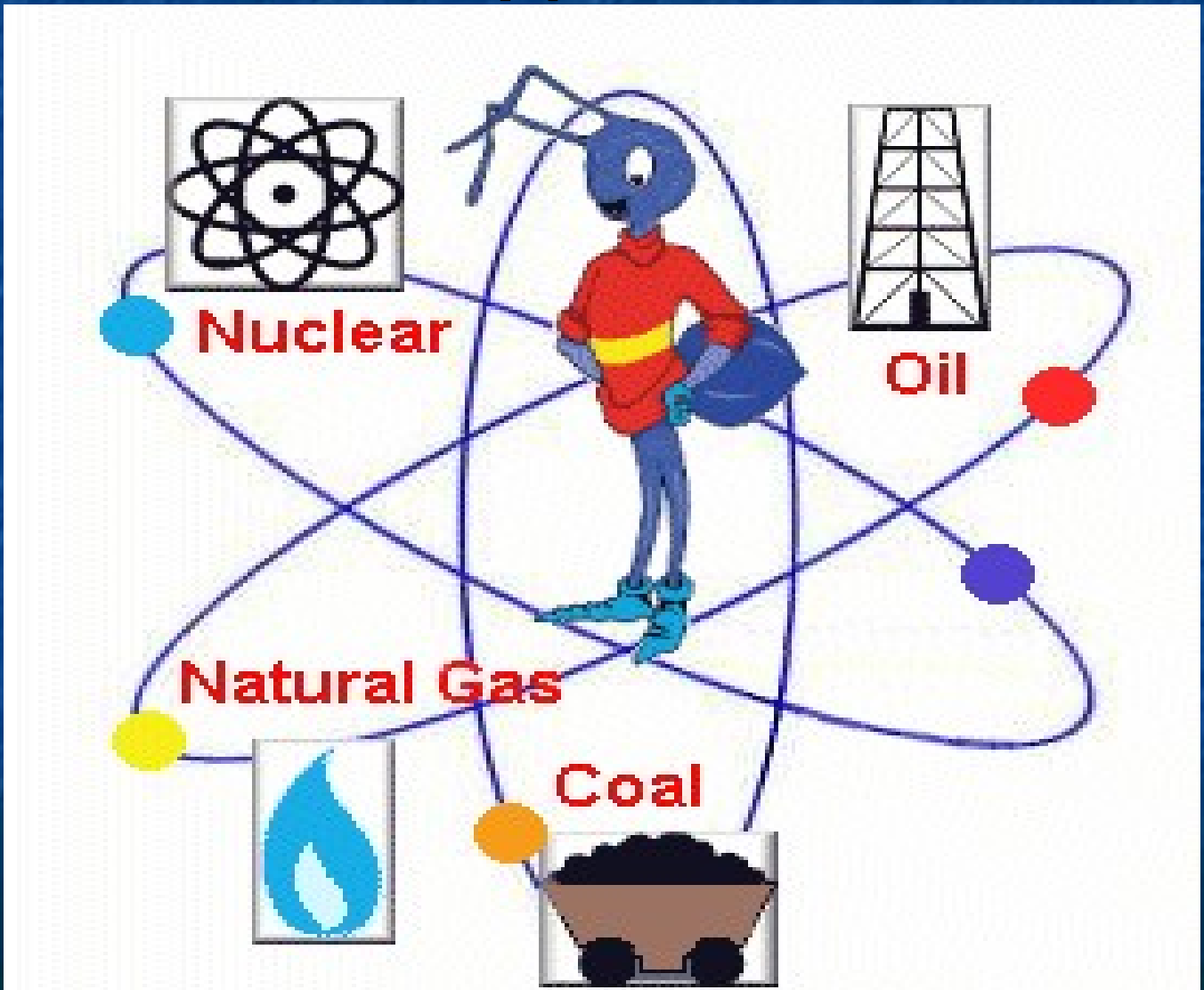
Disadvantages

- Unreliable supply
- Usually produced in small quantities
- Often very difficult to store
- Currently per unit cost of energy is more compared to other types

NONRENEWABLE RESOURCES

A nonrenewable resource is a natural resource that cannot be re-made or re-grown at a scale comparable to its consumption.

Types



NUCLEAR ENERGY

Nuclear fission uses uranium to create energy.

Nuclear energy is a nonrenewable resource because once the uranium is used, it is gone!

COAL, PETROLEUM, AND GAS

Coal, petroleum, and natural gas are considered nonrenewable because they can not be replenished in a short period of time. These are called fossil fuels.

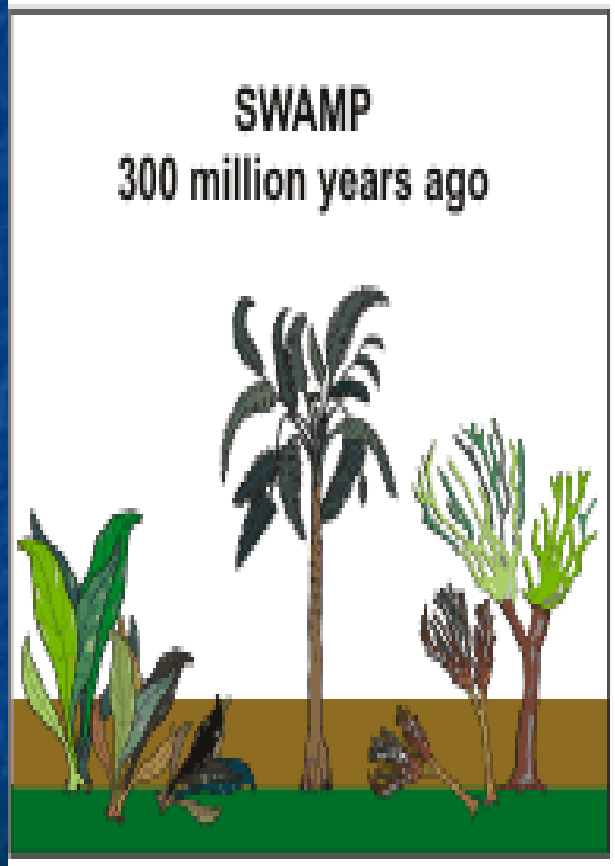
Fossil fuels

- Natural resources such as coal , petroleum ,oil and natural gas take thousands of years to form naturally and cannot be replaced as fast as they are being consumed.
- Extraction of fuel is by mining , drilling and quarrying

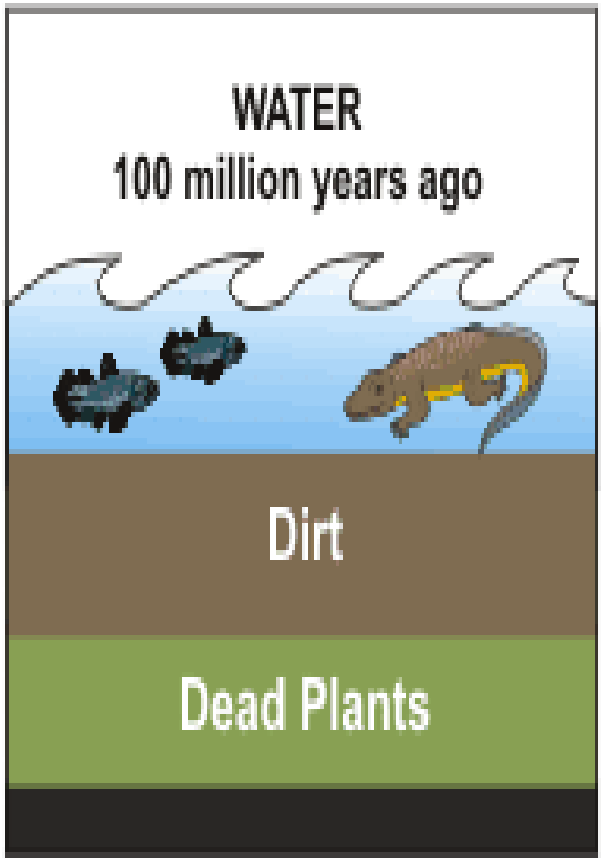
Coal

- India accounts for about 0.8% of the total geological reserves and 5.7% of the total proven reserves of coal in the world.
- The bulk of the coal produced is inferior grade non-cooking coal used to meet the demands of the power sector.

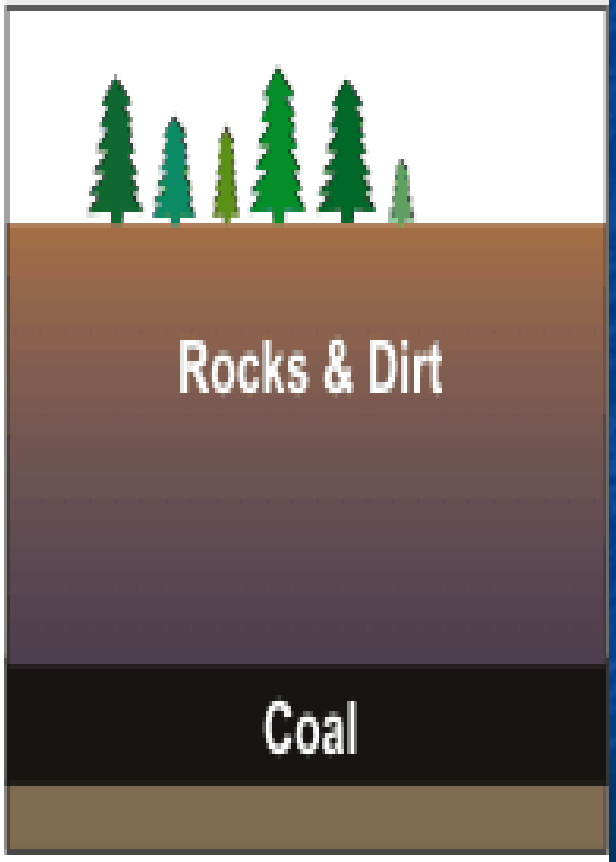
HOW IS COAL MADE ???



Before the dinosaurs, many giant plants died in swamps.

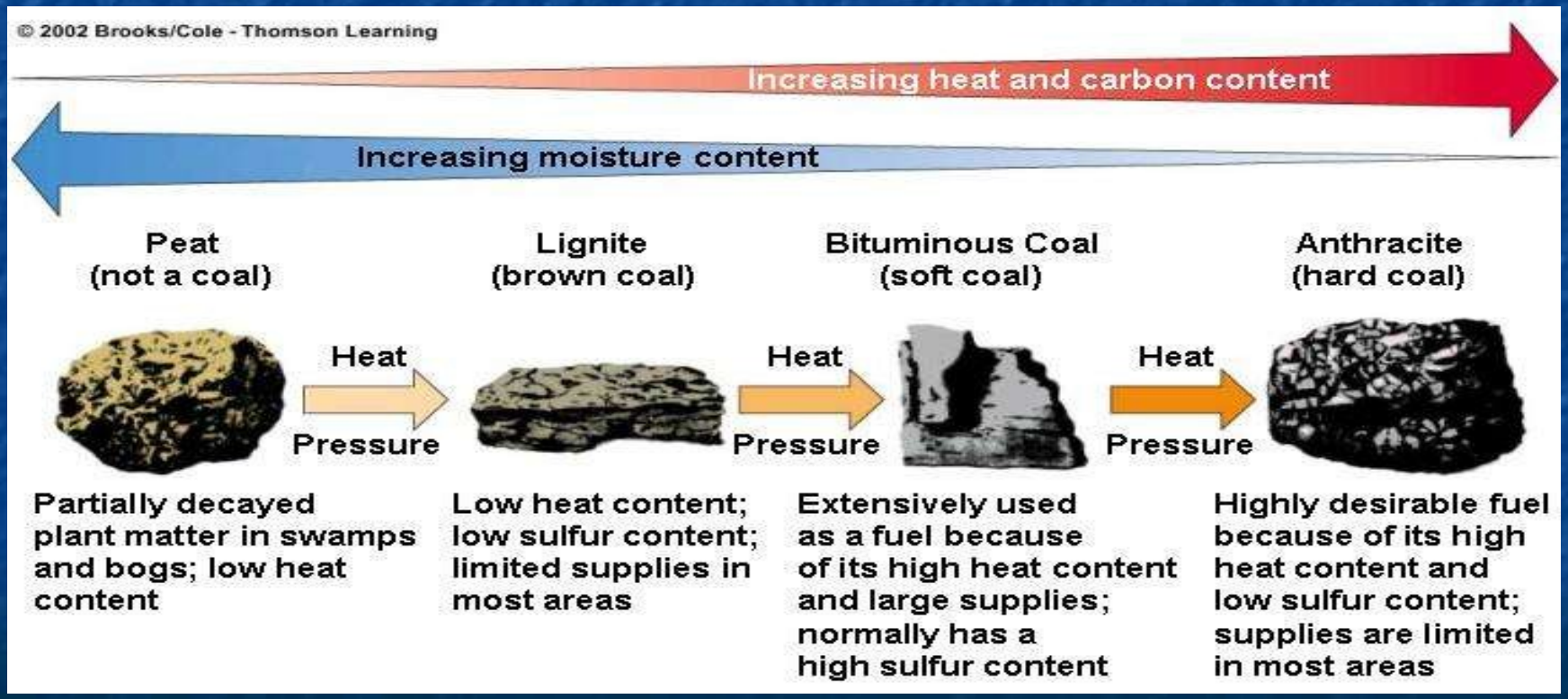


Over millions of years, the plants were buried under water and dirt.



Heat and pressure turned the dead plants into coal.

Coal formation process



DISADVANTAGES

- When coal is burnt it produces carbon dioxide that causes global warming.
- Since coal contains impurities like S and N, it produces toxic gases during burning which causes acid rain and air pollution.
- Traces of mercury and radioactive compounds are also released when coal is burned.
- Severe human health threat.(lung disease)

Oil and Natural Gas

- India has about .04% of the world's proven reserves of hydrocarbons.
- The prognosticated geological resources of the hydrocarbons in country are 21.31 billion tonnes of which 61% are offshore and 39% on land.
- Crude oil is made of many different compounds, each with its specific boiling point. Using distillation, we are able to separate out these compounds and turn them into commercial products, ranging from gas to asphalt

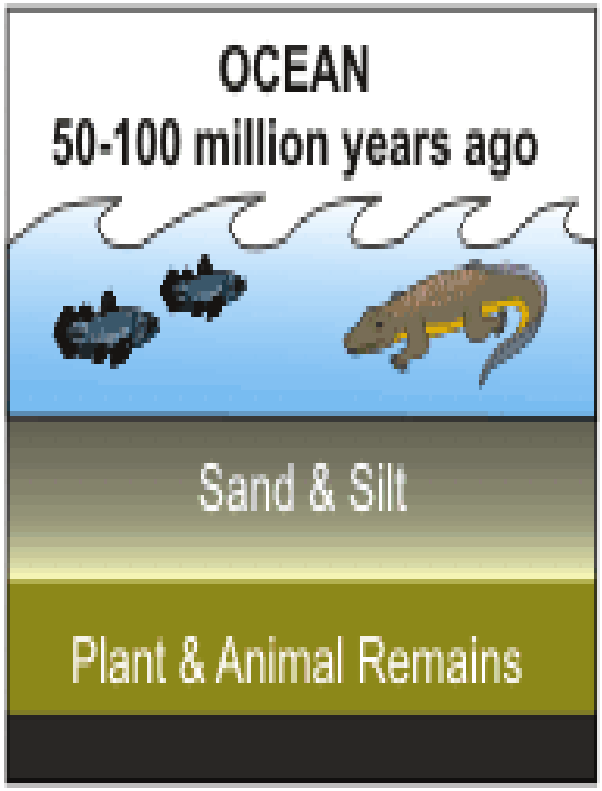
- The petroleum gas , obtained during the cracking and fractional distillation , can be easily converted into liquid under high pressure as LPG .
- Natural gas is found above the oil in oil well .It is the mixture of 50-90% methane and small amount of other hydrocarbons.
- If the natural gas contains lower hydrocarbons like methane and ethane , it is called dry gas.
- If the natural gas contains higher hydrocarbons like propane and butane , it is called wet gas.

Petroleum

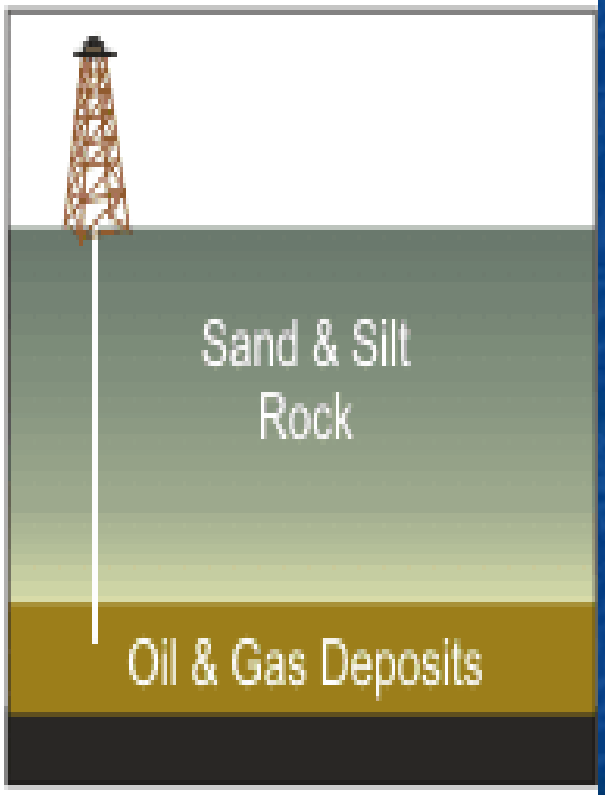
- Petroleum or crude oil is naturally occuring ,flammable liquid consisting of a complex mixture of hydrocarbons with small amount of S,O,N of various molecular weights and other organic compounds that is found in geologic formations beneath the earths surface.

HOW ARE OIL AND GAS MADE ???

Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of silt and sand.

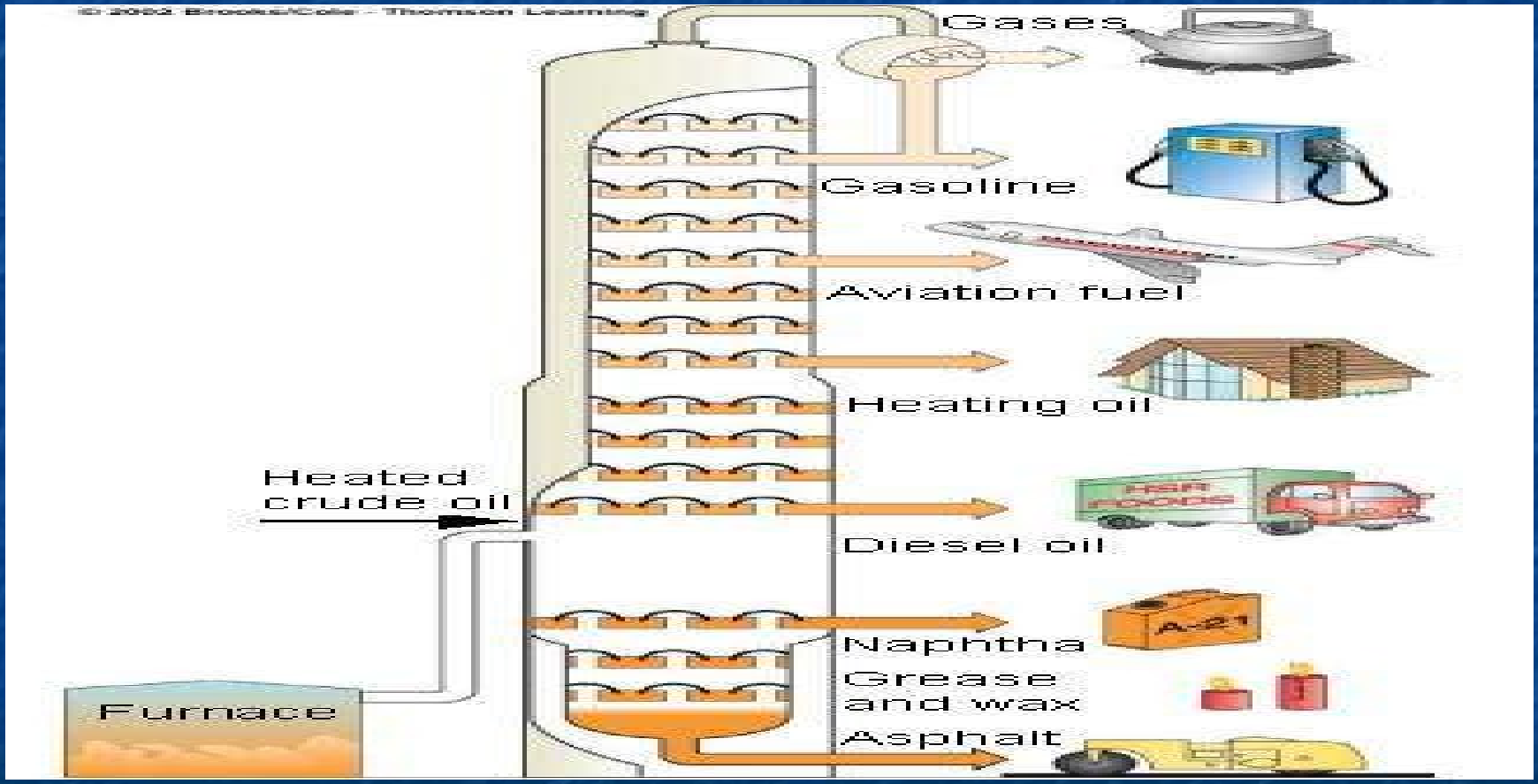


Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.



Today, we drill down through layers of sand, silt, and rock to reach the rock formations that contain oil and gas deposits.

Oil refining process



NATURAL GAS

Advantages

Ample supplies (125 years)

High net energy yield

Low cost (with huge subsidies)

Less air pollution than other fossil fuels

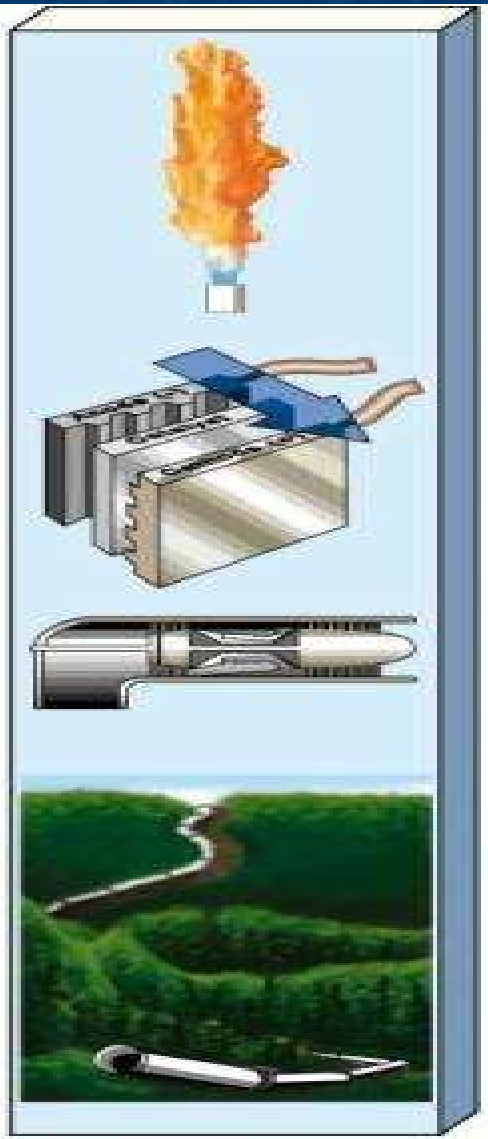
Lower CO_2 emissions than other fossil fuels

Moderate environmental impact

Easily transported by pipeline

Low land use

Good fuel for fuel cells and gas turbines



Disadvantages

Releases CO_2 when burned

Methane (a greenhouse gas) can leak from pipelines

Shipped across ocean as highly explosive LNG

Sometimes burned off and wasted at wells because of low price

ADVANTAGES

- Available in highly concentrated form
- Easy to store
- Reliable supply
- Lower cost per unit of energy produced as the technology is matured

DISADVANTAGES

- Highly polluting
- Available only in few places
- High running cost
- Limited supply and will one day get excausted

HOW DOES WE USE IT?

Equipment	Power Consumption in Watts
Zero watt bulb	12 W
Mosquito Repellents	10 W
Mobile charger	5 W
Voltage stabilizer	25 W
UPS Inverter	40 W
Cable set top box	25 W

Equipment running in stand by mode	Power Consumption in Watts
Compact audio system	27 W
DVD, CD, VCD player	12 W
Microwave oven	6 W
Inkjet printer	5 W
TV	22 W

The Data Indicates…

- Asian Energy Sources released:

  1256.4 million metric tons of Methane
  3228 thousand metric tons of Nitrous Oxide
  1021.1 million metric tons of Carbon Dioxide
  1242.4 million metric tons (carbon dioxide equivalent) of Hydrofluorocarbons, Perfluorocarbons, and Sulfur Hexafluoride

Why to Conserve?

- We have limited fuels available on earth.
- Our demand for energy is increasing day-by-day.
- It is possible that someday, most of fuels will be exhausted, and we will have to switch over to alternate energy.

WHY ENERGY EFFICIENCY?

- Country facing power shortages

  Peak Shortage – 13%

  Average Shortage – 8%

- Additional power required by 2012, 1 lakh MW

  Approximately 8,00,000 crores investment

- **India's energy Intensive for unit of GDP is higher by 3.7 times of Japan, 1.48 times of Asia & 1.5 times of USA**
- Higher wastage of energy.
- Very high energy saving potential.

Easy Solutions-No Cost

Energy Item	Action	Savings
Lighting	Turn lights off when not in use, and use daylighting	**Up to 8-20% of lighting energy**
Heating/Air Conditioning	Set thermostat as low as possible	**For each degree, up to 5% savings**
Heating, Ventilation and Air Conditioning	Limit after school activities to as few heating/cooling zones as possible	**Up to 25% of heating/ cooling costs**
Heating, Ventilation and Air Conditioning	Do not block air flow to HVAC vents	**Up to 10% of heating/ cooling costs**
Heating, Ventilation and Air Conditioning	Keep doors/windows closed while HVAC runs	**1-25% of space conditioning energy usage**
Office Equipment	Turn off machines when not in use	**Up to 10% of building energy usage**

Easy Solutions-Low Cost

Energy Item	Action	Savings
Lighting	Replace incandescent bulbs with compact fluorescent	**Up to 50% of lighting energy**
Lighting	Replace incandescent exit signs with LED lamps	**Up to 5% of lighting energy**
Lighting	Use more task-lighting and less overhead	**25-50% of lighting energy**
Heating, Ventilation and Air Conditioning	Perform scheduled maintenance	**Up to 10% of space conditioning energy**
Heating, Ventilation and Air Conditioning	Install locking covers on thermostats	**Up to 10% of system energy usage**
All Uses	Select student energy team to monitor	**Up to 15% of total facility energy usage**

Easy Solutions-Investments

Energy Item	Action	Savings
Lighting	Replace T-12 fixtures with T-8's & electronic ballasts	**Up to 20-30% of lighting energy**
Lighting	Replace mercury vapor fixtures in gyms or outdoors with metal halide, high-pressure sodium or T8 or T5 high output fluorescents	**Up to 10% of lighting energy**
Lighting	Install occupancy sensors	**Up to 20% of lighting energy**
Heating, Ventilation and Air Conditioning	Install ENERGY STAR ®-labeled programmable thermostats	**10-30% of space conditioning usage**
Heating, Ventilation and Air Conditioning	Install ENERGY STAR ®-labeled equipment.	**20-30% of space conditioning energy usage**
Air Conditioning	Install ENERGY STAR ®-labeled roofing material with high reflectance	**Up to 10% of air conditioning energy usage**

Energy Star

- Products meet strict energy efficiency standards set by US EPA and the US Department of Energy
- In 2005 the US saved enough energy to:

  Avoid greenhouse gas emissions equivalent to those from 23 million cars

  Saved $12 billion on utility bills

  Helped avoid 28,000 megawatts (MW) of peak power

Recycling is an excellent way of saving energy and conserving the environment.

Did you know that:

- 1 recycled tin can would save enough energy to power a television for 3 hours.
- 1 recycled glass bottle would save enough energy to power a computer for 25 minutes.
- 1 recycled plastic bottle would save enough energy to power a 60-watt light bulb for 3 hours.
- 70% less energy is required to recycle paper compared with making it from raw materials.

You can directly contribute by

3. By switching of lights when not required.
4. Using refills instead of buying a new pen.
5. Buying materials in bulk/without packing
6. By growing plants.
7. By being vegetarian also you save energy
8. By encouraging foods made of jowar, bajra, instead of rice.
9. By not wasting food.
10. By using CFL bulbs or tubes.

1. You save energy and protect the environment when you use
2. DIGITAL CAMERAS
3. LCD MONITORS
4. LNG OR CNG OR HYBRID OR ELECTRIC VEHICLES
5. MECHANICAL PENCILS
6. RECYCLED PAPER FOLDERS/PRODUCTS
7. OIL LAMPS INSTEAD OF WAX CANDLES
8. COPPER BOTTOMED STAINLESS STEEL UTENSILS

Summary

- You have the power to make a difference

"Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect." ~Chief Seattle, 1855

THANK YOU