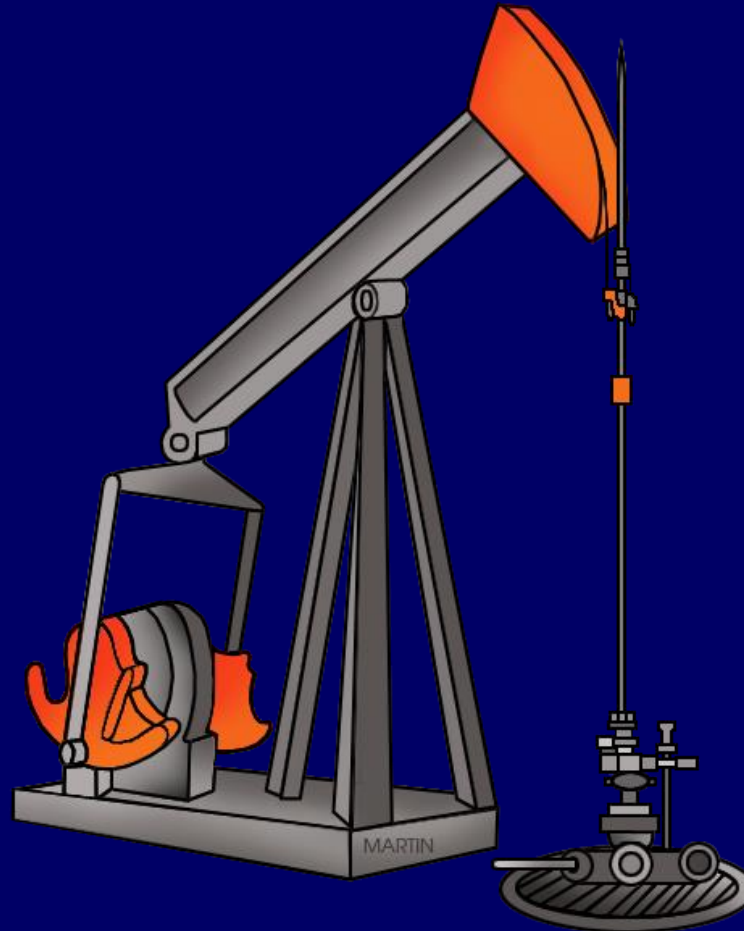


Human Impact

Acquiring Fossil Fuels



Essential Standard 2.2

Understand how human influences impact the lithosphere.

Learning Objective 2.2.2

Compare various methods humans use to acquire traditional energy sources such as: peat, coal, oil, natural gas, and wood.

I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I can describe how using wood as an energy resource has impacted the lithosphere.
- I can describe how using peat as an energy resource has impacted the lithosphere.
- I can describe how using coal as an energy source has impacted the lithosphere.
- I can describe how using oil as an energy source has impacted the lithosphere.

Wood as an Energy Source

Wood is considered humankind's first energy source. Today, wood still provides 9% of the global energy supply.



Over 2 billion people, in developing nations, depend upon wood energy for cooking and heating.

There are also wood-fired power plants, also called biomass plants, that burn wood products to produce steam, which then turns a turbine to generate electricity.

Wood as an Energy Source

Wood is considered humankind's first energy source.



Today, wood still provides 9% of the global energy supply.

Over 3 billion people, in developing nations, depend upon wood energy for cooking and heating.

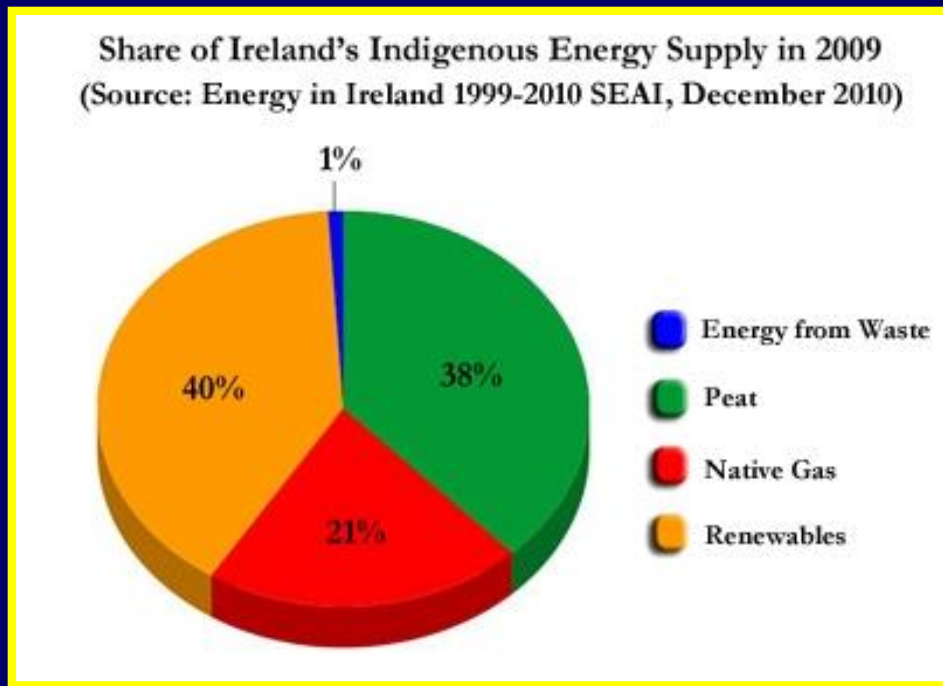
Deforestation

The main impact on the lithosphere from using wood as an energy resource is deforestation that can accelerate erosion.



Peat as an Energy Source

Besides wood, peat was the most widely used energy source. However, during the 20th century, peat was replaced with oil and natural gas, as new techniques made the later less expensive than peat.



Some countries, like Ireland, still use peat as a major power generating source.

Peat as an Energy Source

Peat is another carbon rich energy source that is commonly used for cooking, heat, and generating electricity.



Peat is formed from old plant material that did not decompose.

Peat as an Energy Source



Peat Bog

Due to the lack of decomposition, many fossilized bodies, commonly called bog people, are found in peat bogs.

Peat is found in areas with saturated soils that are oxygen poor, thereby preventing decomposition.



Tollund Man – 4th Century BC - Denmark

Peat as an Energy Source

Peat is harvested by digging up bricks of the spongy, plant-like material.



Wetland Degradation

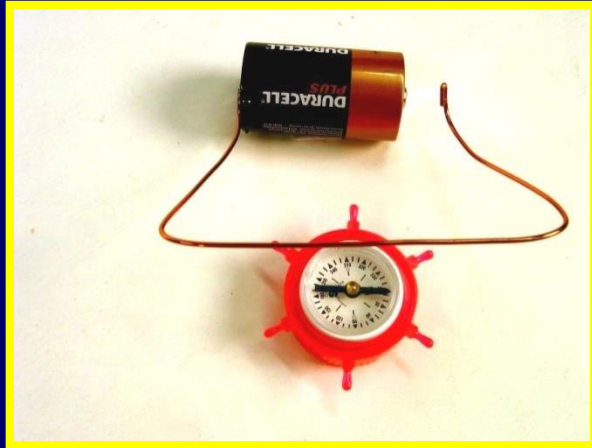
Peat bogs are wetlands that absorb a lot of water during high rain events, reducing runoff.



Harvesting peat bog, therefore, increases surface runoff and erosion.

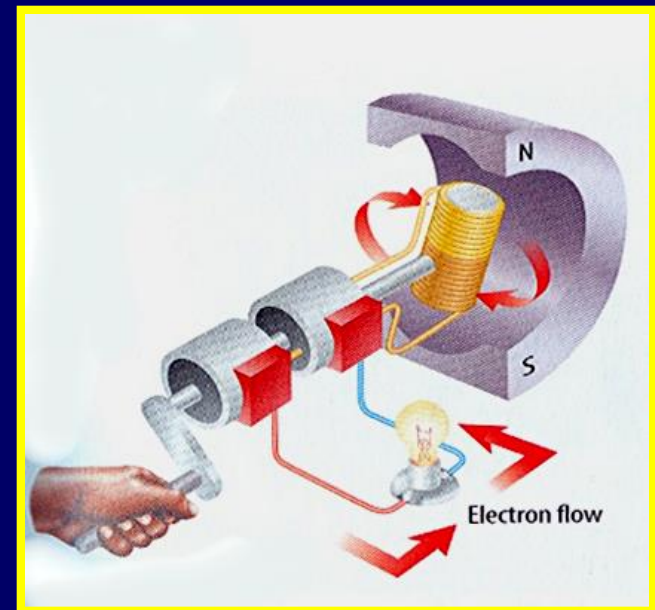
Generating Electricity

Electricity and magnetism are connected.



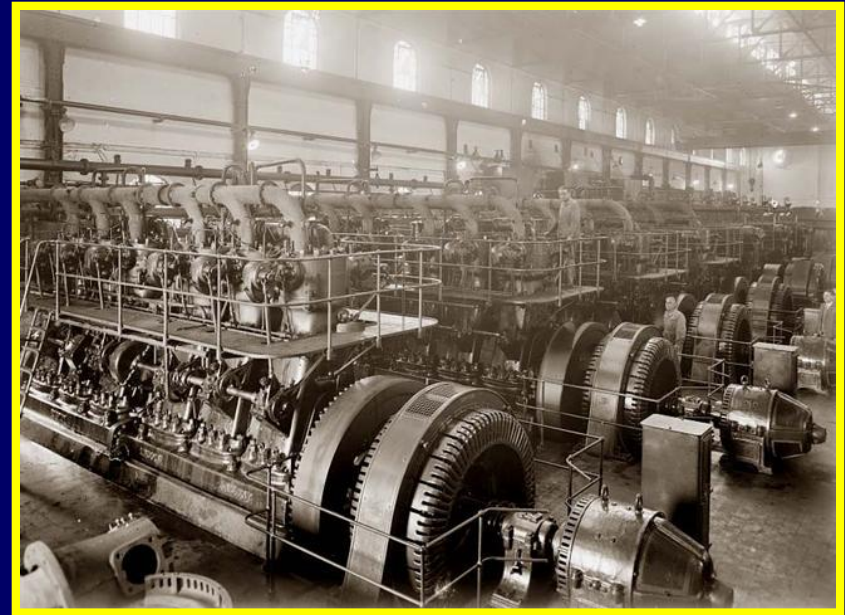
An electrical current will generate a magnetic field.

Also, a moving magnetic field will generate an electrical current in a coiled wire.



Generating Electricity

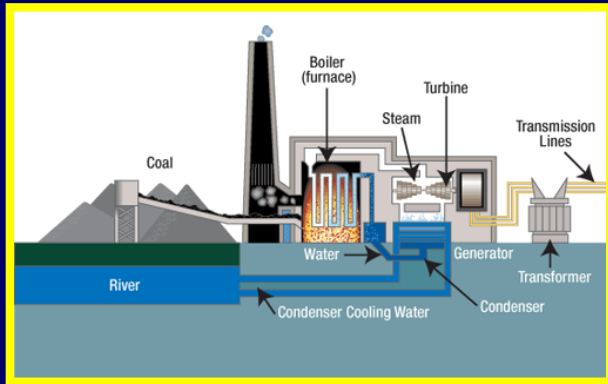
At electrical power plants giant magnets are rotated inside giant wire coils to generate electricity.



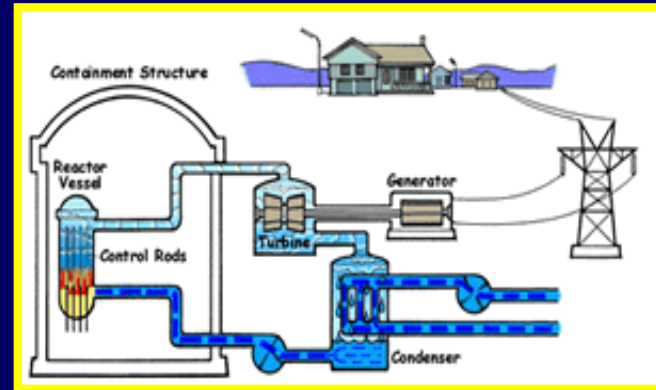
The giant magnets are connected to large rotating wheels called turbines.

Generating Electricity

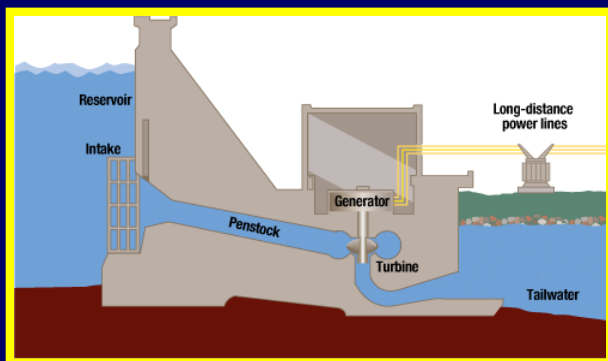
Anything that can turn that turbine can be used to generate electricity.



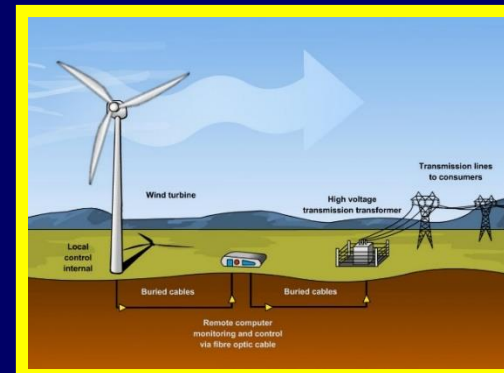
Steam from Burning Coal



Steam from Radioactivity



Falling Water

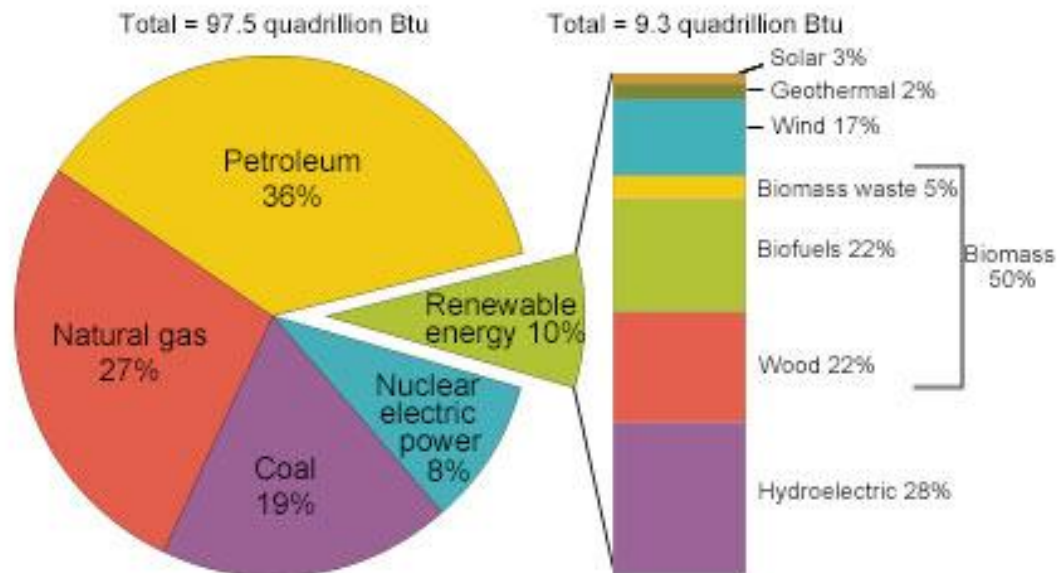


Wind

Energy Sources

Currently over 80% of the energy in the United States comes from the burning of fossil fuels.

U.S. energy consumption by energy source, 2013



Note: Sum of components may not equal 100% as a result of independent rounding.
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1 (May 2014), 2013 data



Fossil Fuels

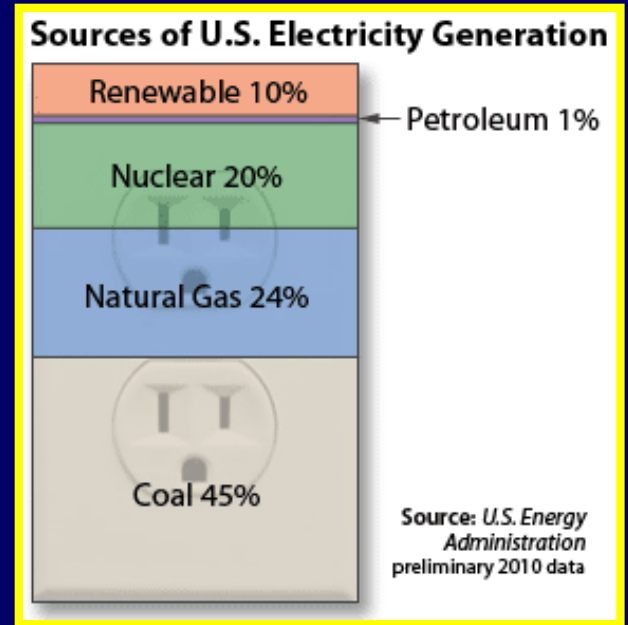
Fossil fuels are organic substances made deep within the Earth from the remains of ancient plants and animals.



When burned, fossil fuels release energy and carbon dioxide.

Coal Generated Electricity

In the United States, coal is still the most common method for generating electricity. (45%)

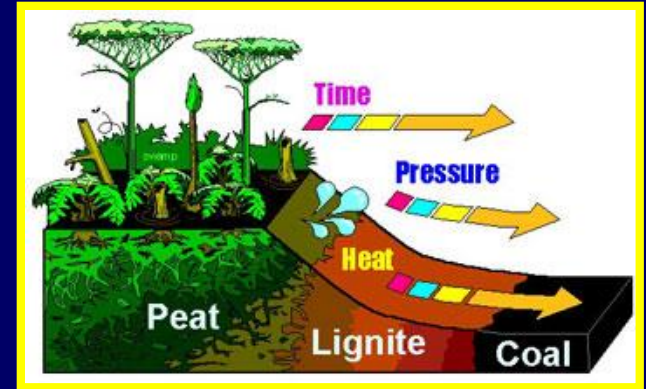


In North Carolina, 80% of our electricity comes from coal burning plants.

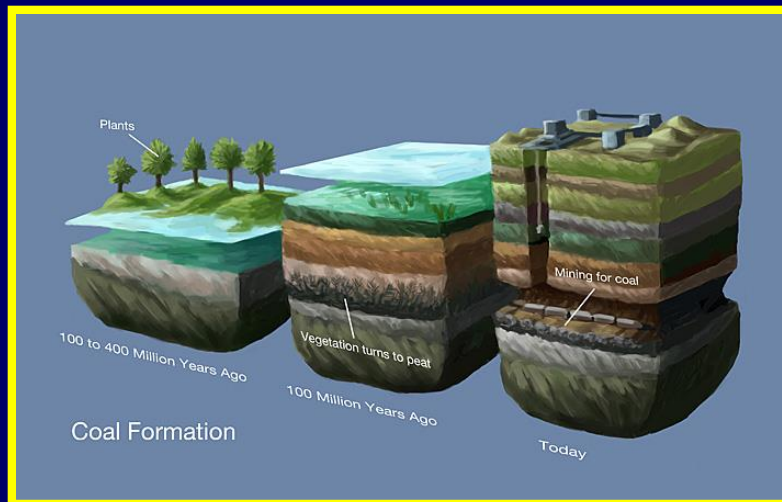


Formation of Coal

Coal, like peat, is formed from old plant material in swamps that did not decompose.



Over millions of year, as sediments built up, heat and pressure turned the carbon rich material into coal.

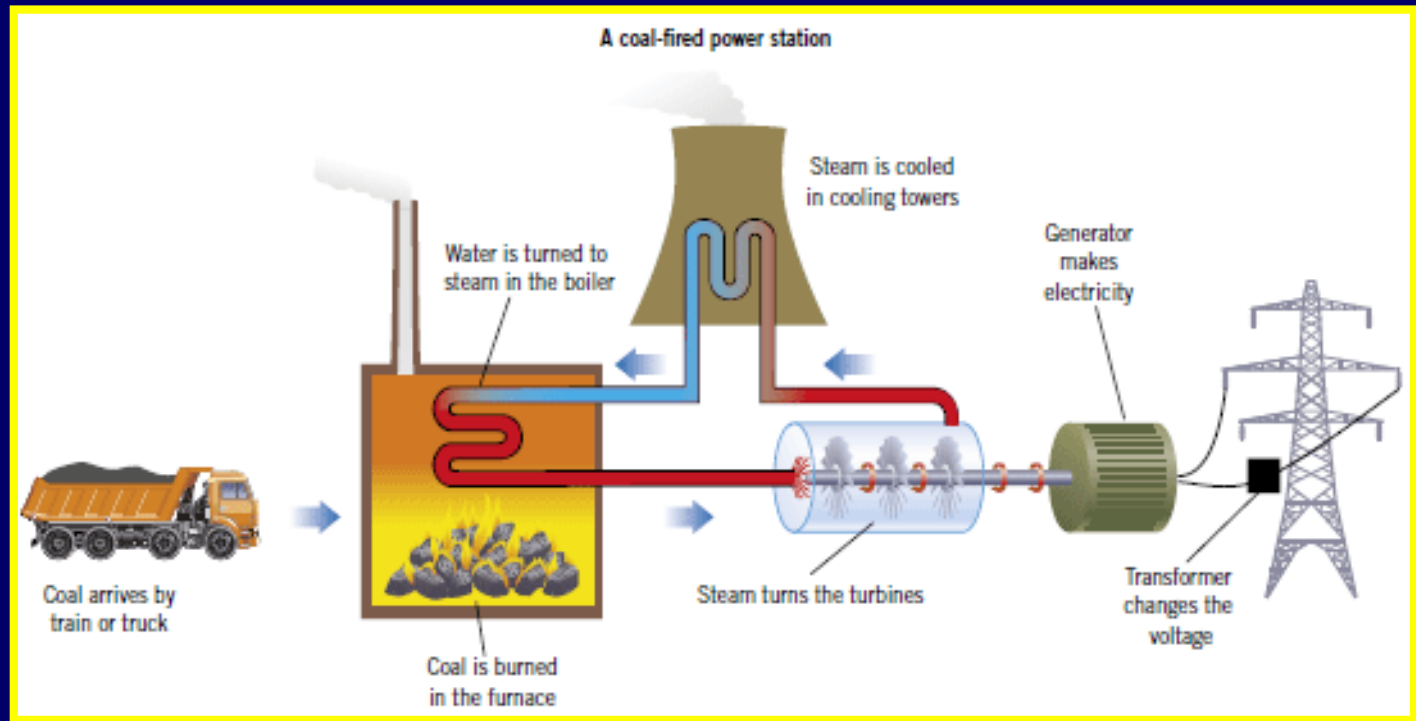


Coal is found deep within the Earth in what are called seams.

Coal is a sedimentary rock

Coal Burning Plant

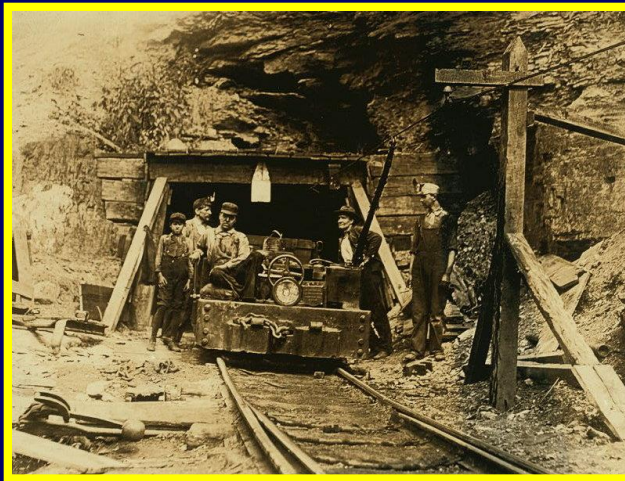
At a coal burning plants, the coal is burned and the heat is used to change water into steam.



The steam turns the turbine, attached to a magnet, inside a wire coil in order to generate electricity.

Underground Coal Mining

Historically, coal has been mined underground as coal miners dug deep coal mine shafts.



Underground Coal Mining

The most damaging effects of underground coal mining, on the lithosphere, result when mines collapse to create sink holes.



Mountaintop Removal

Currently, many coal companies have changed over to less expensive surface mining for coal in a process.



Because surface mining for coal requires removal of all the soil and rock above the coal seam, the process is also known as mountaintop removal.

Mountaintop Removal

Not only does mountain top removal destroy habitats, it also increases erosion, flooding, and water pollution.



Also, during mountaintop removal, all the waste or spoils, is dumped into nearby valleys, burying streams.

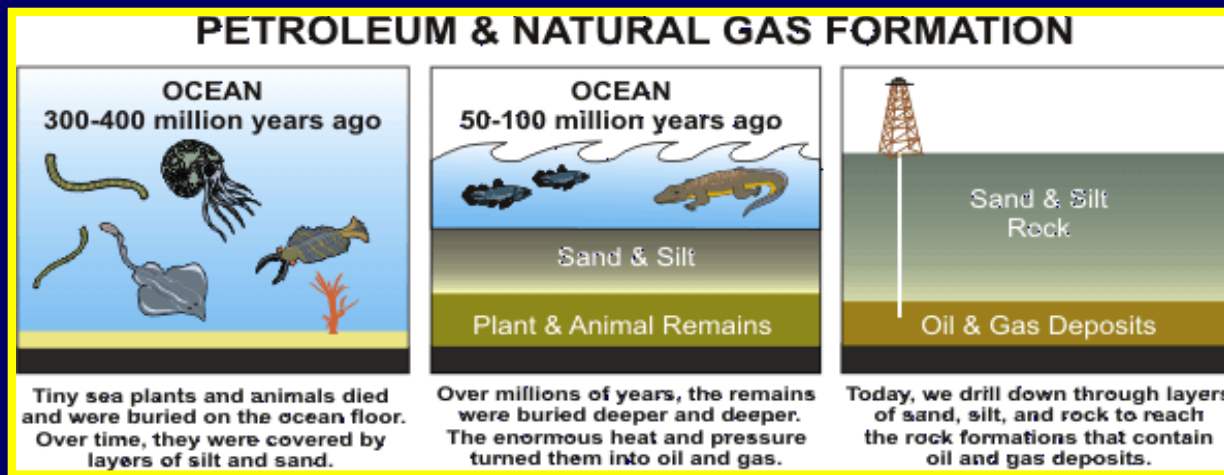
Petroleum

Petroleum, also known as crude oil, is another carbon rich fossil fuel, that is extracted from the ground and used to create refined oil, gasoline, as well as plastics.



Formation of Petroleum and Natural Gas

Petroleum and natural gas formation began as plankton and other marine animals died and were buried in ocean sediments.

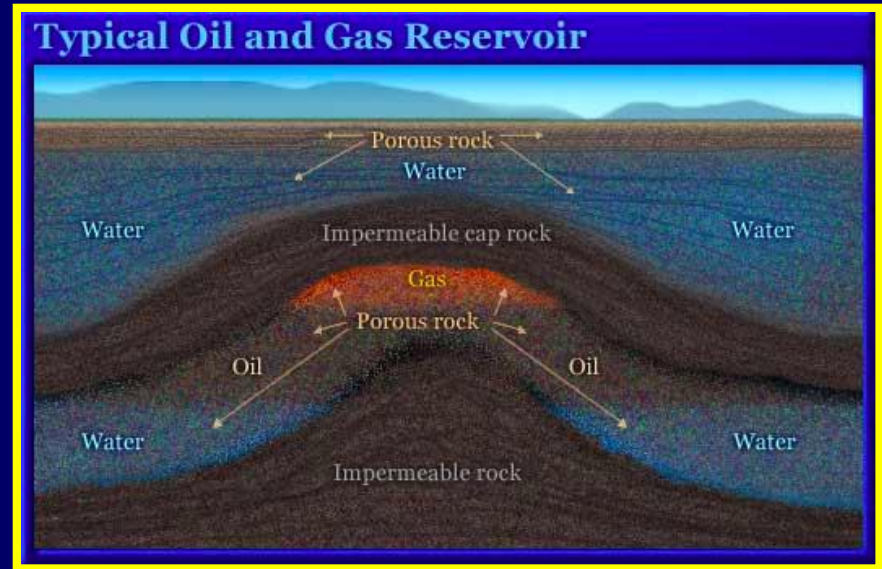


Over millions of years, heat and pressure compressed the organic material into oil and natural gas.

The amount of heat determined whether oil or natural gas was formed. More heat produced natural gas and less heat produced oil.

Oil and Natural Gas Deposits

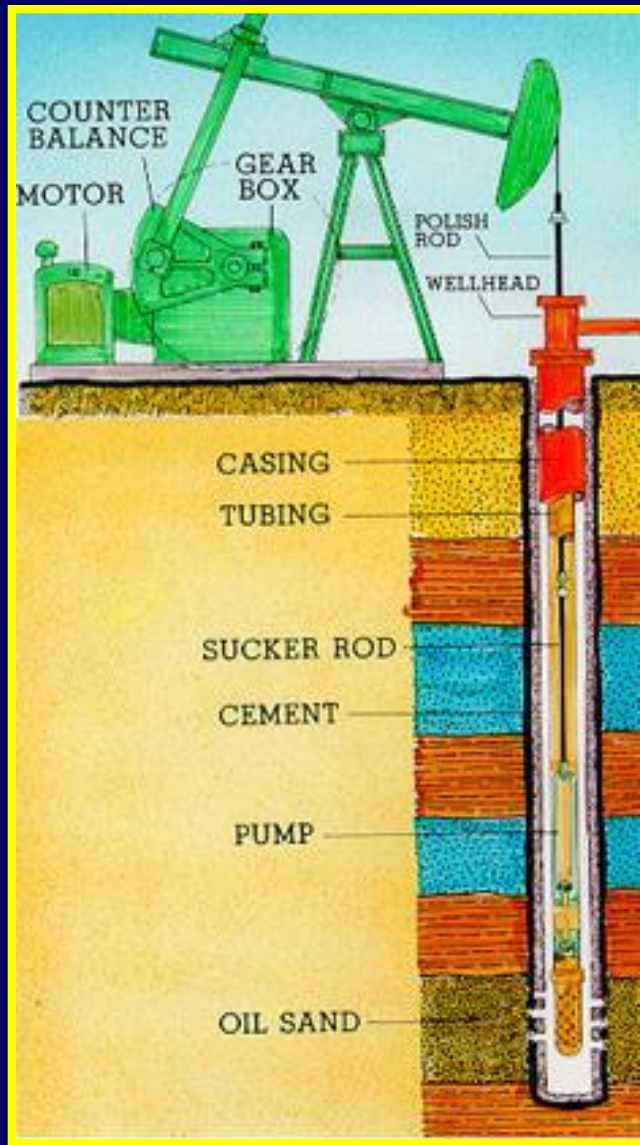
Oil and natural gas is typically found in pools between underground sedimentary rock layers.



Oil and natural gas is extracted through drilling.



Drilling for Oil



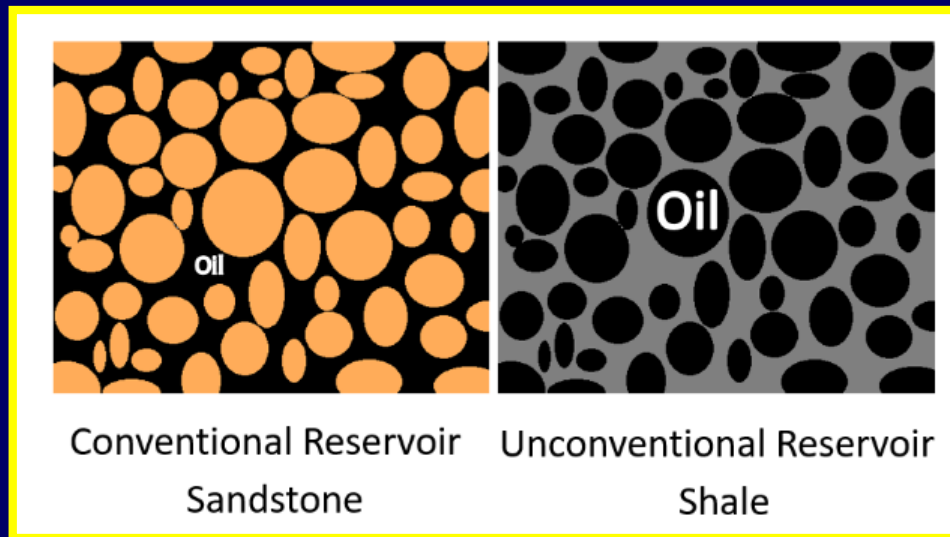
When drilling, a casing made of steel is lowered into the ground to prevent oil from leaking into the freshwater aquifers.

Initially, the release of pressure causes the oil to surge upward.

Later, water and steam is pumped into one end of the deposit to push the oil upward.

Fracking

As oil reserves have decreased, oil companies began using a technique called fracking to get oil that they could not obtain through conventional drilling.

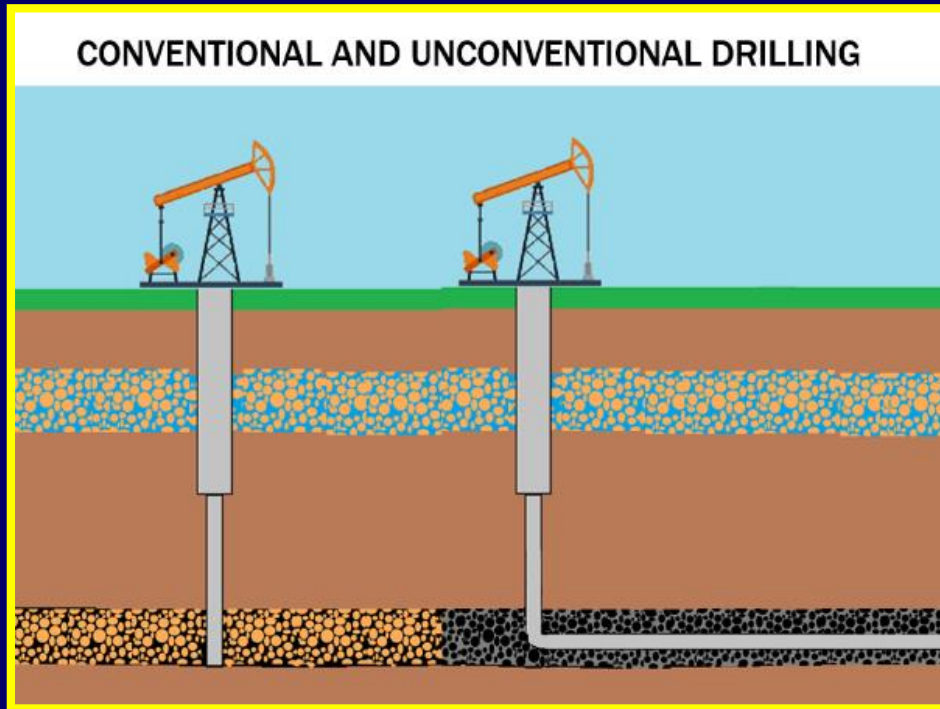


Conventional oil reserves are found in sedimentary sandstone which is porous and permeable, allowing oil to flow easily through.

But fracking targets oil reserves in sedimentary shale (formerly clay), that has much smaller pores but is not permeable, so the oil doesn't flow easily through the rock.

Fracking

During conventional drilling, the well is drilled straight down into sandstone.



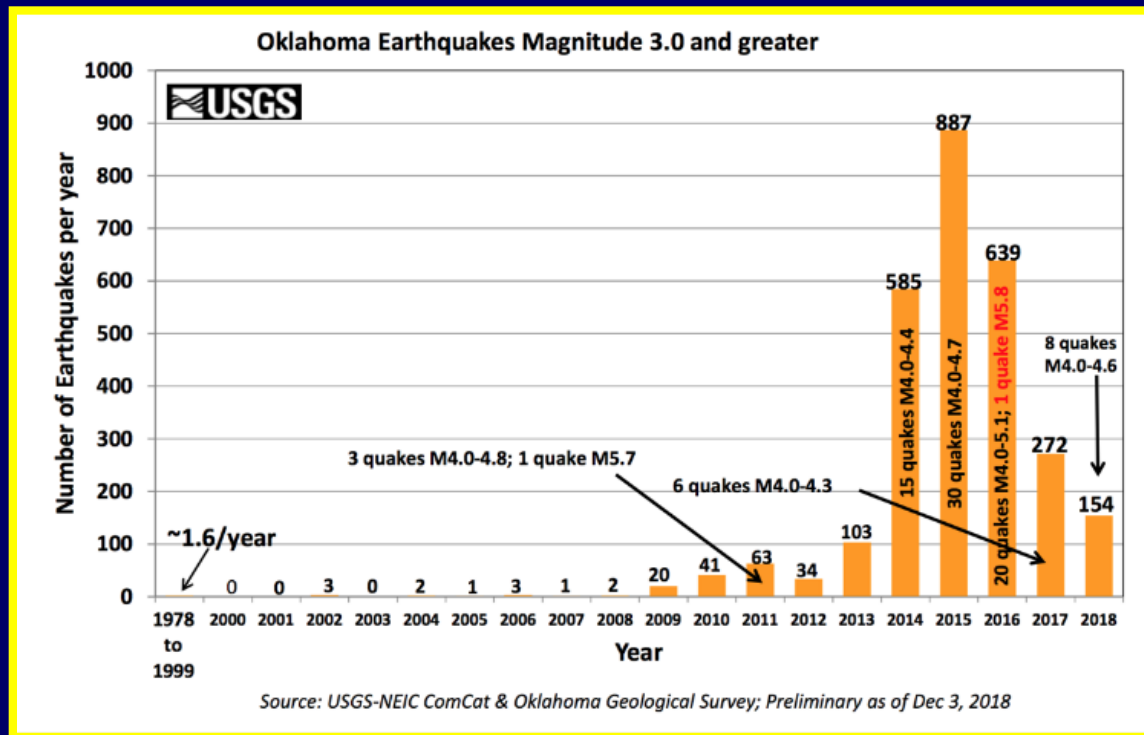
During fracking, the well is drilled straight down and then turned 90 degrees.

Water and sand is then pumped into the well at high pressure, causing the rocks to crack.

The sand then keeps the cracks from closing back up, so that the oil can be extracted.

Earthquakes

In Oklahoma, the number of Earthquakes increased from 20 in 2009 to 887 in 2015, after fracking was used.



Oklahoma banned fracking in 2016, and the Earthquakes began to decrease.

The End

