Chapter 7
Resources and Energy

Chapter menu Resources

- Scientist have identified more than 3,000 different minerals in Earth's crust.
- Mineral resources can be either *metals,* such as silver, or *nonmetals*, such as sulfur.

Lesson 1 - Mineral Resources

End Of Slide

Chapter menu

Resources

- A metal is an element, compound, or alloy that in general has a shiny surface, is a good conductor of heat and electricity, and is able to bend easily when in thin sheets.

Minerals with Metallic Characteristics

End Of Slide

Chapter menu | Resources

- Most minerals with non-metallic characteristics have dull surfaces and are poor conductors of heat and electricity.

Minerals with Non-Metallic Characteristics

End Of Slide

- Most other minerals in Earth's crust are compounds of two or more elements.
- For example – Iron (Fe), can be removed from naturally occurring deposits of the minerals magnetite.

Magnetite iron ore

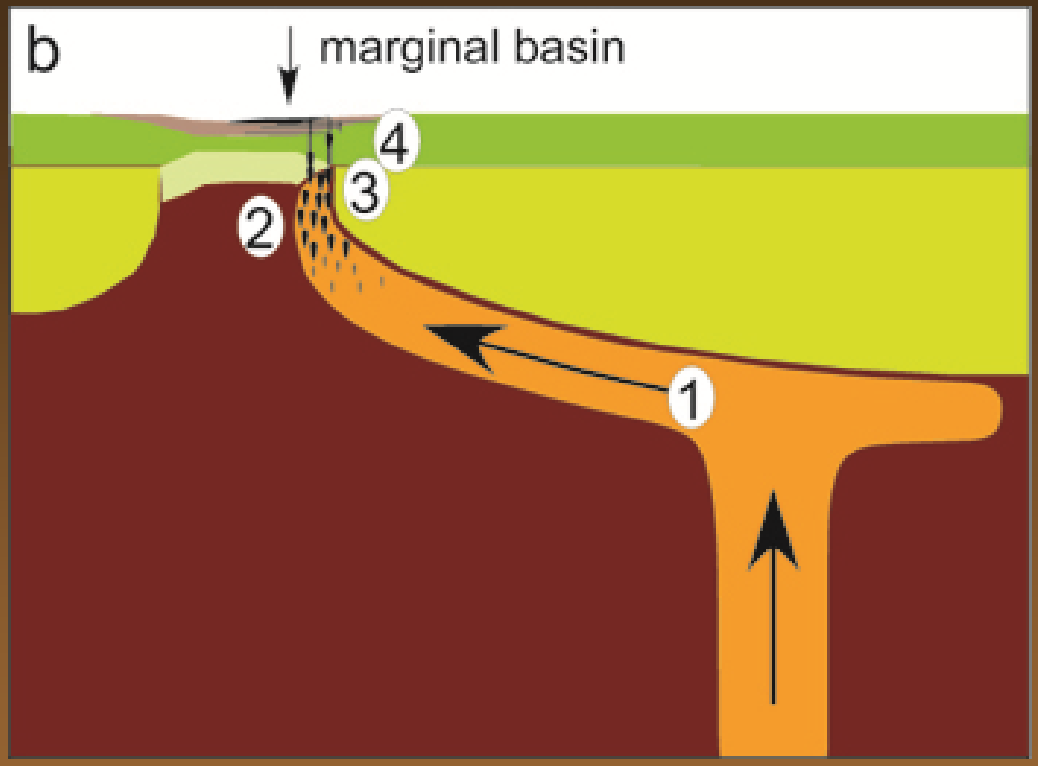
Compounds

Classifying Ores

- An ore is a naturally occurring solid material from which a metal or valuable mineral can be mined for profit.
- Metallic minerals such as gold, and silver, are called native elements and can exist in Earth's crust as nuggets of pure metals or microscopic material.

End Of Slide

- Some ores, such as nickel (Ni) form as the magma cools and the dense metallic minerals sink.
- As the minerals sink, layers of these minerals accumulate at the bottom of the magma chamber to form ore deposits.



Two ways Ores form – Cooling Magma

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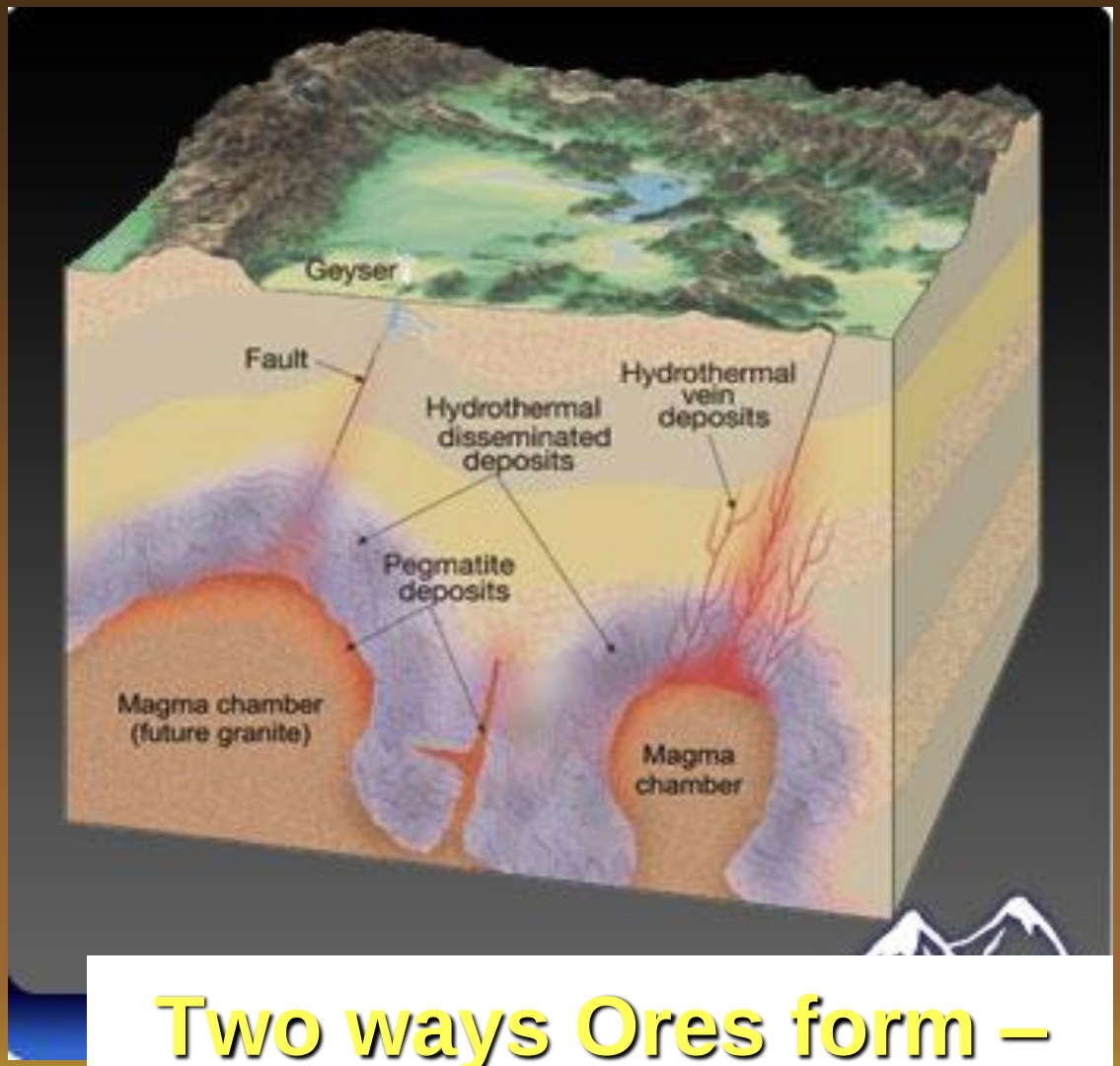
Chapter menu

Resources

- Ores like copper and lead are formed when magma comes into contact with existing rock.
- Heat and chemical reactions with hot fluids from the magma (a.k.a.- contact metamorphism) change the composition of the surrounding rock.



Two ways Ores form – Contact Metamorphism

Check for Understanding

- 1. What is an ore?
- 2. What is a mineral?
- 3. What is a compound?

Write the questions in your scientific notebook and answer questions using complete sentences. ☺

- This alien looking geyser on the edge of Black Rock Desert is actually man made, by accident, that is.

- In 1964 a geothermic energy company drilled a test well at the same site.

Fly Geyser - Nevada

Chapter menu Resources

- The water they struck was that same 200 degrees - hot, but not hot enough for their purposes.

- The well was supposedly re-sealed, but it did not hold.

Fly Geyser - Nevada

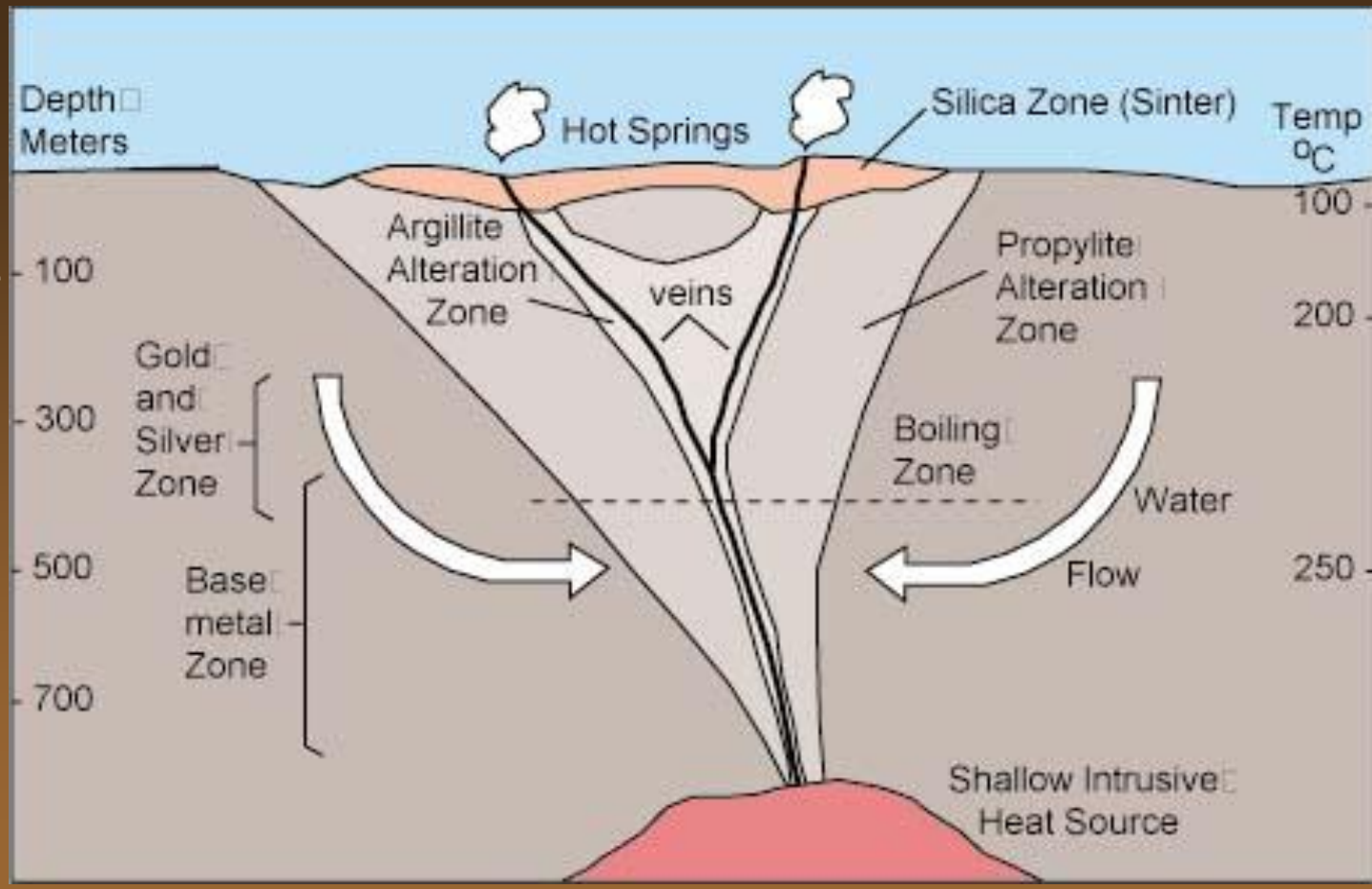
Fly Geyser - Nevada

- This second geyser, known as Fly Geyser, has grown substantially in the last 40 years as minerals from the geothermal water pocket deposit on the desert surface.

- Gold most commonly occurs in quartz veins.
- The classic example of a gold deposit evolves around the formation of granite far underground.
- Fractures formed in the top of the granite, and in the other rocks immediately above and around the granite.

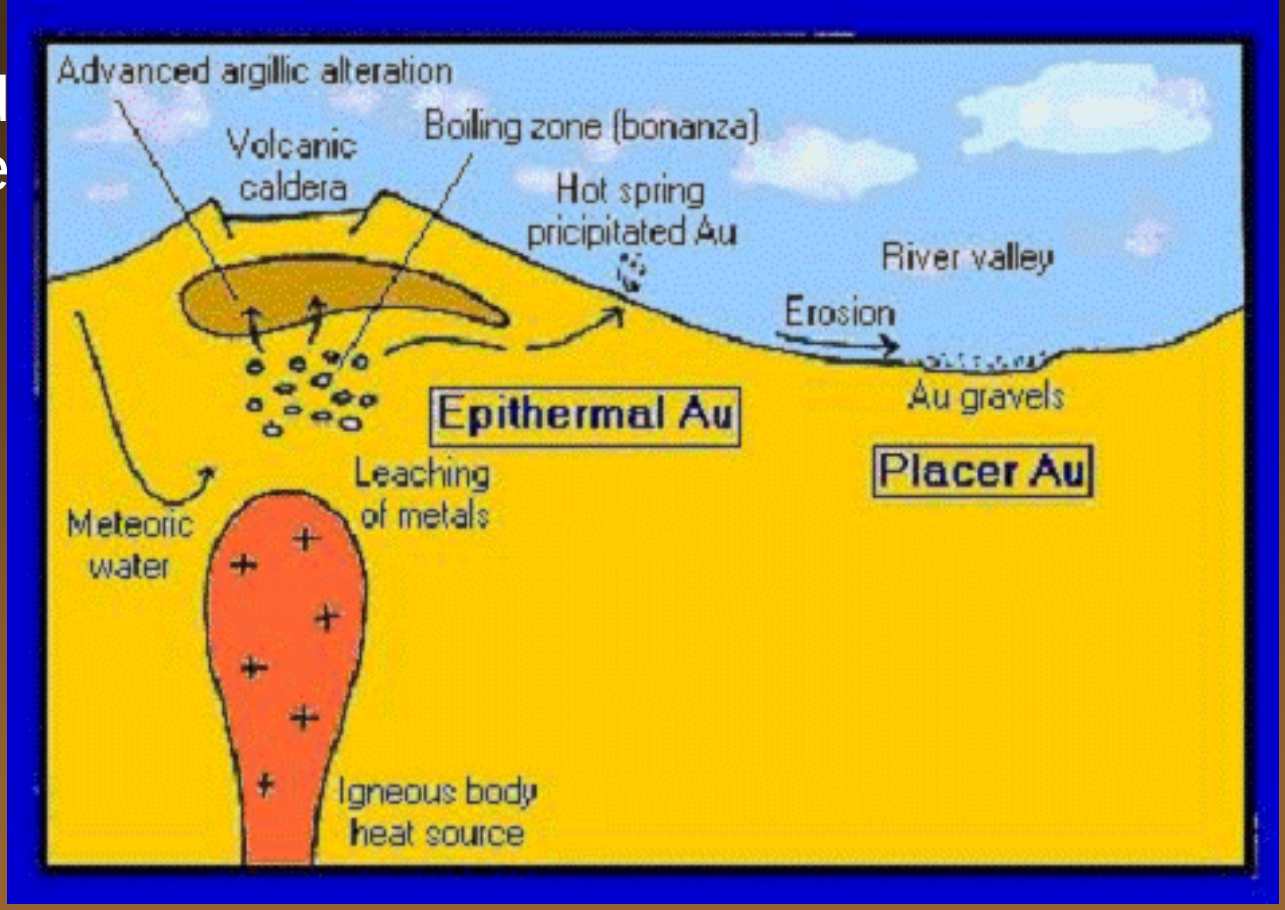
Formation of Gold

- Hot water solutions deposited quartz and gold in these fractures.
- Ages of erosion exposed the top of the granite and the fractures to the surface.



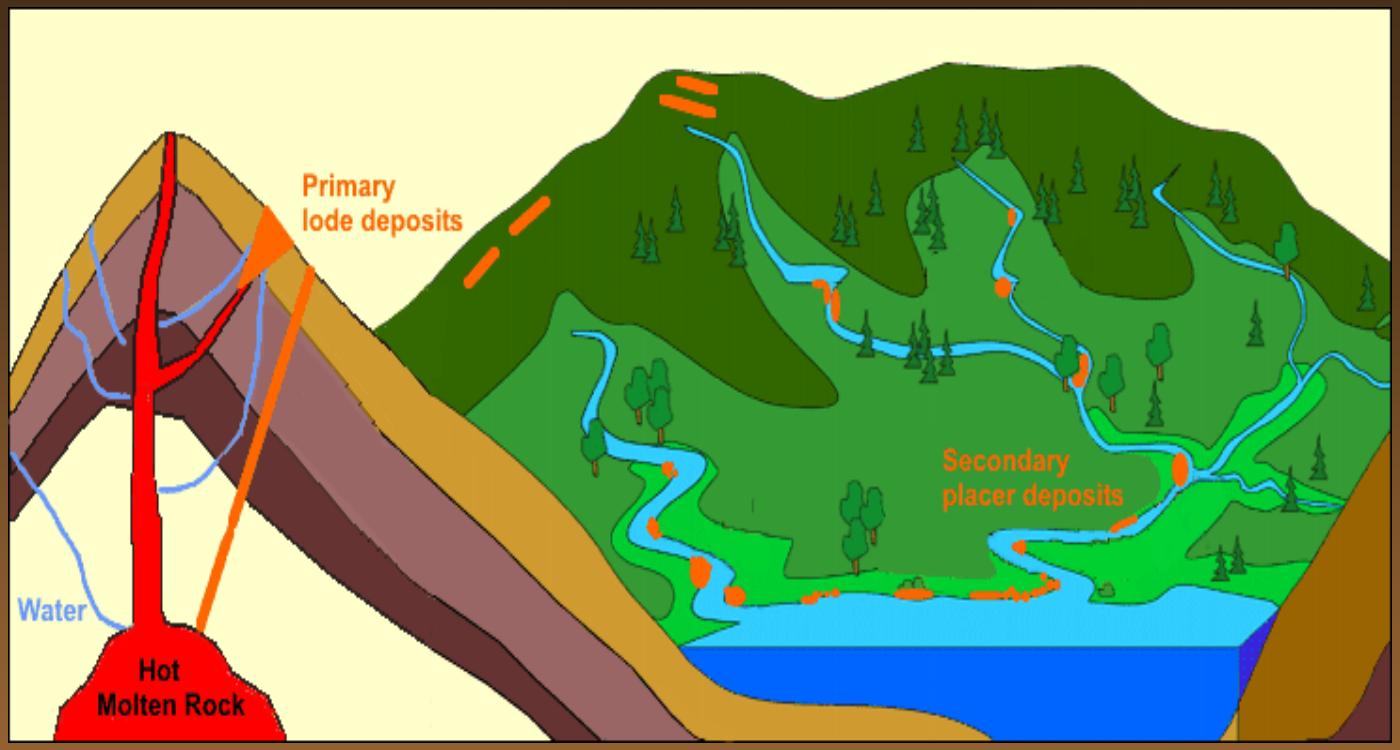
Formation of Gold

- Erosion released the gold from the veins and deposited some of it in the streams and rivers in the valley.
- The rest remained in the hardrock veins, to later be discovered and mined.



Formation of Gold

- There are two main types of gold deposits.
- When gold is found at the place where it was formed, the deposit is called a primary deposit, or a lode deposit.



Two Types of Mineral Deposits – 1. Primary Deposit

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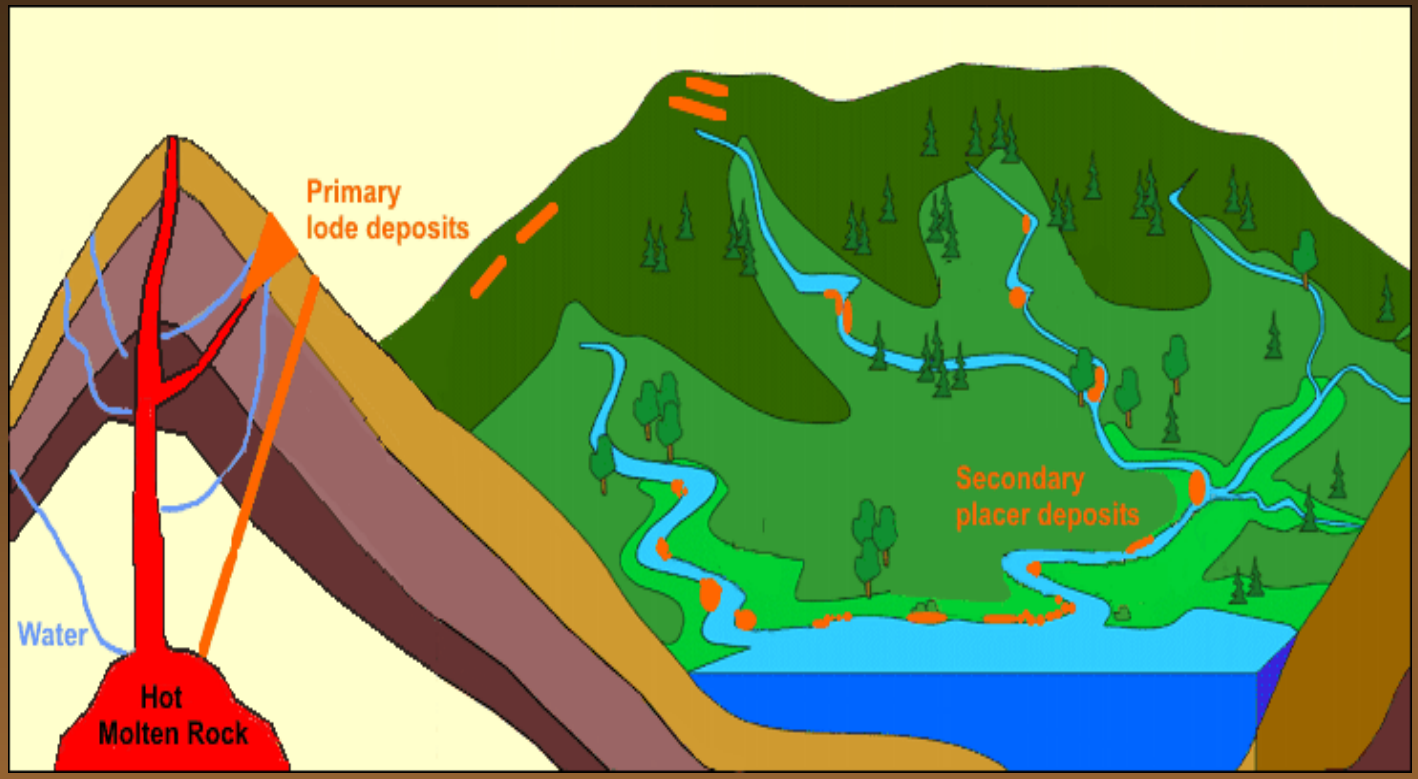
Resources

Two Types of Mineral Deposits – 1. Primary Deposit

- When gold moves away from its primary location by wind, water, ice, or gravity, it can concentrate in another place to form a secondary deposit called a *placer deposit.*



Two Types of Mineral Deposits – 2. Placer Deposit

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Two Types of Mineral Deposits – 2. Placer Deposit

- In the case of placer deposits, streams carry the gold fragments until the currents become too weak to carry these dense metals, which collect in placer deposits.

Ores Formed by Moving Water

End Of Slide

Check for Understanding

- 1. What are the two different types of deposits? Explain each one.
- 2. How are minerals moved in order to become secondary deposits or placers?
- 3. Explain how and why California has large amounts of gold deposits.

Write the questions in your scientific notebook and answer questions using complete sentences. ☺

- Metallic ores, like gold and silver, are valuable metallic ores.
- Sand and Gravel

Lesson 2 – California's Natural Resources
Metallic Ores

End Of Slide

Chapter menu | Resources

- Certain rare nonmetallic minerals, like diamonds, ruby's and turquoise are called gemstones.

Gemstones

End Of Slide

- Other nonmetallic minerals, such as calcite and gypsum, are used as building materials.

Nonmetallic Minerals

End Of Slide

Chapter menu

Resources

- In general an area is considered for mining if it has at least 100 to 1,000 times the concentration of minerals that are found elsewhere.

Mineral Exploration and Mining

End Of Slide

Chapter menu

Resources

- In late 1840's the rush for gold brought California fame (hence the SF 49'ers).

California Gold Rush

Three Days Longer!

New Route to California

— VIA —

WENTWORTH'S HALL!

ORIGINAL PANORAMA

— OF THE —

GOLD REGIONS

— : OF : —

CALIFORNIA!

PAINTED BY S. A. HUDSON, ESQ.,

(Artist of the Panorama of the Mississippi and Ohio Rivers,) FROM SKETCHES TAKEN ON THE SPOT, by Artists accompanying the Expeditions of COL. FREMONT and GEN. KEARNEY.

SECTION I.

The Pacific Ocean. Entrance to San Francisco Bay. Fort St. Francis. Yerba Buena, or San Francisco. Volcano of Santa Clara. City of Angels. Salmon Fishery. Point and Bay San Pablos. Angelos, or Angels Island. Steamer Gen. Kearney, en route for "the diggins." The Diavolo mountains. Straits of Carquinez. Ancient Aztec alters. The Irish rancho. Floating Boarding house. Suisun Bay. Mountain of San Jose. Wreck of the Albatross. The Labyrinth Sacramento River. The lower washings. Encampment by night. MOONLIGHT VIEW OF THE MOUTH OF THE AMERICAN RIVER.

SECTION II.

The valley of the San Joaquin. Dr. March's rancho. Indian Encampment. Mouth of the Cosumes river. SUTTER'S FORT. Mormon diggers. Feather river. The Buttes. American River, and the Pine digging. Encampment. Dry diggers. The Cascade. Weber's creek, and stores. Sutter's saw mill. Distant view of the great chain of Sierra Nevada Mountains. Sunset.

Brilliant Sunset View of PYRAMID LAKE,

Showing the Encampment of Col. Fremont and Kit Carson.

On Monday, Tuesday and Wednesday Evenings,

April 30th, and May 1st and 2nd, commencing at 8 o'clock,

And on Wednesday Afternoon, at 3 1-2 o'clock.

ADMISSION 12 1-2 CENTS.

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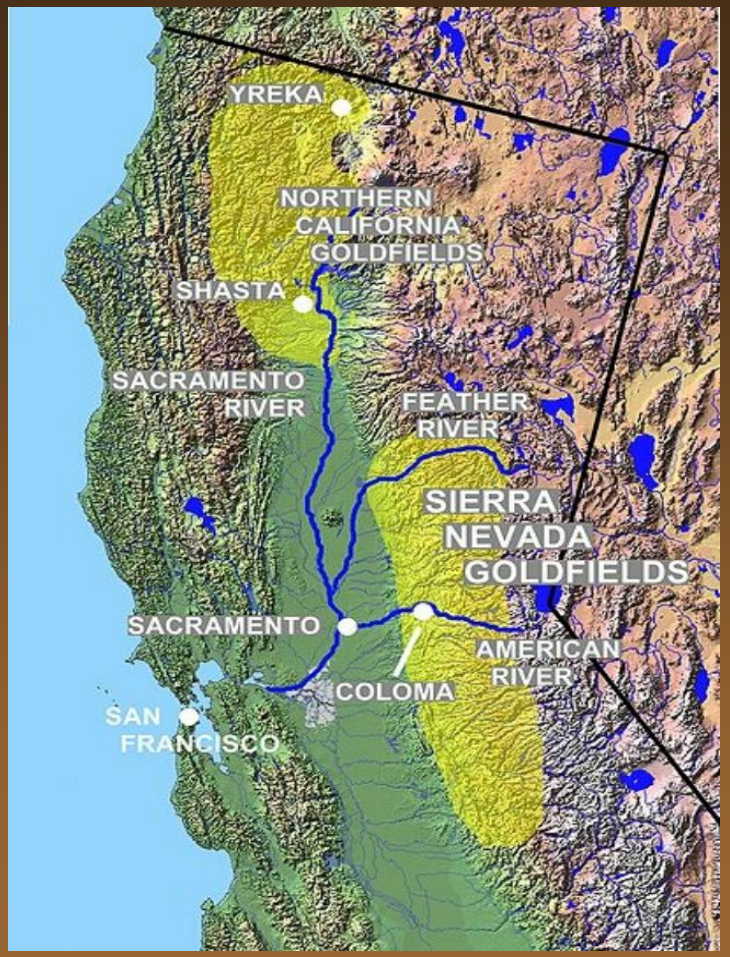
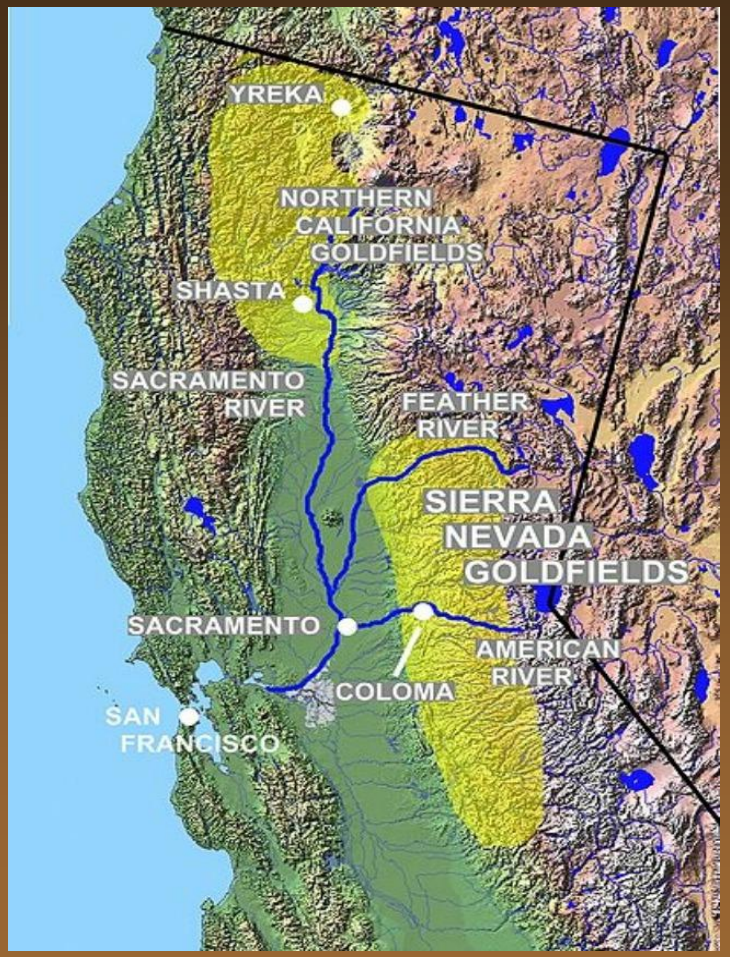
- Gold is from the rocks of the Sierra Nevada Mountains.
- Over time rock was eroded and gold was transferred and deposited down the river and streams.



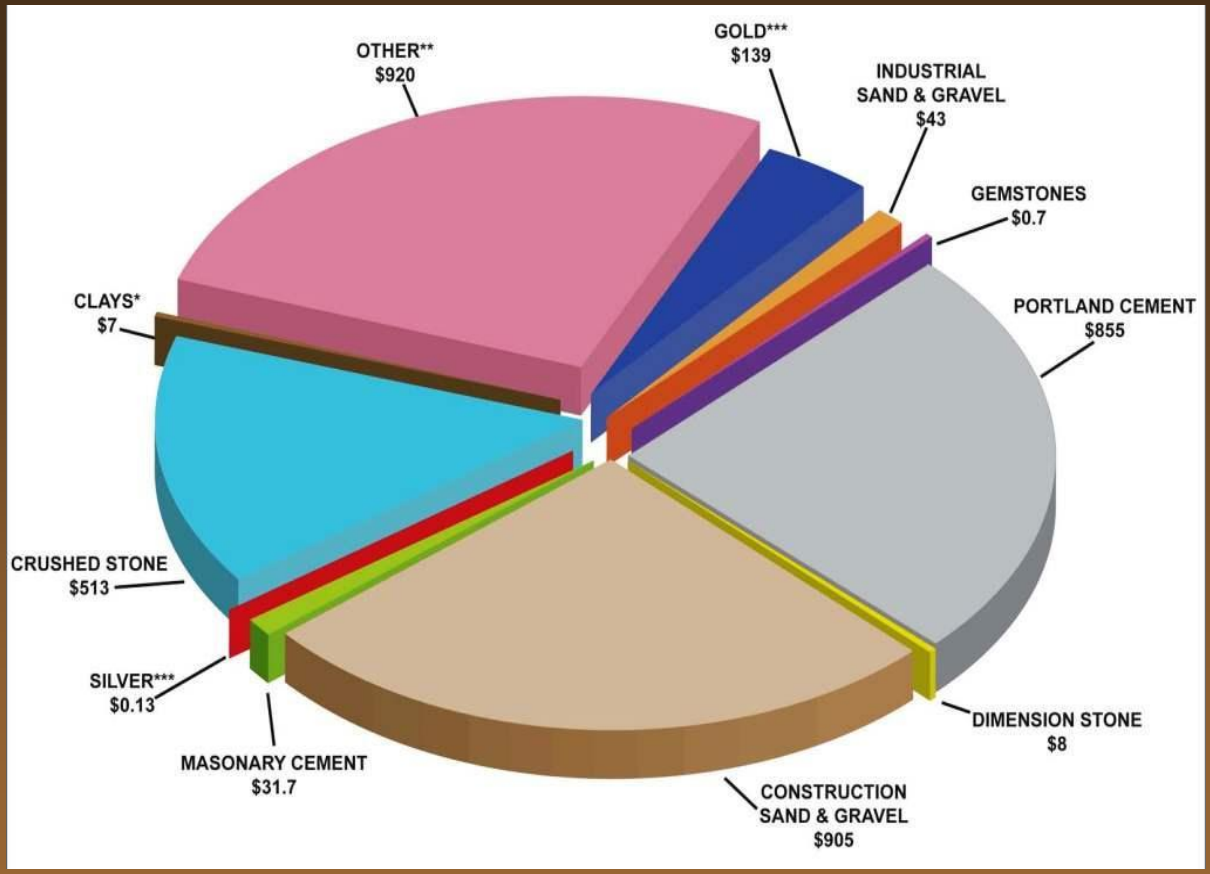
California Gold Rush

- Gold is found parallel to the coast because of plate tectonics.
- California gold was a result of folded up continental rock which created natural zones for quartz rock to form.



California Gold Rush

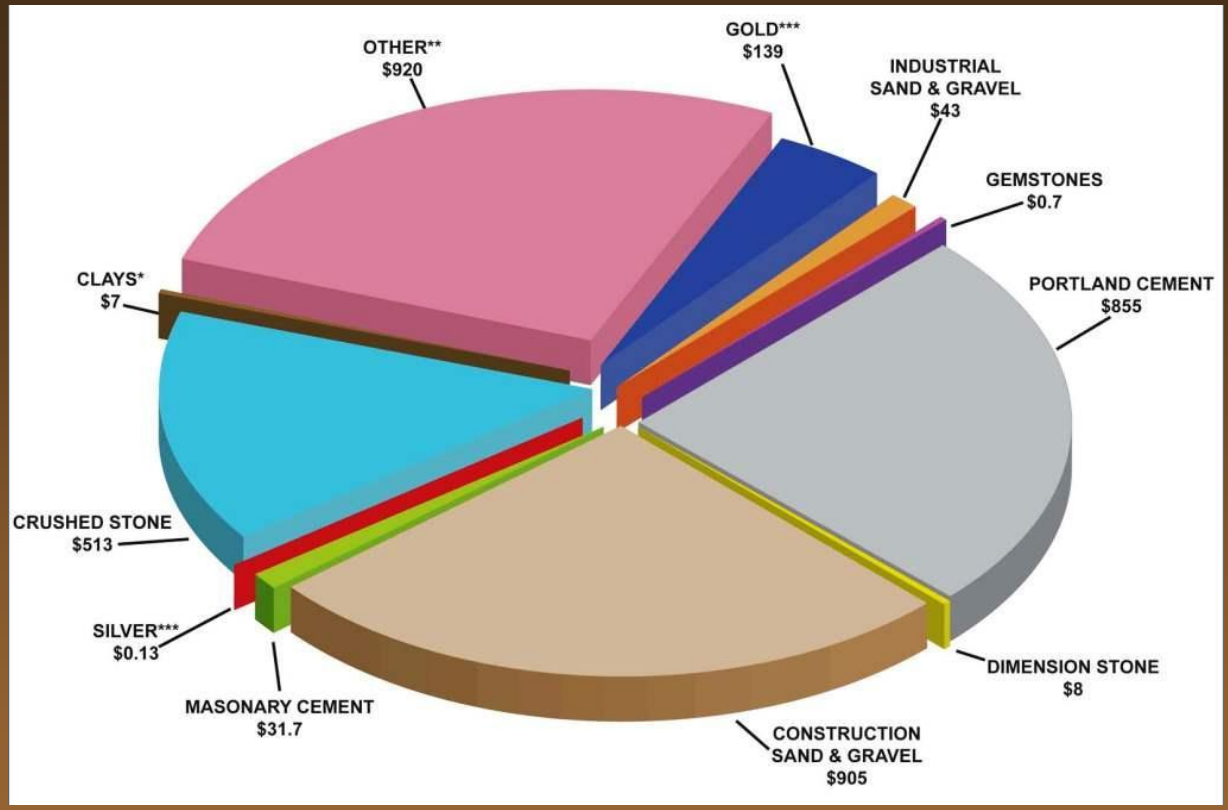
California Minerals



- California (**2013**) is ranked **8th** in the United States in the production of nonfuel minerals. (**Behind Nevada, Arizona, Minnesota, Florida, Texas, Alaska and Utah**).

California Minerals

Other includes – Borax and Salt



- According to the California Geological Survey (CGS), California produced $ 2.9 billion worth of non-fuel minerals in 2010 with 700 active mines employing 5,300 people.

California Gold

- California mined over 199,000 ounces of gold worth approximately $240 million, according to the CGS.

- Construction-grade sand and gravel continues to be California's leading industrial mineral commodity (2010), with an estimated total value of $809 million for 82 million tons produced.

California's Sand & Gravel

- California's third largest mineral commodity was Portland Cement valued at nearly $855 million.
- Crushed stone ranked fourth in the state with a value of $513 million.

California's Cement

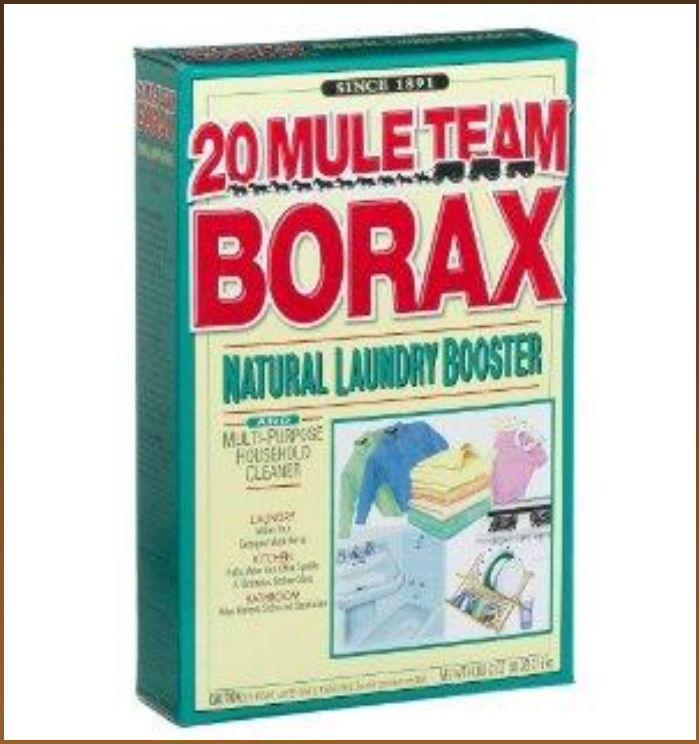
- Boron now ranks 2nd (2010) and is another valuable mineral to California and found in Death Valley.
- The company Borax founded one of only a few mines in the world.
- This mineral company is worth about $700 million a year to California.

Borax in Valencia, CA

Uses of Boron

- Boron forms as bright, transparent crystals that are almost as hard as diamonds.
- It is used in cleaning compounds and fertilizers and also as an abrasive.

- Borax is usually a white powder consisting of soft colorless crystals that dissolve easily in water.



Borax

Check for Understanding

- 1. Explain why gold was formed in the northern regions of California?

- 2. What are the 3 main commodities that California produces/extracts from the Earth?

Chapter menu

Resources

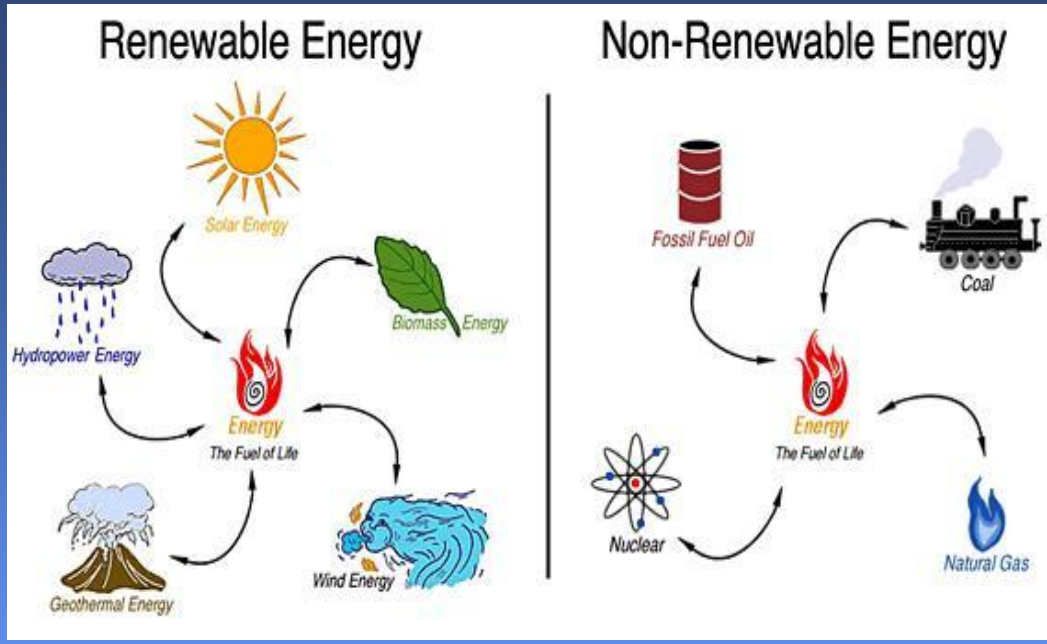
Is this resource renewable or nonrenewable?

1. Walk to the side of the room in which you believe the resource is renewable or non-renewable. Discuss why you are there.
2. Be prepared to explain why.
3. Summarize the last statement that was said.
4. Discuss your response

Resources

1. Coal
2. Water
3. Oil
4. Wind
5. Sunlight

- Non-Renewable resources are a primary source of energy and are extremely valuable.
- Draw this below in your goal sheet.



Renewable	Non-Renewable
Bio Fuels	Fossil Fuel
Wind	Coal
Hydro	Natural Gas
Solar	Nuclear
Geothermal	

Lesson 3 - Nonrenewable Energy Fossil Fuels

Chapter menu | Resources

- A Nonrenewable resource is a resource that forms at a rate that is much slower than the rate at which it is consumed.

Nonrenewable Energy

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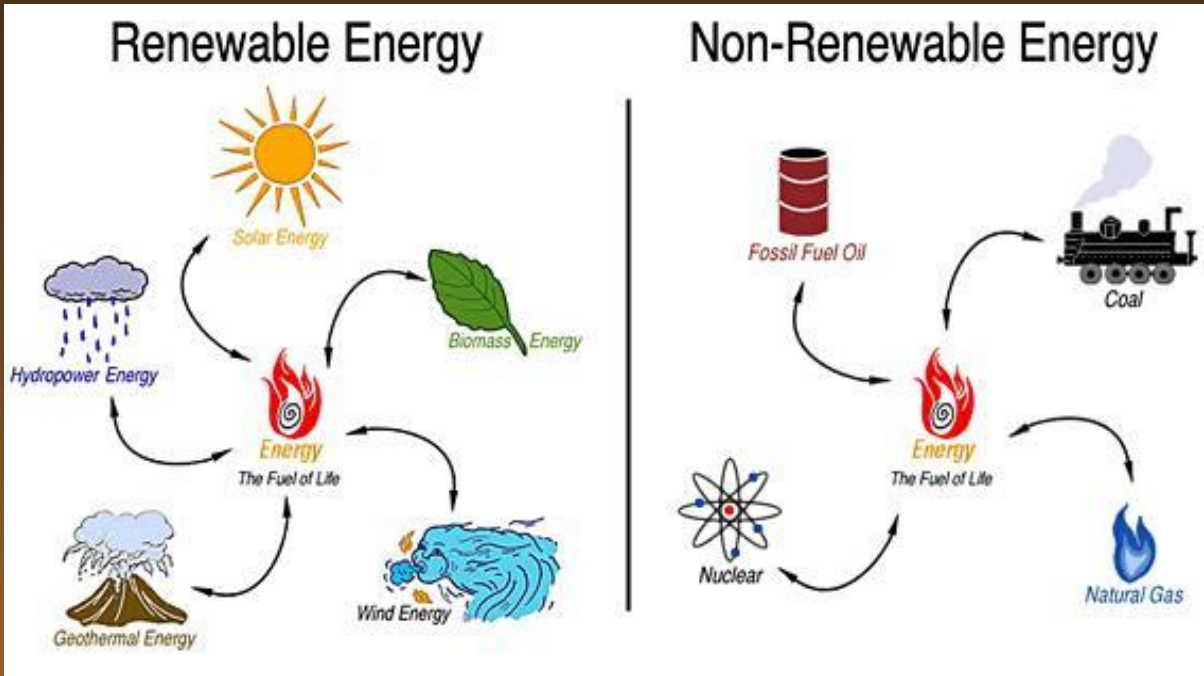
Chapter menu

Resources

- Fossil fuels are a nonrenewable energy resource that formed from the remains of organisms that lived long ago; examples include oil, coal, and natural gas.



Nonrenewable Energy

- Much of the energy humans use every day comes from the burning of the hydrocarbons that make up fossil fuels.
- Coal is used for electricity (50% of U.S.), heating and a number of industrial applications.

Fossil Fuels

- Coal is composed primarily of carbon along with: hydrogen, sulfur, oxygen, and nitrogen.

- When wood, coal, and oil are burned, the energy of heat and light is released along with carbon dioxide back into our atmosphere.

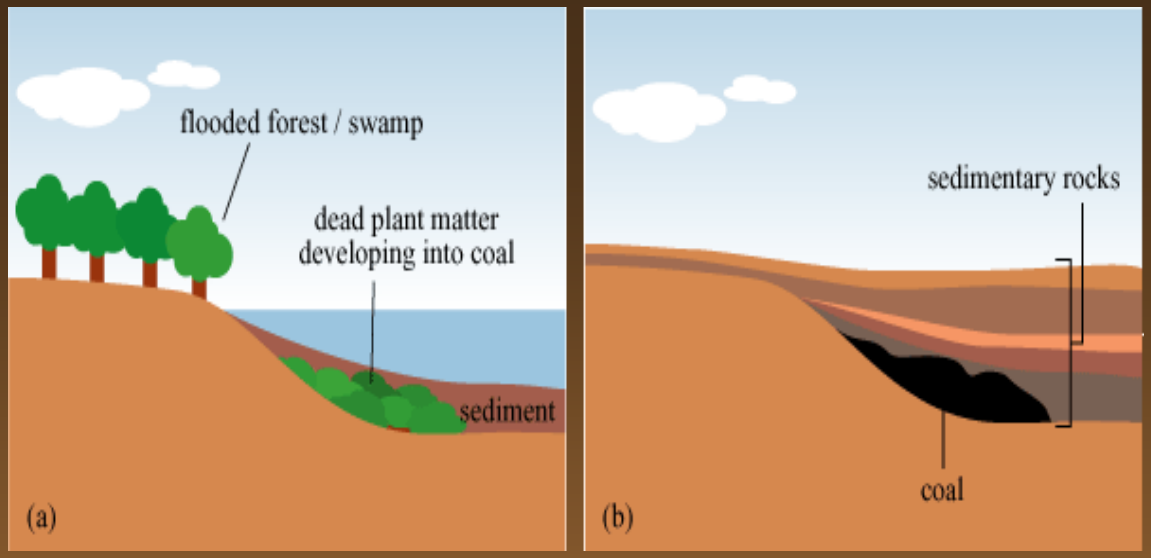
Fossil Fuels

Check for Understanding

1. Name 3 types of renewable fuel and 3 types of non-renewable fuel.

2. How is non-renewable fuel classified?

- Coal is the most commonly burned fossil fuel, formed during a complex process called carbonization.
- Carbonization is when partially decomposed plant materials is buried in swamp mud and becomes peat.



Formation of Coal Step 1

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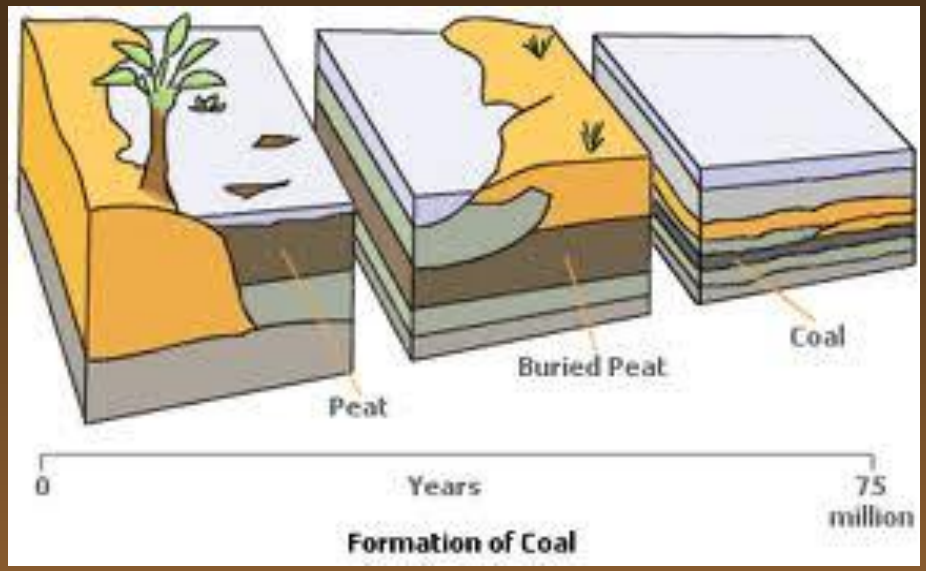
Chapter menu | Resources

- As bacteria consume some of the peat and release the gases methane, CH_4, and carbon dioxide, CO_2, the contents of peat gradually change until mostly carbon remains (anthracite).



Formation of Coal Step 2

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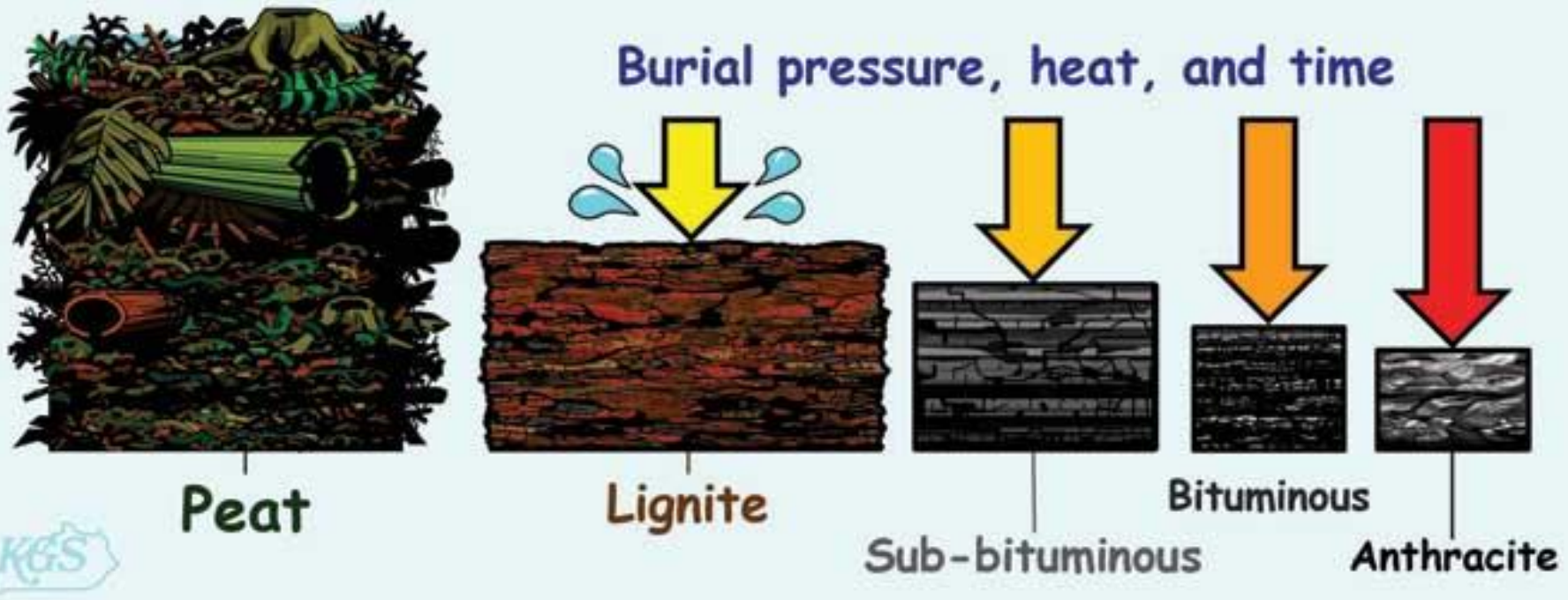
Resources



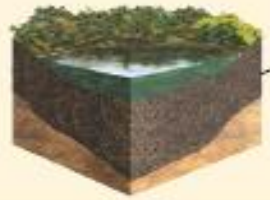
Types of Coal

- Over time (100,000 of years) peat changes to lignite.

- Over millions of years peat will become concentrated into anthracite.

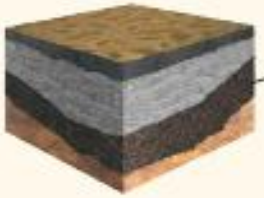
Concentrate of Coal

Types of Coal



Stage 1: Peat

The partial decomposition of plant remains forms a brownish-black material called *peat*.

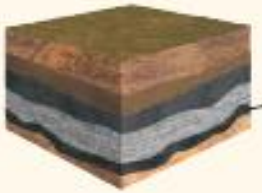


Stage 2: Lignite

Peat is buried by other sediment. As heat and pressure increase, peat becomes lignite. Lignite is also called *brown coal*.

Stage 3: Bituminous Coal

Increased temperature and pressure turn lignite into bituminous coal, which is 80% carbon. Bituminous coal is also called *soft coal*.



Stage 4: Anthracite

Under high temperature and pressure conditions, bituminous coal eventually becomes anthracite, which is the hardest form of coal.

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Chapter menu

Resources

Coal vs. Lemon

Think of coal as a candy.

- Peat is like lemon taffy
- Lignite is like a lemon head.
- Bituminous coal are like lemon heads.
- Anthracite is like a sour war head

- Coal is the most abundant fossil fuel in the world.
- Two-thirds of the known coal deposits are found in the United States, China and Russia.

Fossil-Fuel Supplies

- The top coal producers in 2010 were (in millions of tons):
- China 3,650
- United States 985
- India 571

- Scientist predict in 200 years we will run out of all coal reserves.

Fossil-Fuel Supplies

- *Oil shale* is a relatively abundant material that contains petroleum.
- The cost of mining oil from shale is far greater than the present cost of recovering oil from other sedimentary rocks.

Fossil-Fuel Supplies

- How Coal becomes energy at First Energy Power Plant
- Visual of how coal is created.

Fossil-Fuel Supplies

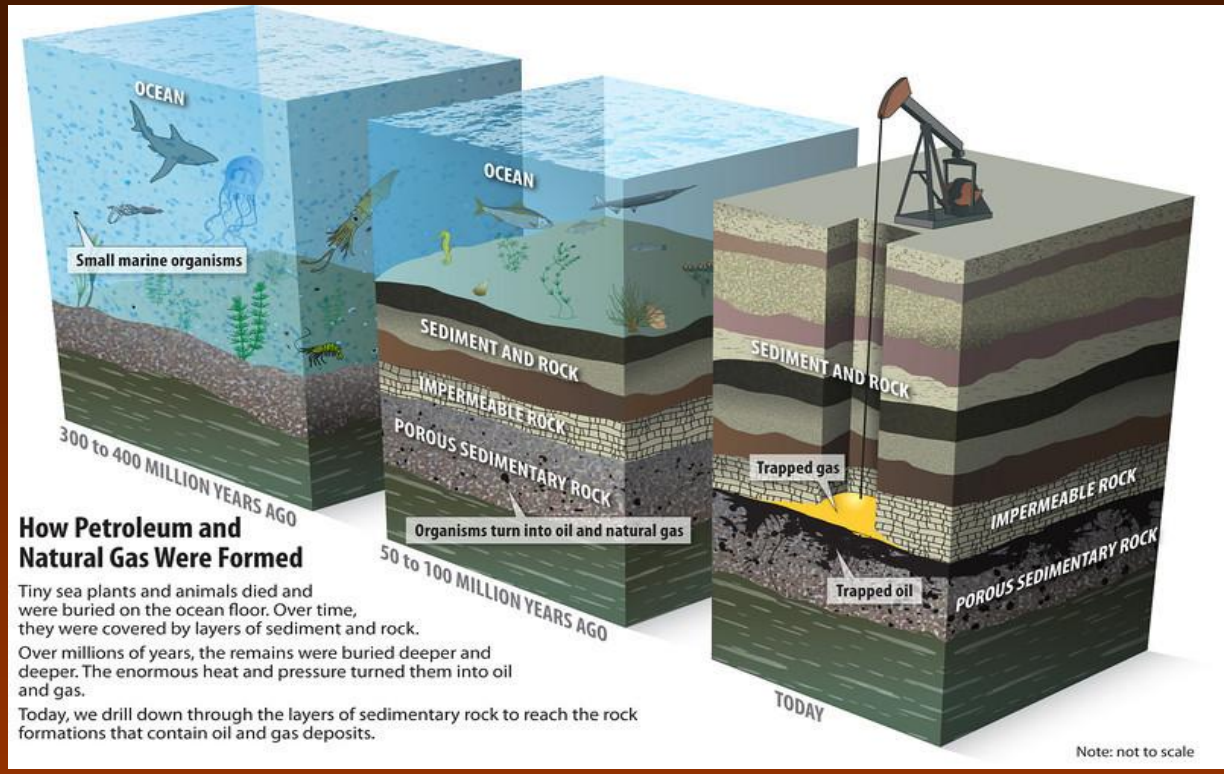
Check for Understanding

1. Why is the extraction of coal harmful to the environment?

2. What are some other non-destructive options engineers and scientist can use to extract coal from the Earth?

Write the questions in your scientific notebook and answer questions using complete sentences. ☺

- Today's oil formed from the preserved remains of prehistoric zooplankton and algae, which had settled to a sea or lake bottom in large quantities.
- Oil and natural gas are most often mined from permeable sedimentary rocks



Lesson 4 - Formation of Petroleum and Natural Gas

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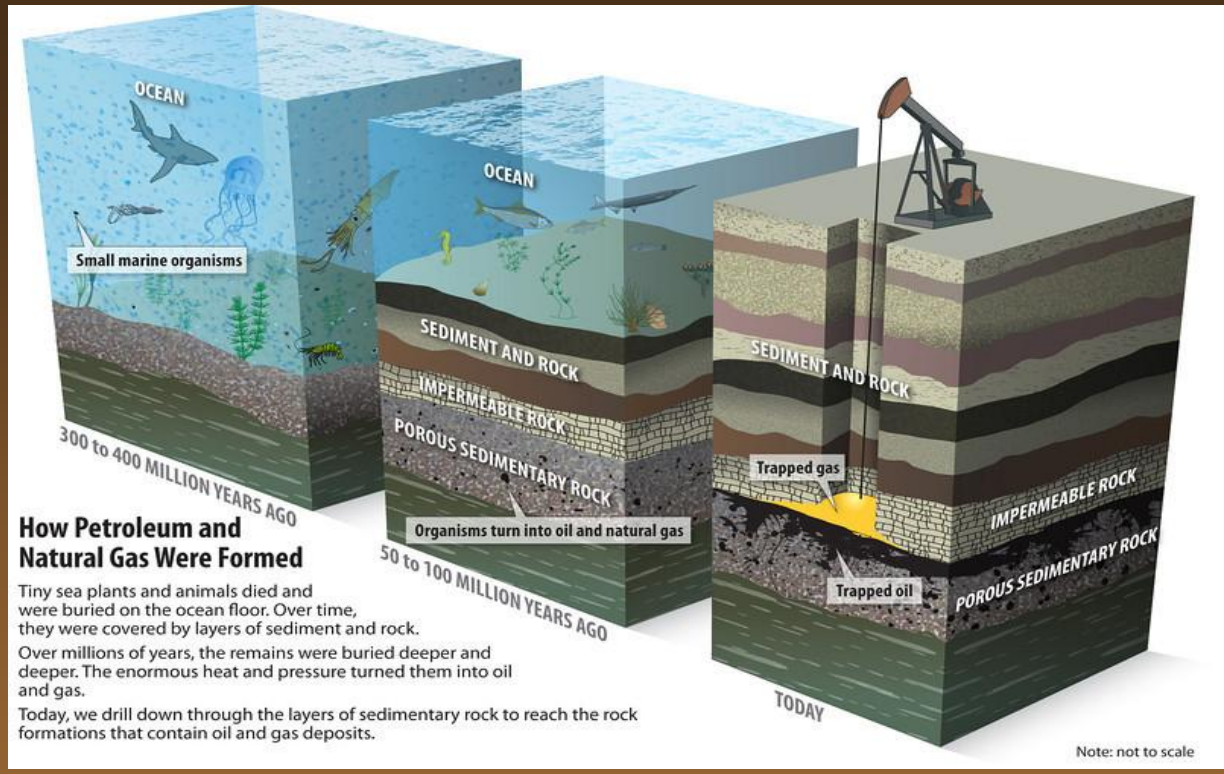
Chapter menu | Resources

- Over geological time the organic matter mixed with mud, is buried under heavy layers of sediment resulting in high levels of heat and pressure.



Formation of Petroleum and Natural Gas

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Chapter menu | Resources

- Like coal this extreme heat and pressure condenses the former organisms in to a mixture of organic chemical compounds called kerogen.
- Kerogen cannot be given a chemical formula because its composition can vary.

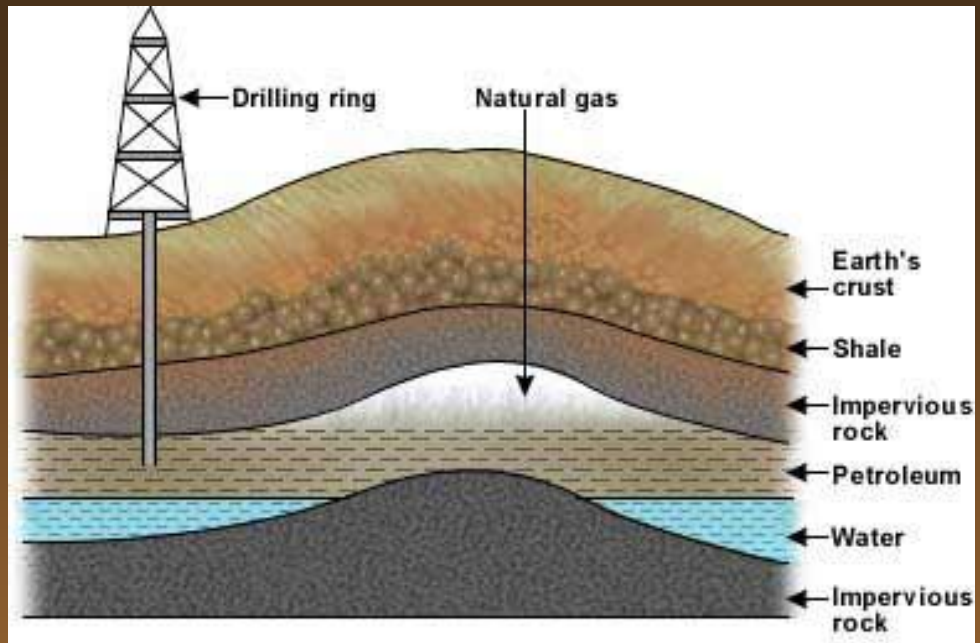
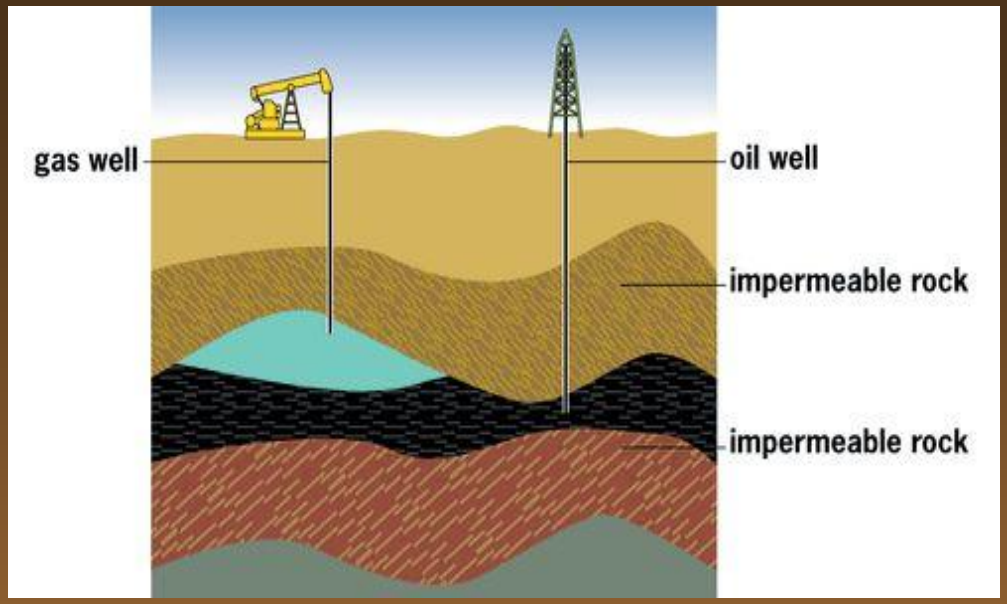


Diagram to show the occurrence of petroleum under the surface of earth.

Formation of Petroleum and Natural Gas

End of Slide

- When Kerogen is heated to the right temperatures in the Earth's crust, *Oil window* 175–250 ° F, *Gas window* 250–300 ° F, it releases crude oil or natural gas, collectively known as hydrocarbons (fossil fuels).



Formation of Petroleum and Natural Gas

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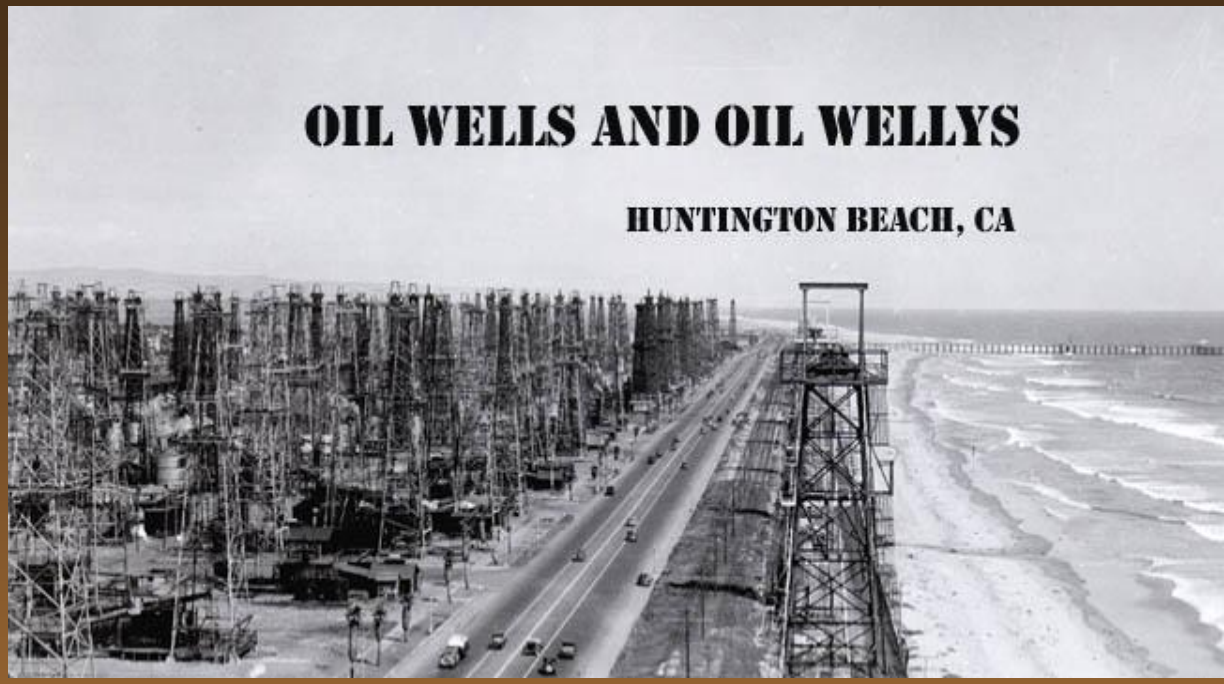
Chapter menu

Resources

- Three conditions must be present for oil reservoirs to form:

- (1) Source rock rich in hydrocarbon material (kerogen) buried deep enough for heat to cook it into oil.



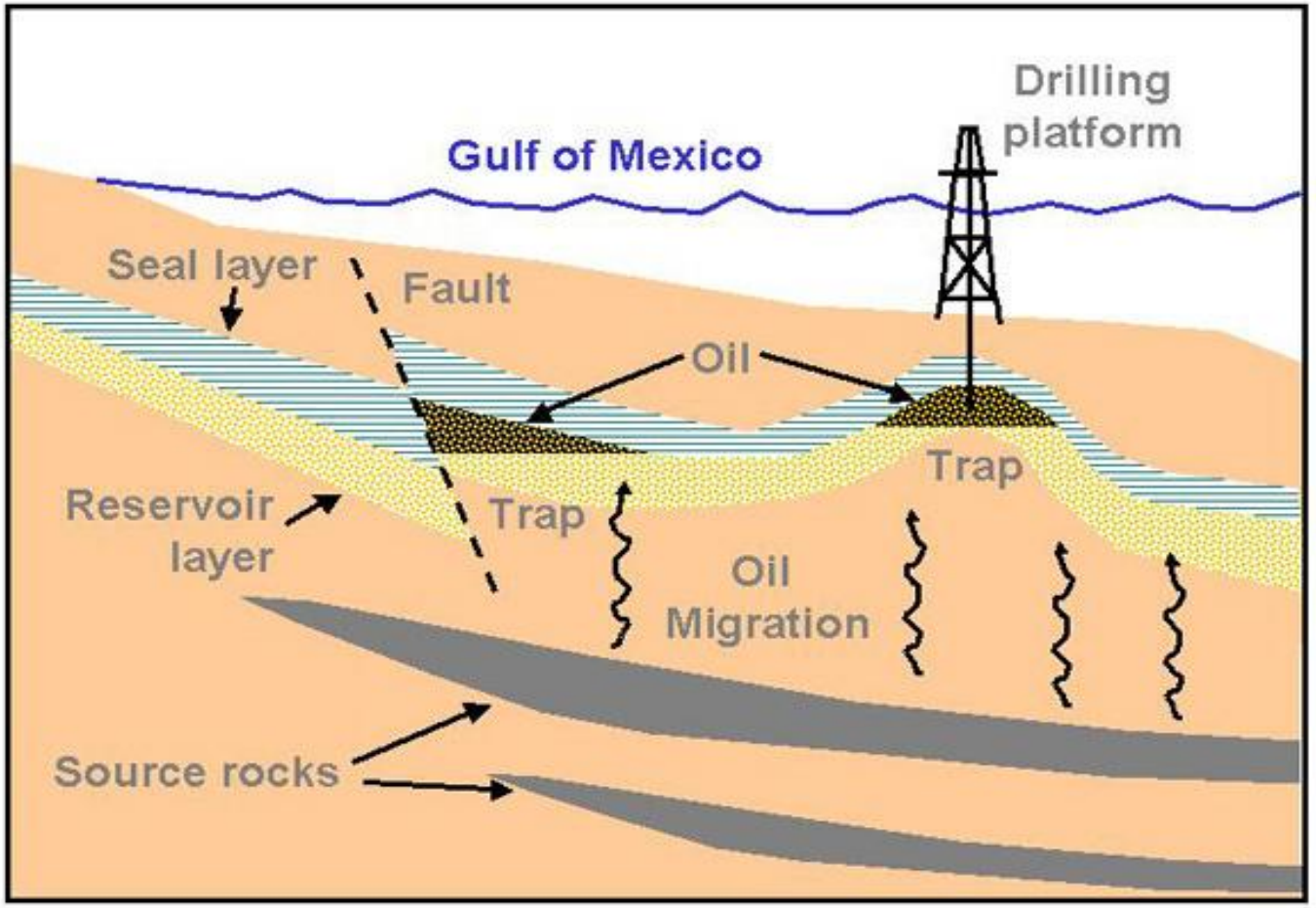
(Oil Reservoir) How Hydrocarbons are Trapped

- (2) a porous rock, like sandstone, for it to pass through and accumulate in. (ex. a bath towel can only hold so much water)

- (3) and a cap rock (seal) that prevents it from escaping to the surface.

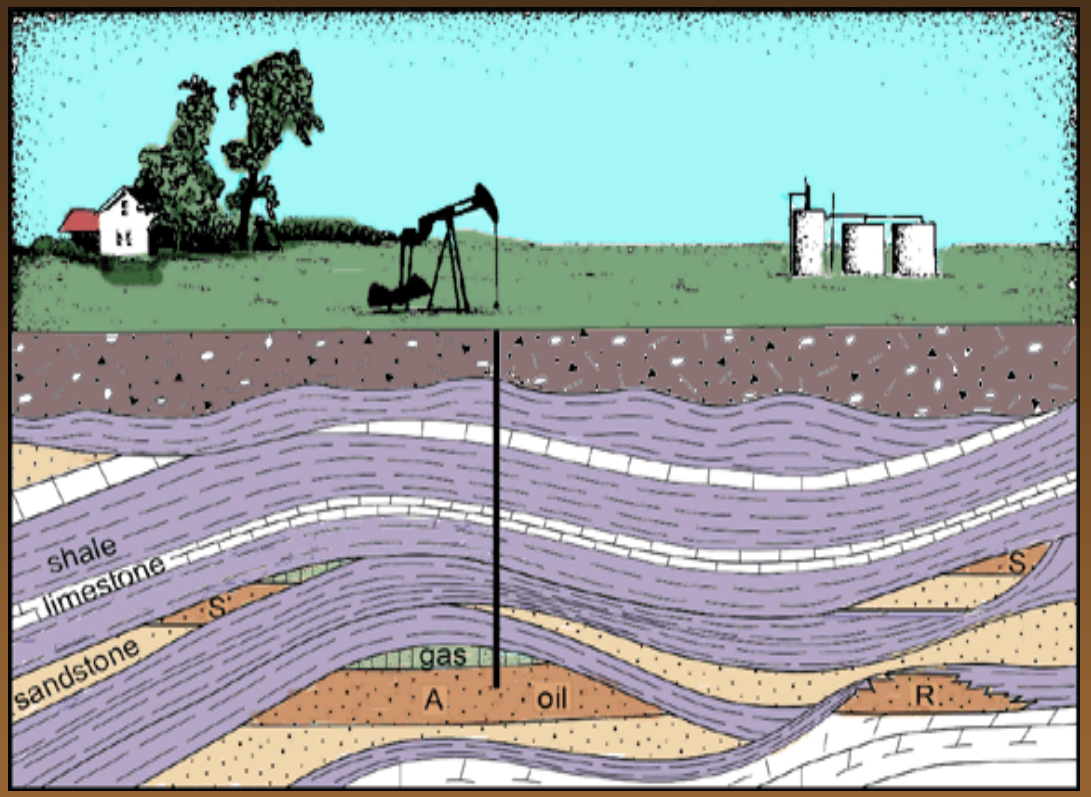
Hydrocarbon Trap

- Because most hydrocarbons are lighter than rock or water, they migrate upward through adjacent rock layers.



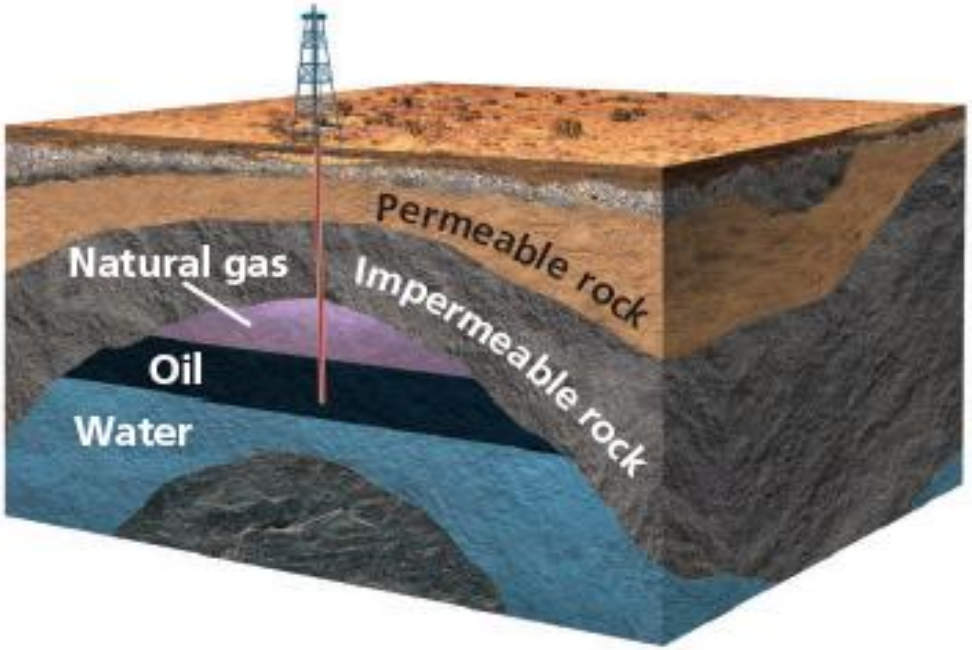
Crude Oil Reservoirs

- This continues until either reaching the surface or becoming trapped within porous rocks (known as reservoirs) by impermeable (trap) rocks above.



Crude Oil Reservoirs

- The underground fluids then arrange themselves like a three-layer cake.
- Water is denser then oil so it is the lower layer while gas is above the layer of oil because it is the less dense of the three.



Many oil traps are anticlines, or upward folds in rock layers.

Crude Oil Reservoirs

Check for Understanding

1. Why does natural gas sit on top of oil?

2. How is oil and natural gas formed?

- At Rancho La Brea, the crude oil was not trapped and has been seeping out of the ground through conduits and fissures in the coastal plain sediments for the past 40,000 years, the seeps forming pools in low-lying areas.

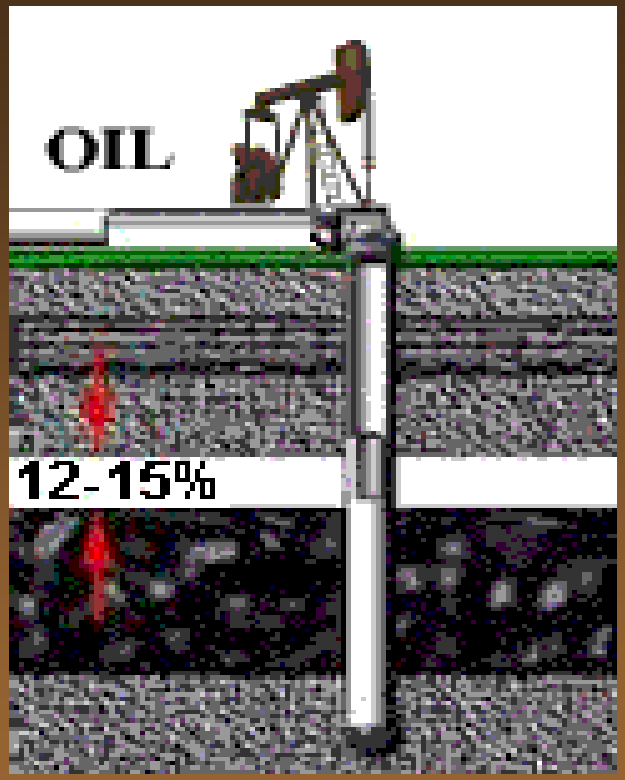
La Brea Tar Pits

- Over tens of thousands of years, this produced the cone-shaped asphalt deposits found at Rancho La Brea.

- Giving us a complete and historical look at the environment of the Los Angeles area 40,000 years ago.

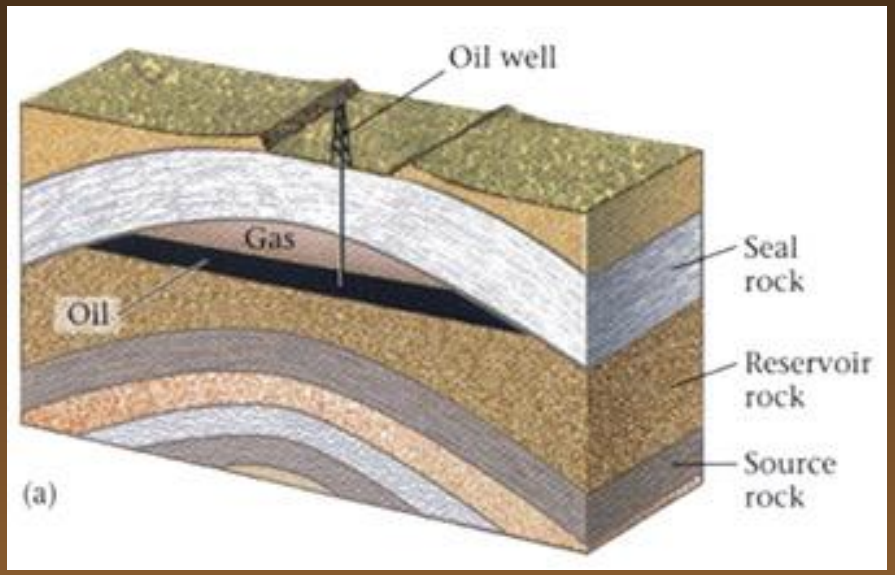
La Brea Tar (Asphalt) Pits

- When hydrocarbons are concentrated in a trap, an oil field forms, from which the liquid can be extracted by drilling and pumping.



Crude Oil Reservoirs

- When an oil well is drilled the pressure of the overlying rock is removed, (like a cap on a soda bottle) fluids rise up and out through the well.



Oil Traps

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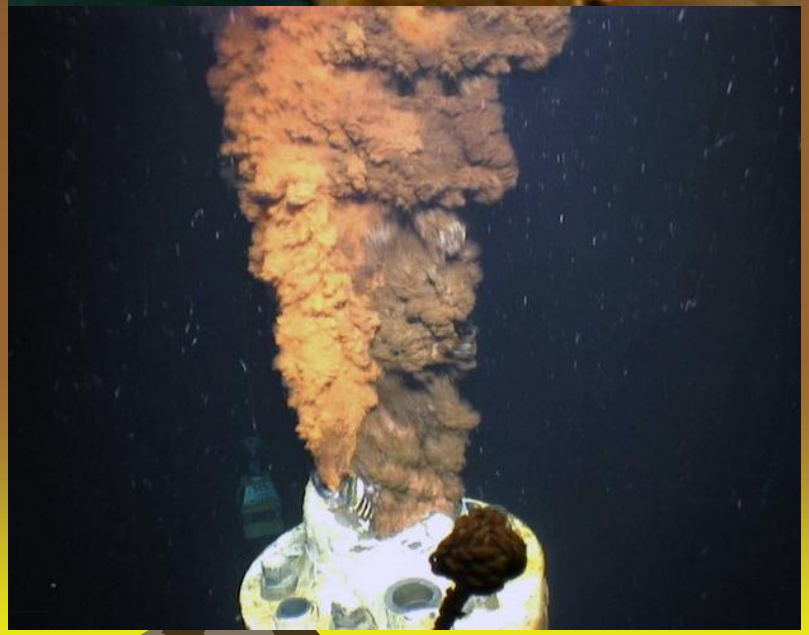
Chapter menu

Resources

- One danger to pumping oil is known as a blowout.
- The largest accident in history occurred in the Gulf of Mexico – known as the Deepwater Horizon oil spill (BP), it flowed unabated for 3 months in 2010.



Dangers of Pumping Oil – Gulf Spill 2010

- *Deepwater Horizon* platform would sink after burning for more then one day.

- It released about 4.9 million barrels crude oil or about 53,000 barrels per day.

Dangers of Pumping Oil – Gulf Spill 2010

Dangers of Pumping Oil – Exxon Valdez 1989

- BP's internal investigation determined that a bubble of methane gas escaped from the well and shot up the drill column, causing and explosion that killed 11 workers.

Resources

- Petroleum and natural gas are very important sources of energy for transportation, farming, and many other industries.

Petroleum and Natural Gas Deposits

- *Crude oil*, or unrefined petroleum, is also used in the production of plastics, synthetic fabrics and rubber, medicines, waxes, chemical fertilizers, detergents, shampoos, and many other products.

Fossil-Fuel Supplies

End Of Slide

Chapter menu

Resources

- **One 42-gallon barrel of oil creates 19.4 gallons of gasoline. The rest (over half) is used to make over 6000 items like these:**
- Solvents, Diesel fuel, Motor Oil, Gasoline, Ink
  Floor Wax, Ballpoint Pens, Football Cleats, Upholstery, Boats
  Insecticides, Bicycle Tires, Lipstick, Pillows, Cameras
  Nail Polish, Fishing lures, Bearing Grease, Soap, Caulking
  Faucet Washers, Enamel, Dice, Dishes
  Food Preservatives, Vitamin Capsules, Deodorant, Footballs
  Panty Hose, Life Jackets, Rubbing Alcohol, Skis, Mops
  Epoxy Paint, Electrician's Tape, Insect Repellent, Oil Filters, Umbrellas
  Yarn, Fertilizers, Hair Coloring, Roofing, Toilet Seats
  Fishing Rods, Denture Adhesive, Speakers, Plastic, Glycerin
  Tennis Rackets, Rubber Cement, Fishing Boots, Rope, Candles Trash
  Bags, House Paint, Hand Lotion, Roller Skates, Surf Boards
  Shampoo, Wheels, Paint Rollers, Shower Curtains, Guitar Strings
  Safety Glasses, Antifreeze, Helmets Awnings, Eyeglasses, Clothes
  Combs, CD's & DVD's, Paint Brushes, Detergents, Vaporizers
  Balloons, Sun Glasses, Tents, Crayons, Parachutes
  Telephones, Golf Bags, Anesthetics, Toothpaste, Golf Balls
  Artificial Turf, Bandages, Dentures, Model Cars, Hair Curlers
  Movie film, Soft Contact lenses, Drinking Cups, Fan Belts Car
  Shaving Cream, Ammonia, Antiseptics, Refrigerators, Perfumes

- Oil / Gas wells are found in Los Angeles, San Francisco, Santa Barbara and San Diego.

Nonrenewable Energy in CA

Chapter menu | Resources

- In California, Oil and natural gas provide 78% of all energy used in the state.

Nonrenewable Energy in CA

End Of Slide

Chapter menu

Resources

- The United States produces more nuclear energy then any other country, but it only provides us with 20% (Per E.P.A – 2012) of the electricity we consume.

- Our megawatt capacity is 101,000 which is about the same as France (2) and Japan (3) combined.

Lesson 7.5 - Nuclear Energy

Chapter menu

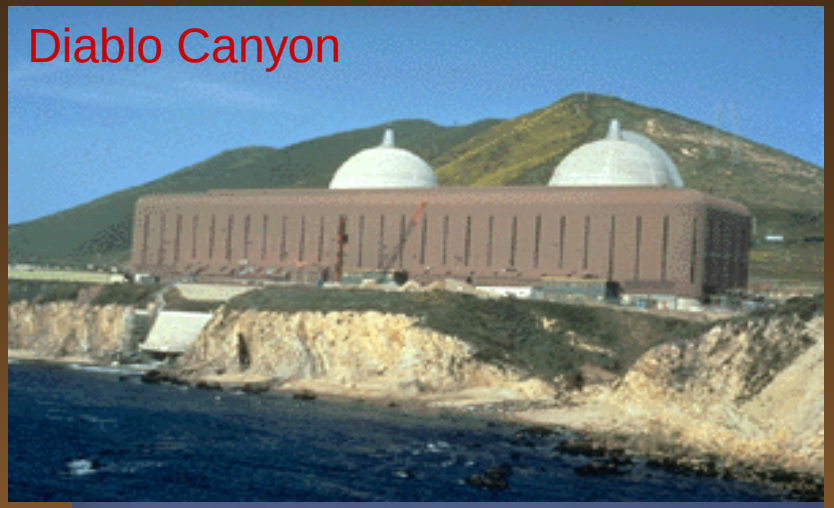
Resources

- In 2010, nuclear provided almost 14 percent of the entire California power mix (which includes out of state imports).

- California has two operating nuclear power plants:

(1) Diablo Canyon near San Luis Obispo

(2) San Onofre Nuclear Generating Station



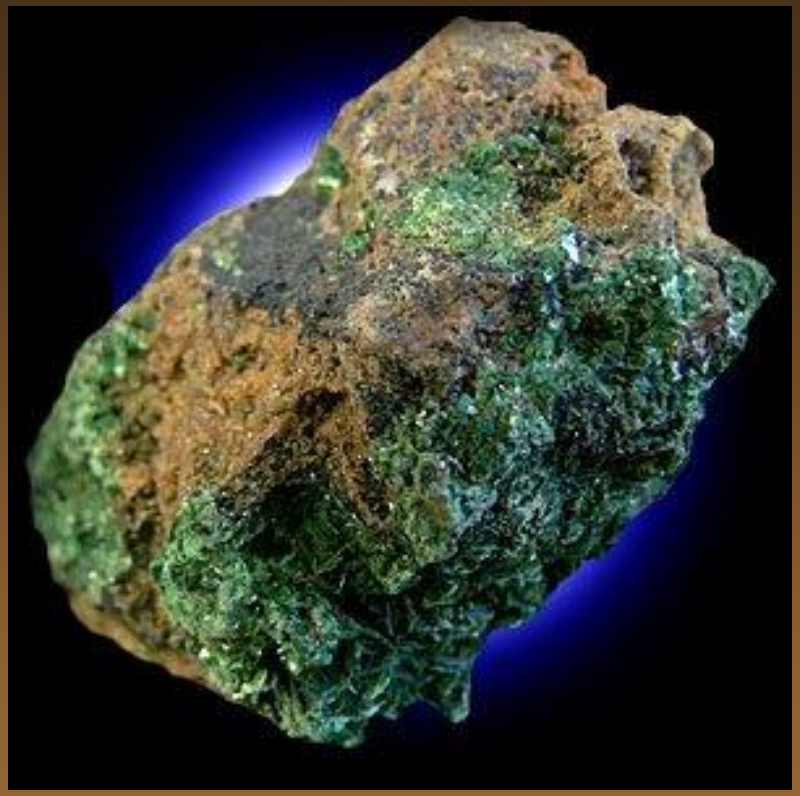
Two California Nuclear Power Plants

- France is most reliant on nuclear power.
- Its electrical energy from nuclear reactors produces 75% of its electrical energy, as of 2010.
- The European Union as a whole, nuclear energy provides 30% of the electricity.

Nuclear Energy Around the World

- Currently, *uranium*-235, is the only naturally occurring element used for nuclear fission.

- http://www.atomicarchive.com/Fission/Fission1.shtml



The Source of Nuclear Energy

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Chapter menu

Resources

- This ore is mined and processed into fuel pellets.

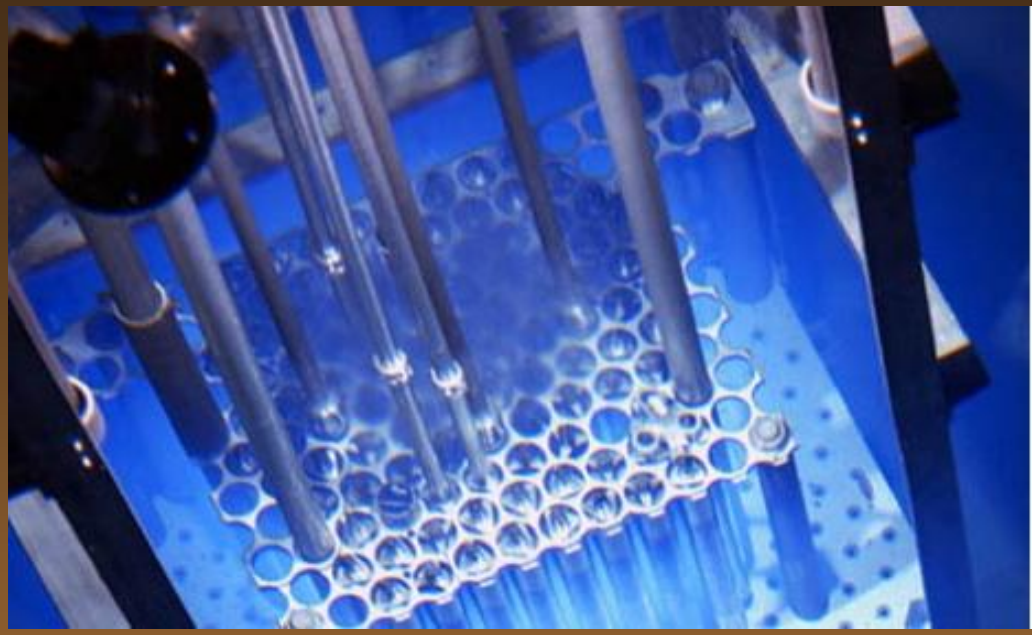
The Source of Nuclear Energy

End Of Slide

Chapter menu | Resources

Fission and Fuel Rods

- At the nuclear reactor uranium-enriched pellets are placed into rods to make *fuel rods*.
- Bundles of these fuel rods are place under water are then bombarded by neutrons to induce a nuclear reaction.



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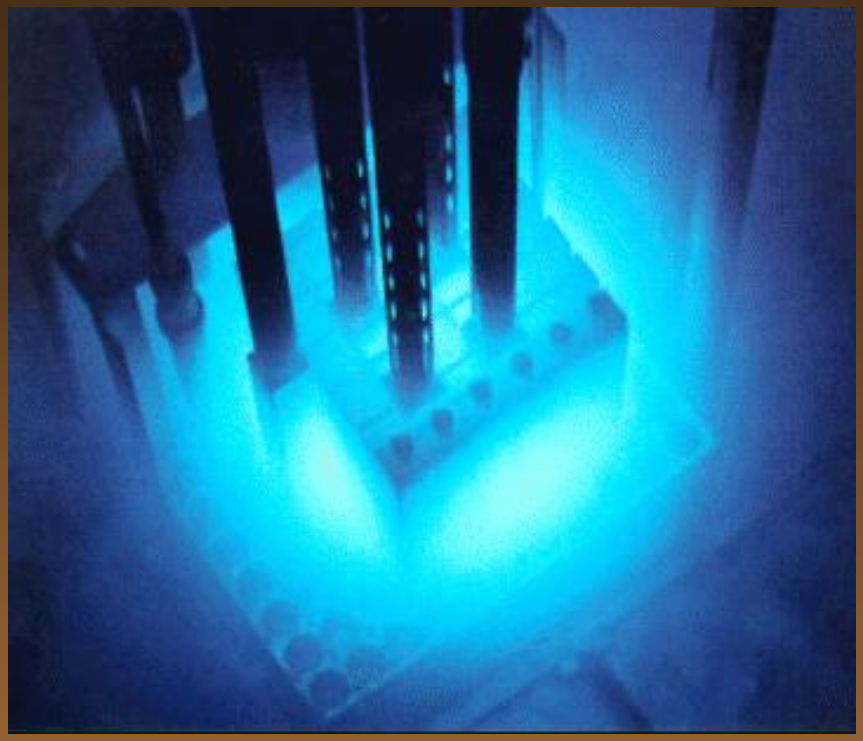
Chapter menu

Resources

Fission and Fuel Rods

- The resulting chain reaction from nuclear fission causes the fuel rods to become very hot ~ 525° F.
- Water is pumped around the hot fuel rods to absorb and remove heat energy.



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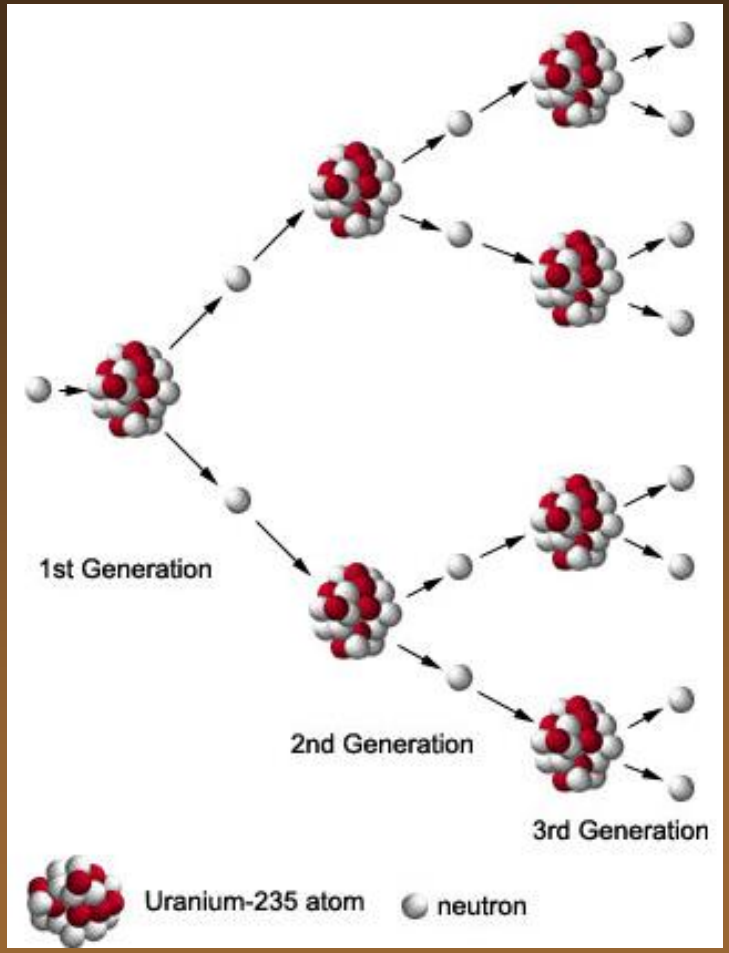
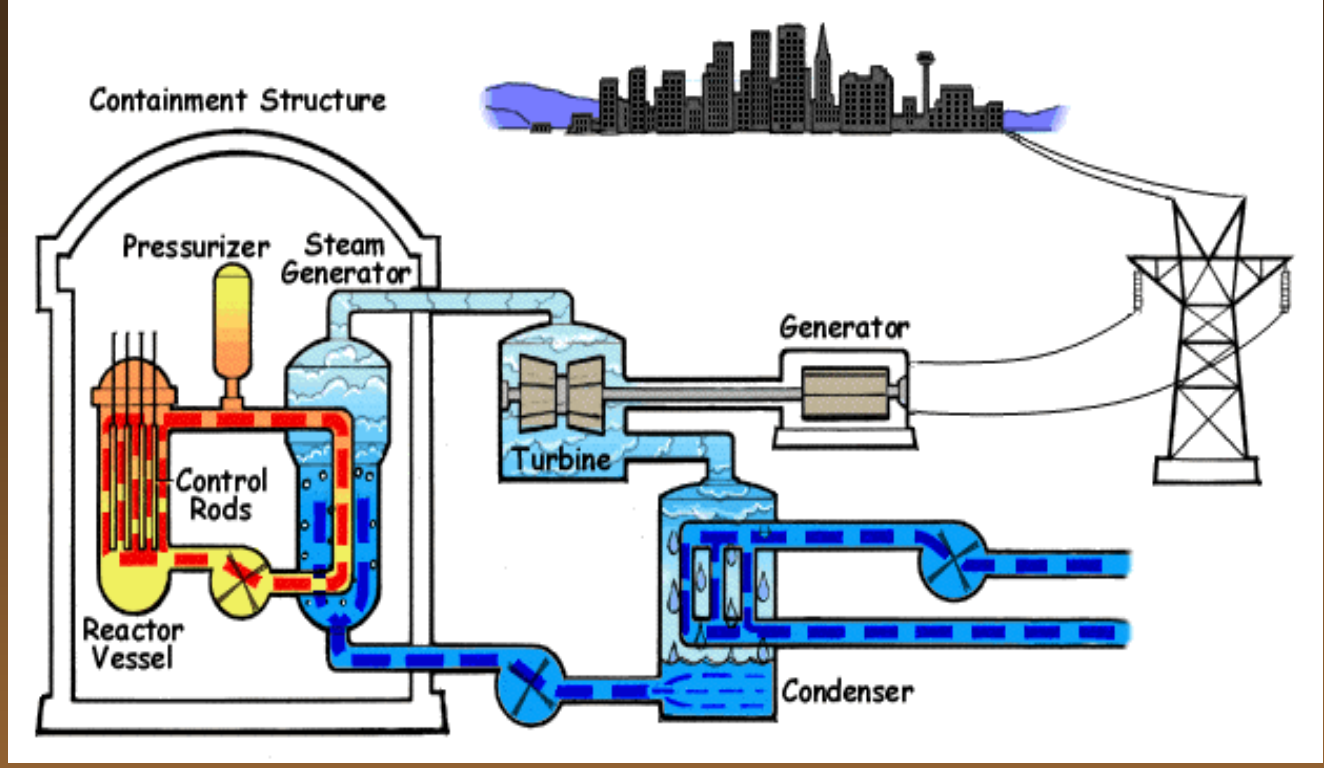
Chapter menu | Resources

- A nuclear reaction occurs because the extra neutron that strikes the uranium atom makes it unstable causing it to split immediately.
- The split causes a chain reaction which releases more neutrons and more energy in the process.



Nuclear Energy

How Power is Harnessed in a Nuclear Reactor



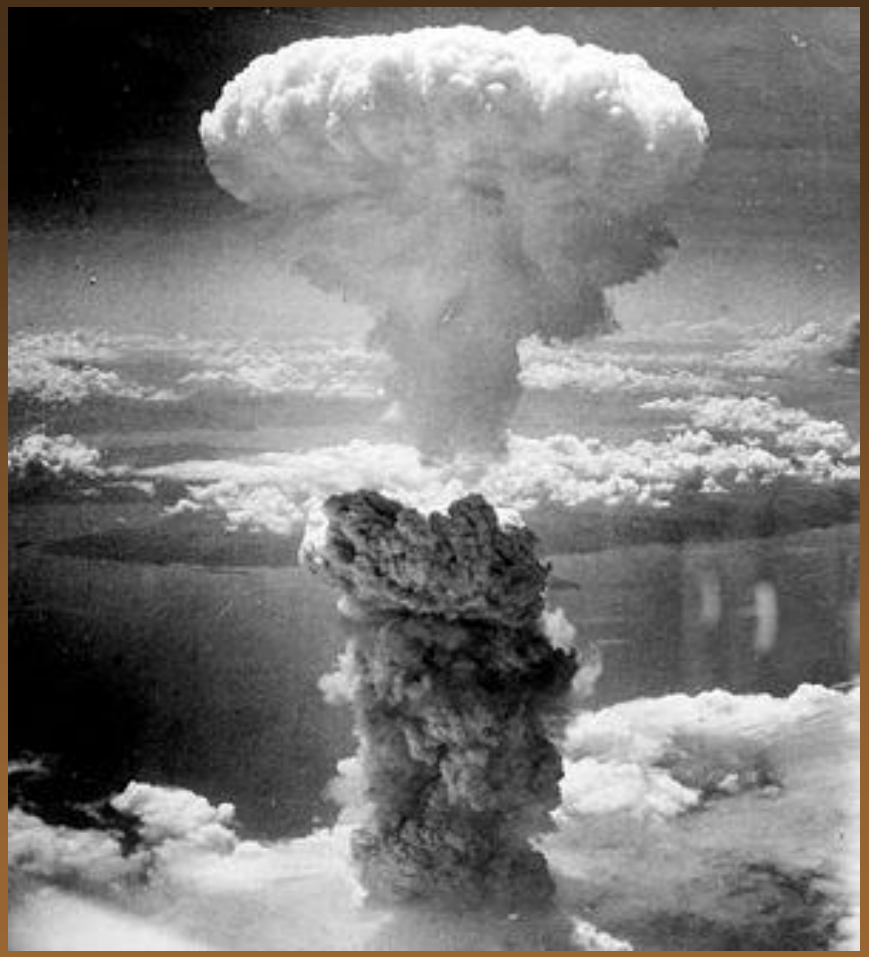
- Once the water becomes a steam, it travels into a turbine that spins a magnetic generator which creates an alternating current to use for electricity.

End Of Slide

Chapter menu

Resources

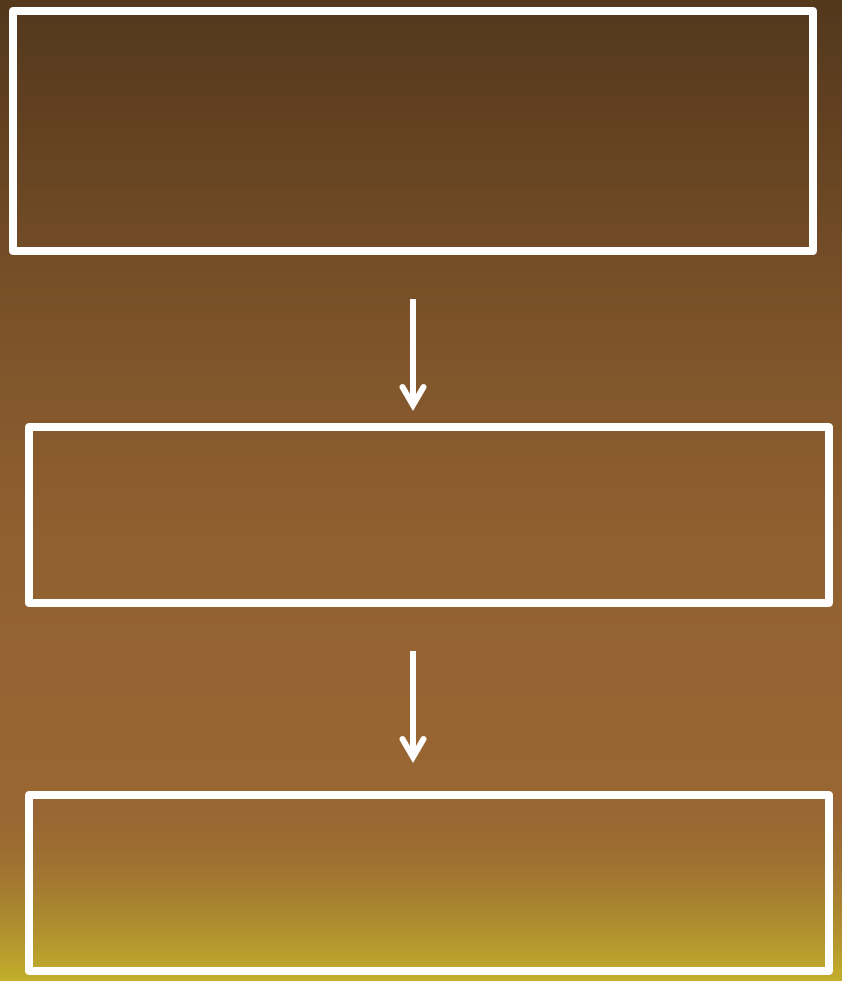
- Controlled reactions produce heat (~ 525° F) that can be used to generate electricity.
- If left uncontrolled, a fission reaction will escalate quickly (over 2000° F) and may result in an explosion or meltdown.
- Nagasaki bomb



Nuclear Energy

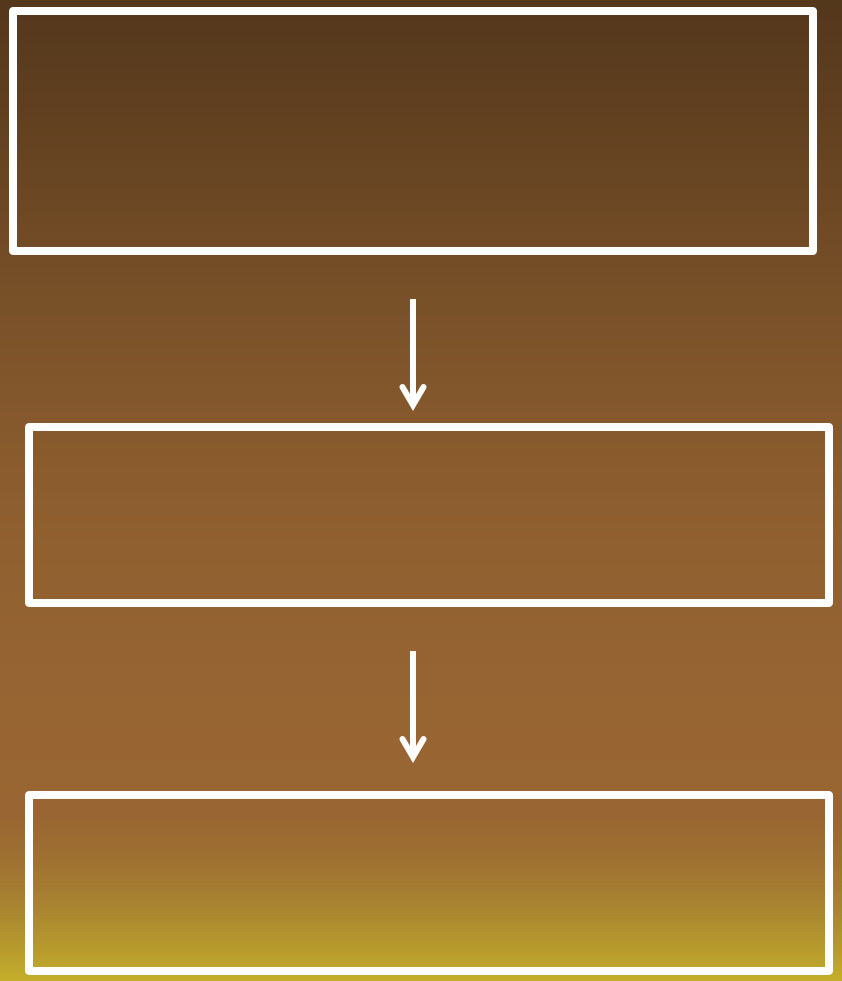
Chain of Events Chart

- Draw a box. In the box, write the first step of a nuclear power plant generating electricity.
- Under the box, draw another box, and use an arrow to connect the two boxes. In the second box, write the next step of the process.
- Continue adding boxes until the process is finished.



Chain of Events Chart

- Draw a box. In the box, write the first step of a nuclear power plant generating electricity.
- At least 5 boxes
- You may use the back of your sheet.



Advantages of Nuclear Fission

- Nuclear power plants burn no fossil fuels and produce no air pollution.

End Of Slide

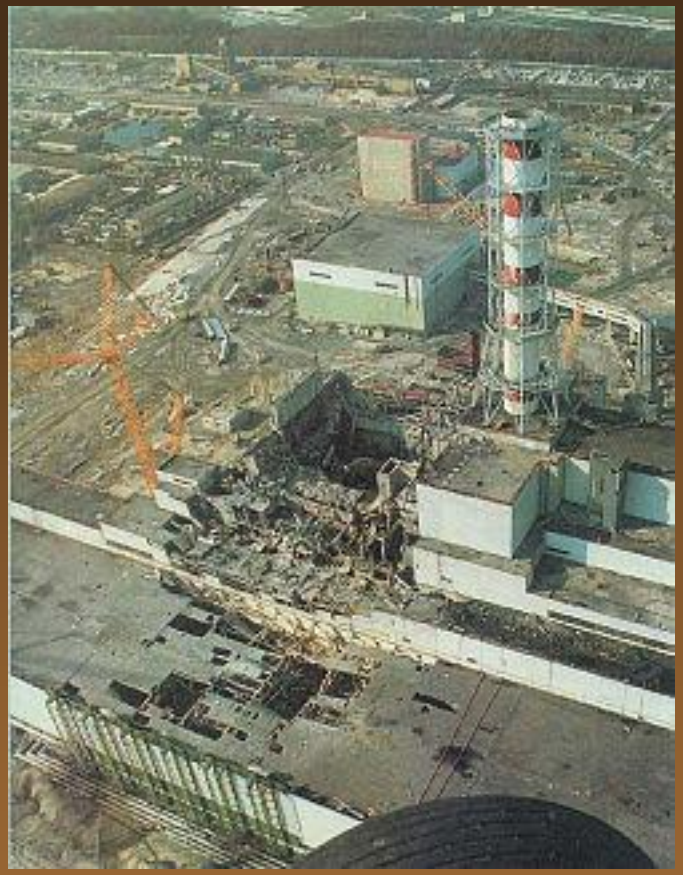
Chapter menu

Resources

- What is left over is radioactive.
- If doses of radiation are prolonged it will destroy cells and cause sickness (radiation sickness).

Disadvantages of Nuclear Fission

- It is considered the worst nuclear power plant accident in history.
- The Ukrainian disaster (under Soviet rule) began during a systems test with an unexpected power surge.
- Mutations in both humans and other animals increased following the disaster.



’86 Chernobyl

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Chapter menu
Resources

- The Fukushima disaster was more complex as multiple reactors and spent fuel pools were involved.

- The connection to the electrical grid was broken and all power for cooling was lost and reactors started to overheat and meltdown.

’11 Fukushima

End Of Slide

Chapter menu

Resources

- Despite attempts to flood the plant with water a 12 mile radius had to evacuated to avoid contamination and this nuclear accident is now considered to be the worst in history.

’11 Fukushima

End Of Slide

Chapter menu

Resources

- The U.S.'s worst accident happened in PA when The Three Mile Island reactor overheated because of both mechanical and human failures (Stuck relief valve).

- The handling of this accident made didn't make things better:
- First, pregnant women and children within a five-mile radius were evacuated.
- Then the evacuation zone was extended to a 20 mile radius but most returned within three weeks.

'79 Three Mile Island

End Of Slide

Chapter menu

Resources

- The TMI accident enhanced the credibility of anti-nuclear groups and triggered protests around the world (’79 NY, 200,000 people).

- Following the Three Mile Island disaster, construction in the U.S. declined: in total, 51 American nuclear reactors were canceled from 1980–1984.

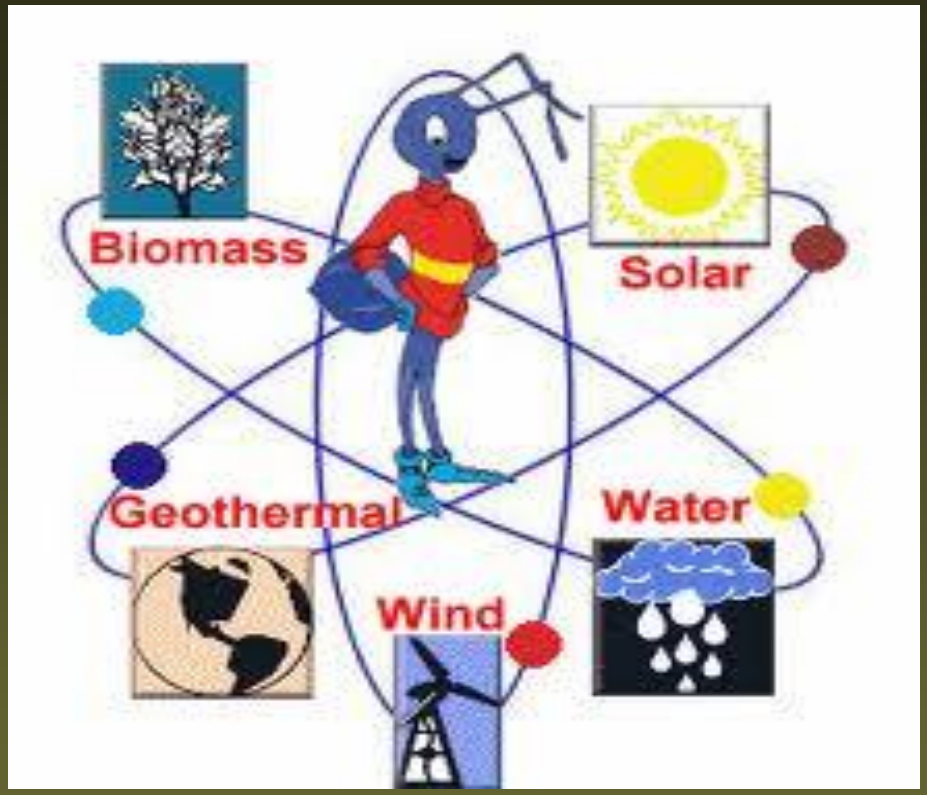
Anti -Nukes

Check For Understanding

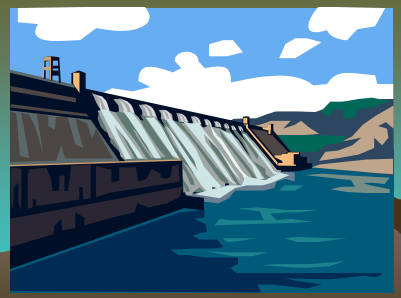
- List 2 positives and 2 negatives in regards to utilizing nuclear power.

- Draw a nuclear power plant reactor.

- A renewable resource is a natural resource that can be replaced at the same rate at which the resource is consumed.
- How a Dam works



Lesson 7.6 - Renewable Resource



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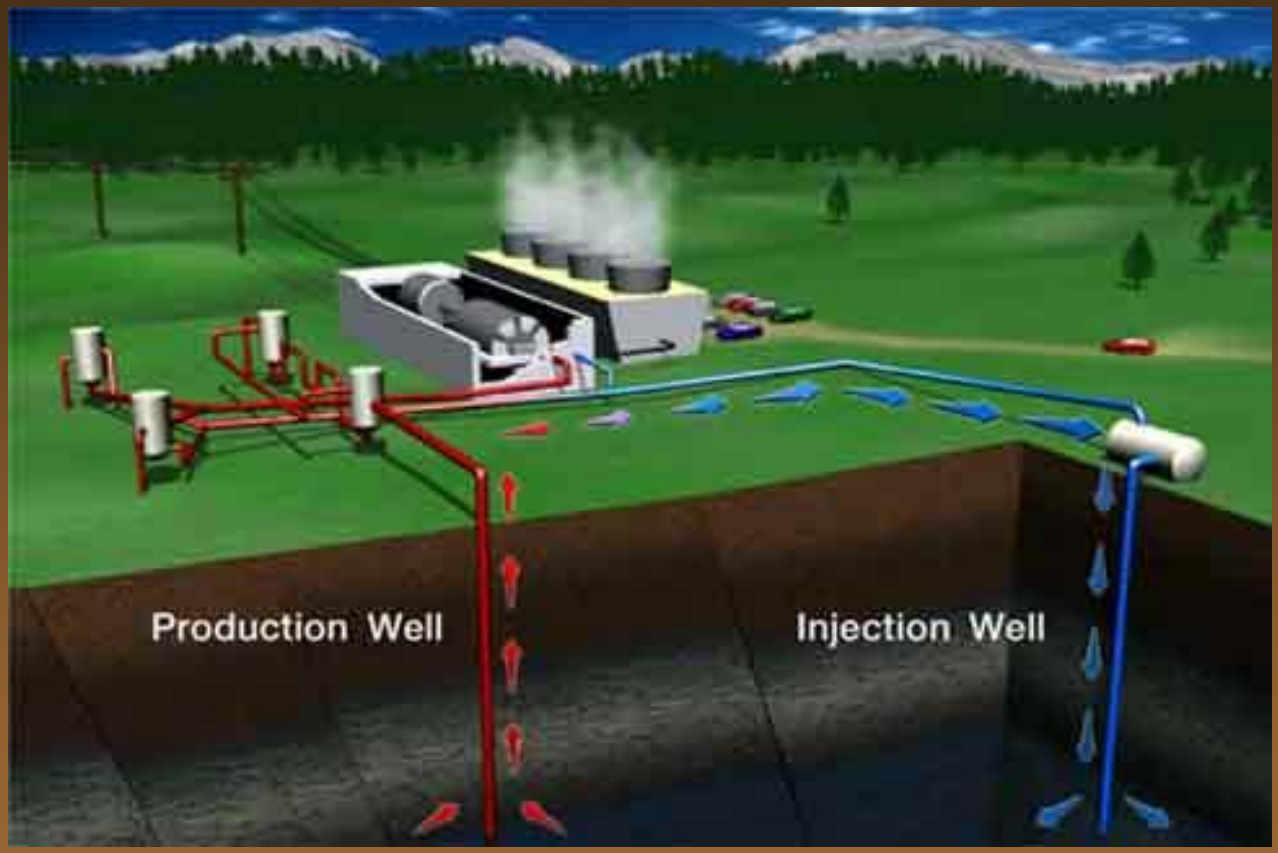
Chapter menu

Resources

- Geothermal energy is energy produced by heat within Earth.
- The heat is provided by magma that is close to the surface.



Geothermal Energy

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Chapter menu | Resources

Geothermal Energy

- The resulting steam from water passing by nearby magma or hot gases, deep in the earth, produces a large amount of geothermal energy.
- Ex - Iceland

- In California there are very few places to harness geothermal energy.

* The largest being the mountains near San Francisco. (Clear Lake)

California Geothermal Energy

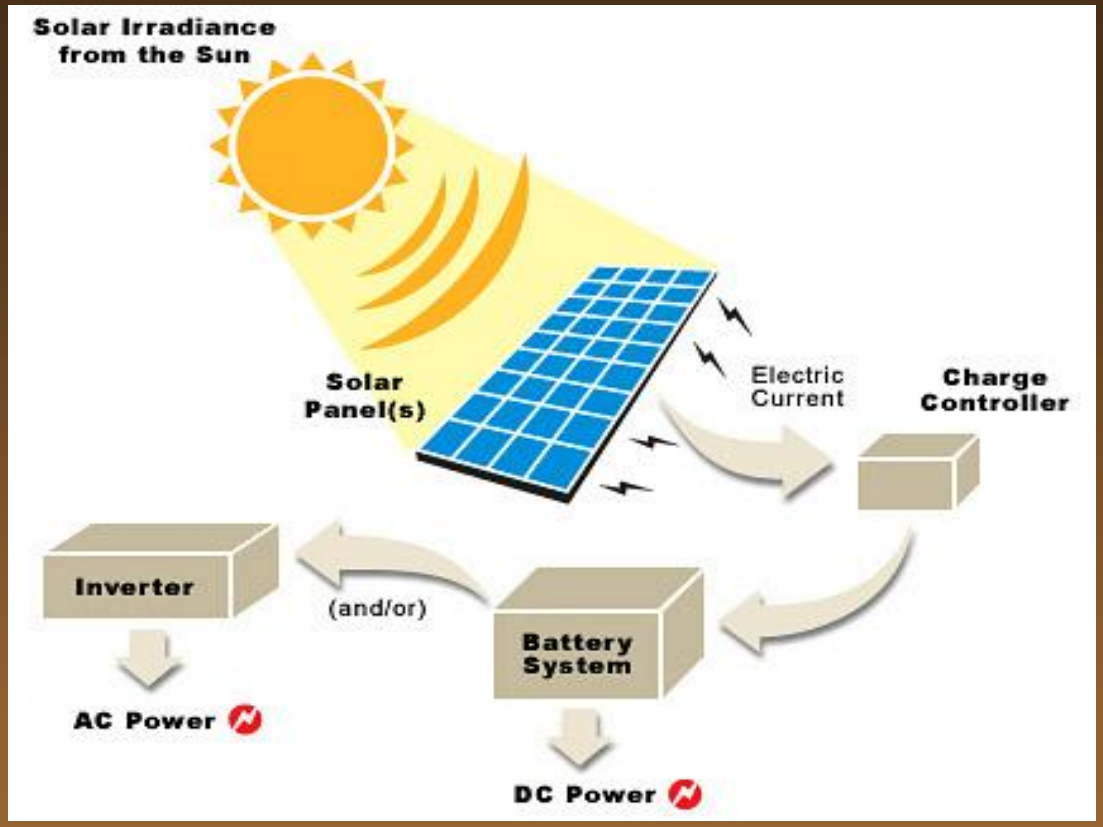
Coso Volcanic Fields
Inyo, California
(near hwy 395)

Check for Understanding

- Draw a quick sketch of how Geothermal Energy Works. Take less then 1 minute.

- Turn to your partner and explain your drawing. 30 seconds.

- While plants capture the Sun's energy to move carbon from the atmosphere to the biosphere.
- Electricity can be created the same way using solar panels this is known as solar energy.



Solar Energy

- The solar cells that you see on calculators and satellites are also called photovoltaic (PV) cells.

- The name implies (photo meaning "light" and voltaic meaning "electricity"), convert sunlight directly into electricity.

Photovoltaic Cells: Converting Photons to Electrons

- Two plates of pure silicon would not generate electricity in solar panels, because they have no positive or negative charge.
- Solar panels are created by combining silicon with other elements that do have positive or negative charges.

How Solar Panels Work

- Google has reportedly invested $168 million dollars on the world's largest solar power plant.
- The power plant will make use of technology called power towers.

Solar power plant in Mojave Desert.

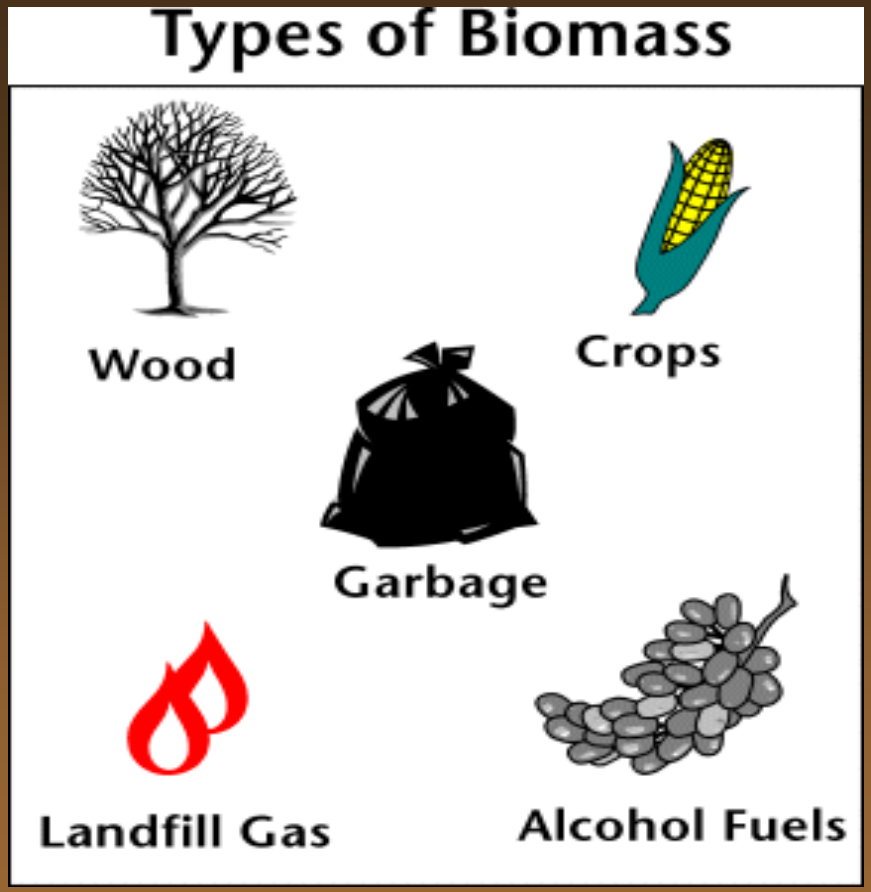
- The plant will use 173,000 heliostats, making it the largest project of its kind.
- The tower is expected to be completed by 2013.

Solar power plant in Mojave Desert.

Check for Understanding

- Why do satellites in space use Photovoltaic Panels (Solar Panels) to re-charge?

- Biomass is plant material, manure, or any other organic matter that is used as an energy source.
- An example is a tree.



Biomass

End Of Slide

Chapter menu | Resources

- More than half of all trees that are cut down are used as fuel for heating or cooking.
- Also bacteria that decomposes the organic matter produce gases, such as methane that can be burned.

Biomass

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Chapter menu | Resources

- Wind energy is now being used to produce electricity in locations that have constant wind.
- Wind farms may have hundreds of giant wind turbines that can produce enough energy to meet the electricity needs of entire communities.

Energy from Wind

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Chapter menu

Resources

- More than 13,000 (95%) of California's wind turbines are located in three primary regions:

California Wind Farms

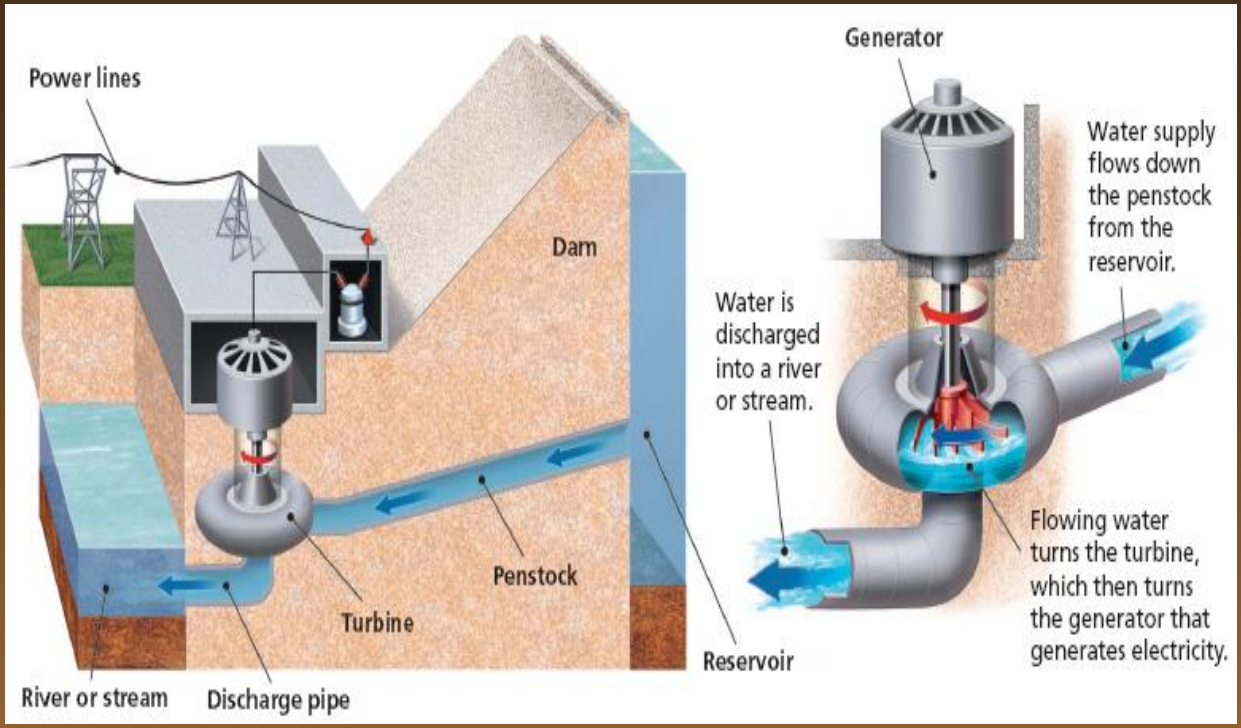
- (1) San Gorgonio (near Palm Springs, (E of L.A.)
- (2) Altamont Pass (E of S.F.)
- (3) Tehachapi (SE of Bakersfield)
- They produce 2.3% (’07) gross power

California Wind Farms

- There are not many areas in California with constant strong winds.

Wind Turbine Prevention

- Energy can be harnessed from the running waters of a rivers and streams or from ocean tides.
- Energy produced by running water or hydroelectric energy makes up 11% of the total electricity in the U.S.



Energy from Moving Water

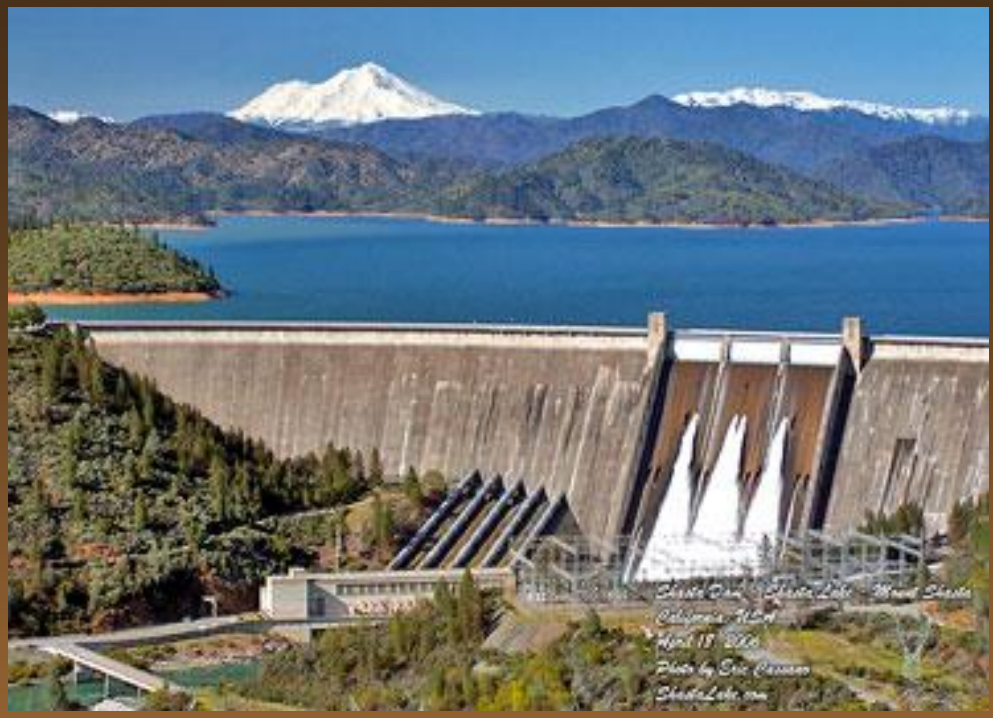
- In a dam, running water is held back then released through a channel that spins a turbine.
- These turbines, which then turns generators, produces the electricity.

Hoover Dam – Colorado River

Water-Way Dam's

- (1) Sediment supply - dams are the second major cause of sediment loss from beaches.

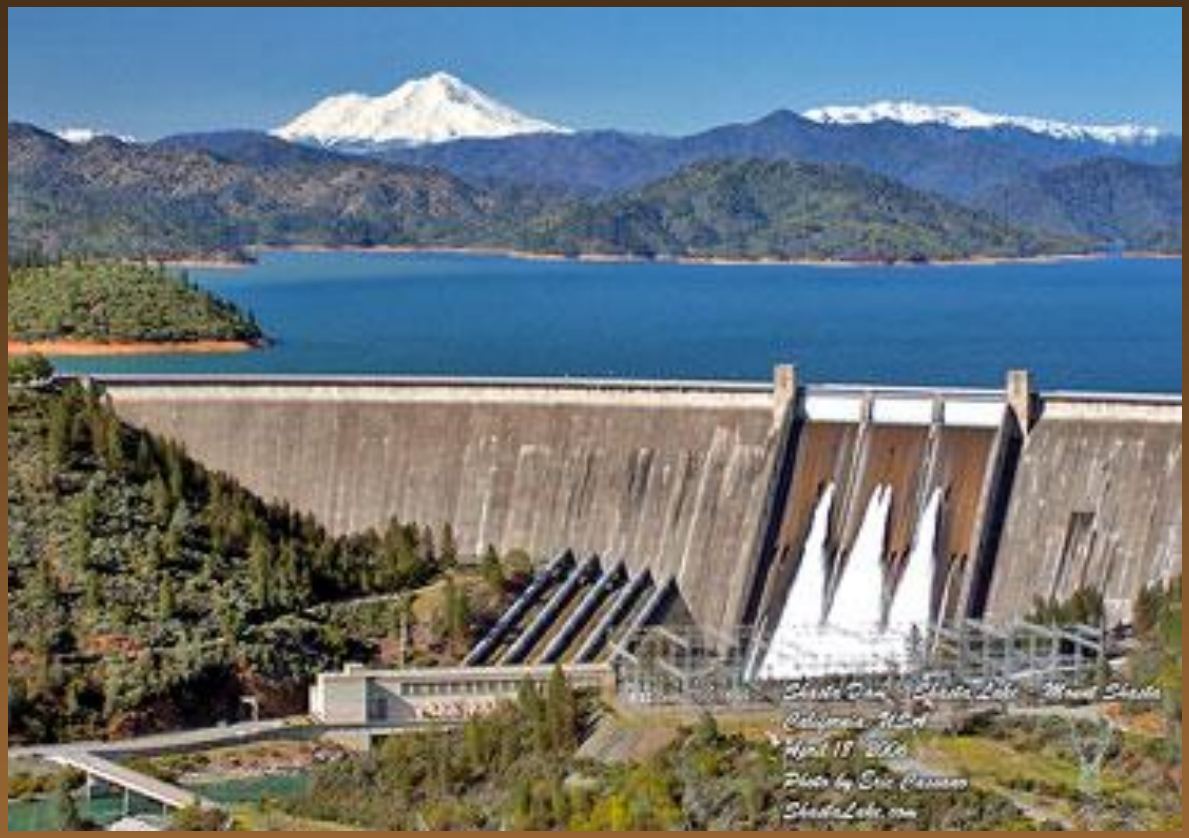
- (2) Dams impede the passage of anadromous fish species (salmon) therefore disrupting food chain.



Shasta Dam – Sacramento River

Dams – Three Negative Impacts

- (3) Dams can destroy rich soil supplies previously counted on by populations near the river.



Dams – Three Negative Impacts

California Dams

- There are 1400 federal and state jurisdictional dams in California.
- Ten reservoirs have storage capacity greater than 1 million acre-feet (Hoover, Castaic and Shasta).

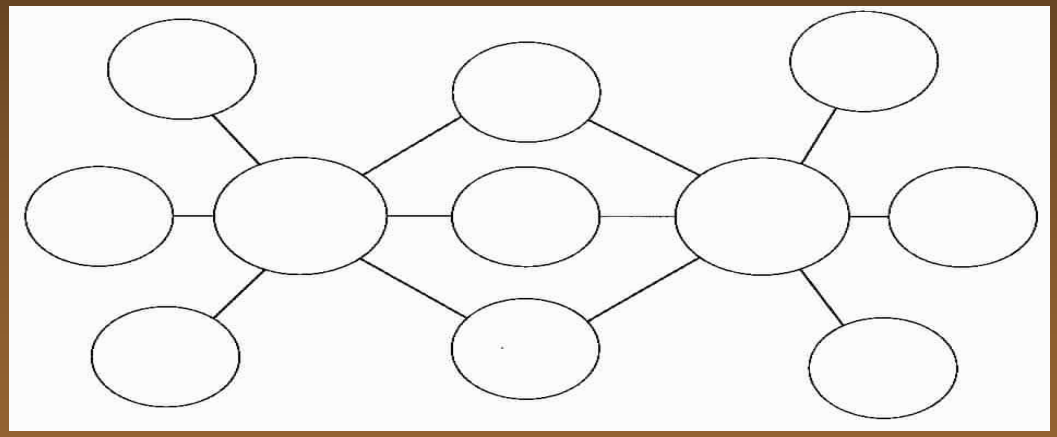
Lake Castaic Dam – California Aqueduct

- The 386 Hydroelectric plants in CA produce more than 15% of California's power.

California Dams

Check for Understanding

- On your double bubble so far you should have the following…
  - Non-Renewable: Coal, Nuclear, Coal and Natural Gas
  - Renewable: ?



- Our supply of fossil fuels is limited.
- Scientists are studying how the use of traditional energy sources affects Earth's ecosystems.

Lesson 7.7 - Resources and Conservation

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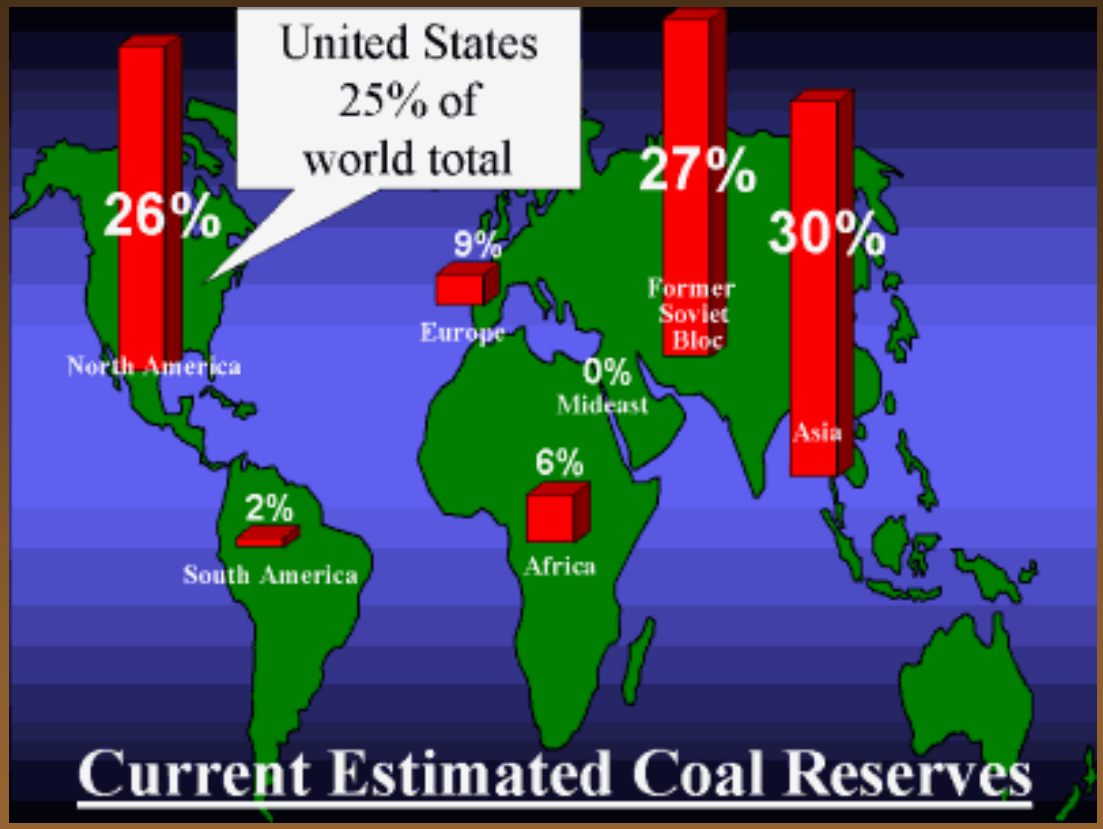
Chapter menu | Resources

- They estimate that the worldwide coal reserves will last about 200 years, and within 20 years, humans will have used half of Earth's oil supply.



Resources and Conservation

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Chapter menu

Resources

- We have learned from past failures that mining can damage or destroy fragile ecosystems.
- Also, fossil fuels and nuclear power can add pollution to Earth's air, water, and soil.

Environmental Impacts of **Mining**

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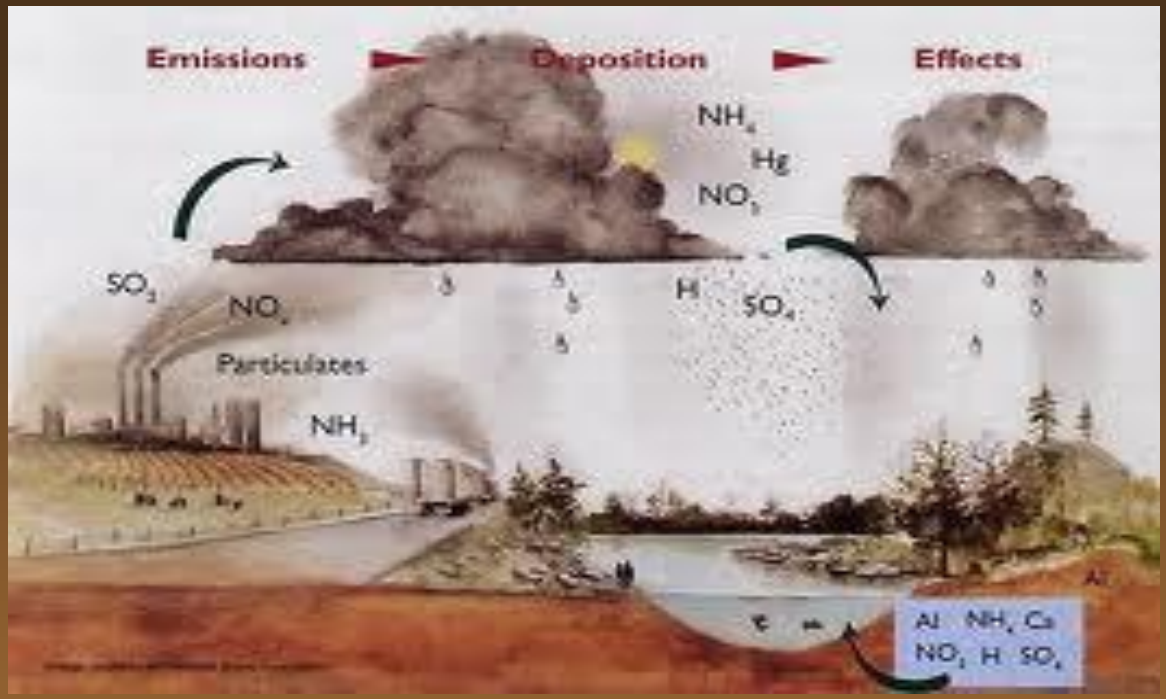
Chapter menu | Resources

- Burning coal releases large amounts of sulfur dioxide, SO_2, into the atmosphere.
- When SO_2 combines with water in the air, acid precipitation forms.



One example is Acid Rain

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Chapter menu | Resources

- Industrial acid rain is a substantial problem in China and Russia and areas down-wind from them.
- These areas all burn sulfur-containing coal to generate their heat and electricity.

Acid Rain

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Chapter menu
Resources

Mine Reclamation

- Mine reclamation is the process of restoring land that has been mined to a natural or economically usable purpose.
- Reclamation helps reduce the long-lasting environmental impact of mining.

End Of Slide

Check for Understanding

- What is mine reclamation?
- How is acid rain formed?
- Do not use your notes and answer the questions individually.

- By conserving natural resources, people can ensure that limited natural resources last longer.
- Conservation can help reduce the environmental damage and amount of pollution that can result from the mining and use of natural resources.

Bolsa Chica Reserve

Conservation

End Of Slide

Chapter menu

Resources

- Recycling is the process of recovering valuable or useful materials from waste or scrap and reusing some of those items.
- Recycling requires energy, but recycling uses less energy than the mining and manufacturing of new resources does.

Recycle

- Another way to conserve minerals is to use other abundant or renewable materials in place of scarce or nonrenewable materials.

- Brass and Copper are minerals in need of conservation.

Mineral Conservation

Integrated Waste Management Act (’89)

- AB939 (’89) - Integrated Waste Management Act, was passed because of the increase in waste stream and the decrease in landfill capacity.

- Jurisdictions were required to meet diversion goals of 25% by 1995 and 50% by the year 2000 and beyond.

60 /605 FRWYs

Material Recovery Facility

- Material Recovery Facilities (MRF) are being used to divert the cities waste streams.

Material Recovery Facility

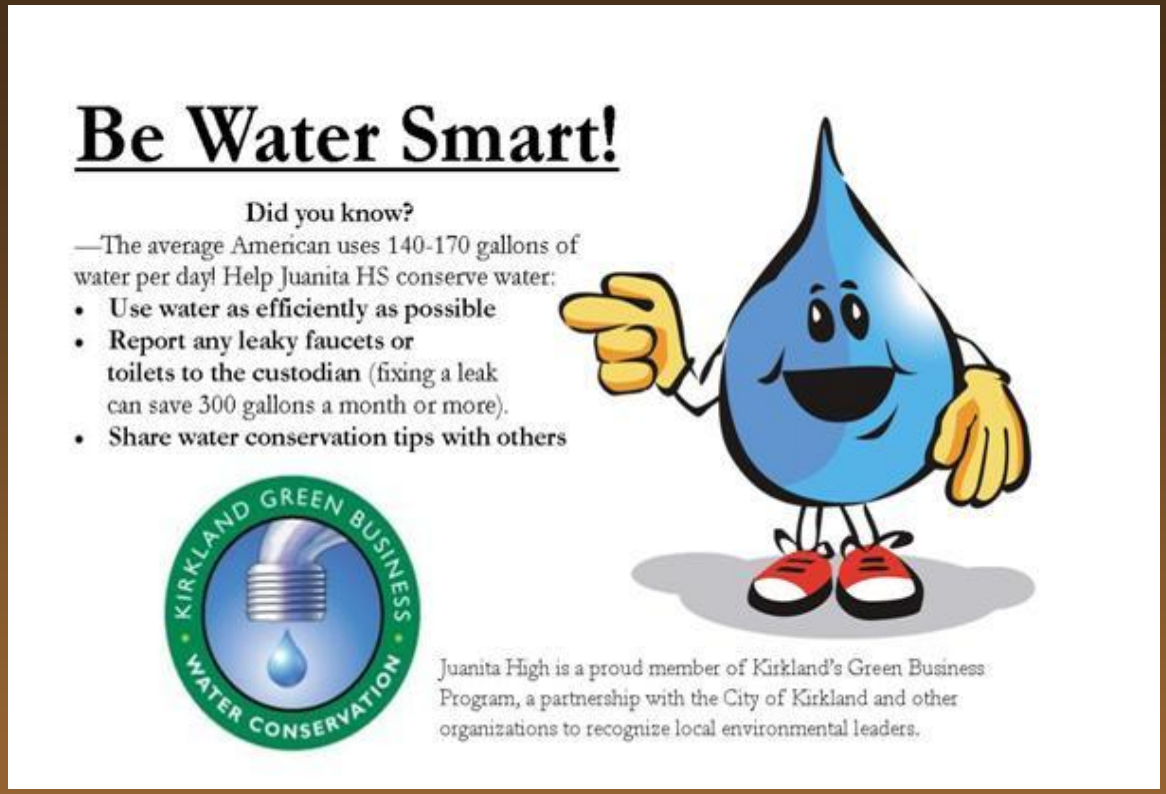
- The closest is Athens MRF on Valley Blvd., La Puente.

- Reducing the amount of energy used every day can conserve fossil fuels.
- Reducing the amount of driving and increasing insulation for a house and adding energy-efficient appliances to your home, all help conserve energy.

Fossil-Fuel Conservation

End Of Slide
Chapter menu
Resources

- Some scientists estimate that by the year 2050, the world will have a critical shortage of freshwater resources.



Conservation of Water

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Chapter menu

Resources

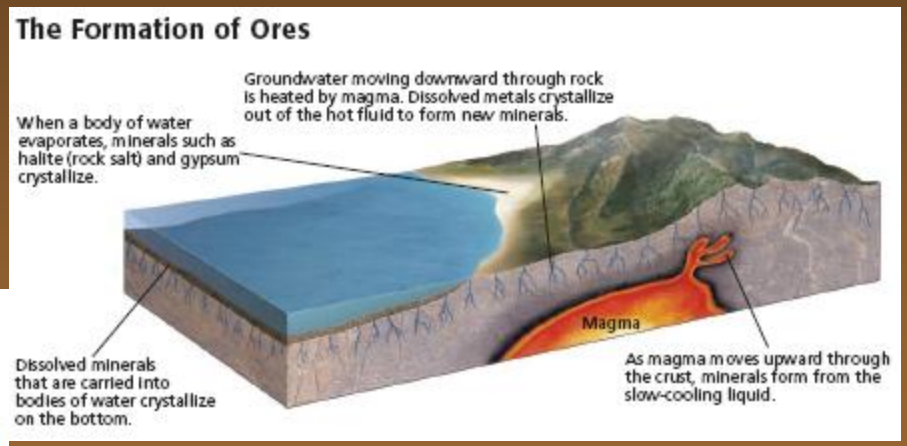
Check for Understanding

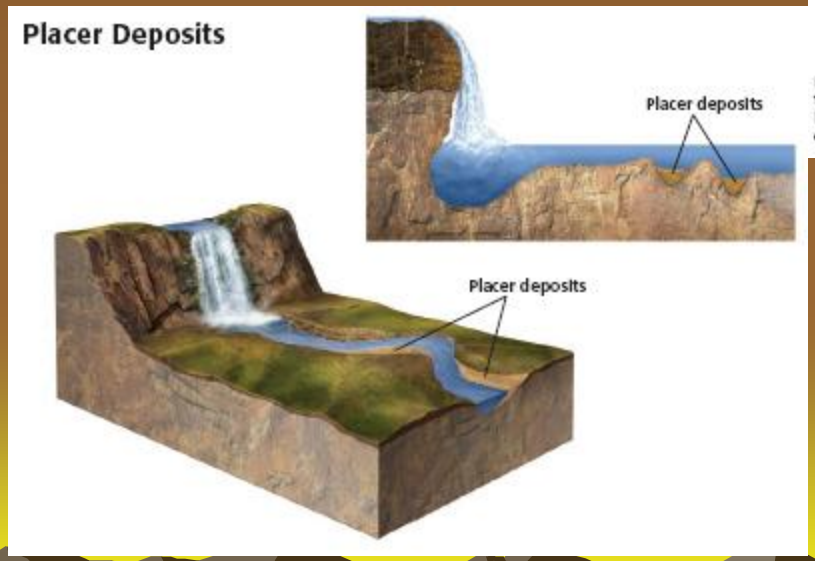
- What does a MRF building do?

- Name three ways in which you can conserve water usage?
  1.
  2.
  3.

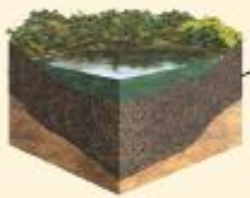
Chapter 7

The Formation of Ores and Placer Deposits



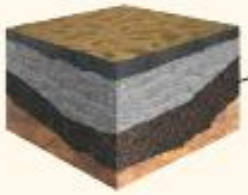


Types of Coal



Stage 1: Peat

The partial decomposition of plant remains forms a brownish-black material called *peat*.

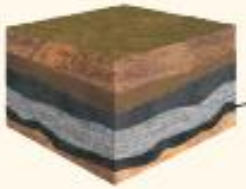


Stage 2: Lignite

Peat is buried by other sediment. As heat and pressure increase, peat becomes lignite. Lignite is also called *brown coal*.

Stage 3: Bituminous Coal

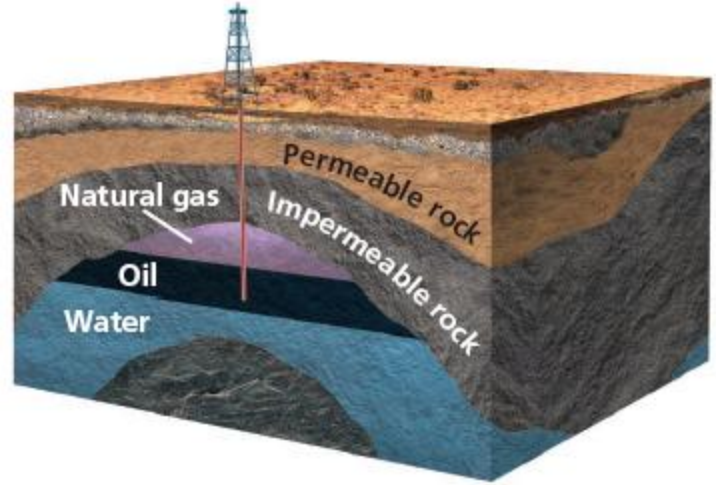
Increased temperature and pressure turn lignite into bituminous coal, which is 80% carbon. Bituminous coal is also called *soft coal*.



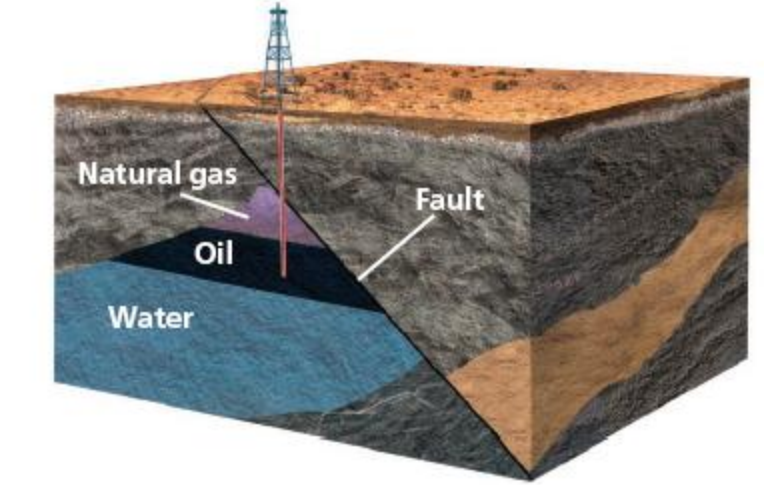
Stage 4: Anthracite

Under high temperature and pressure conditions, bituminous coal eventually becomes anthracite, which is the hardest form of coal.

Oil Traps

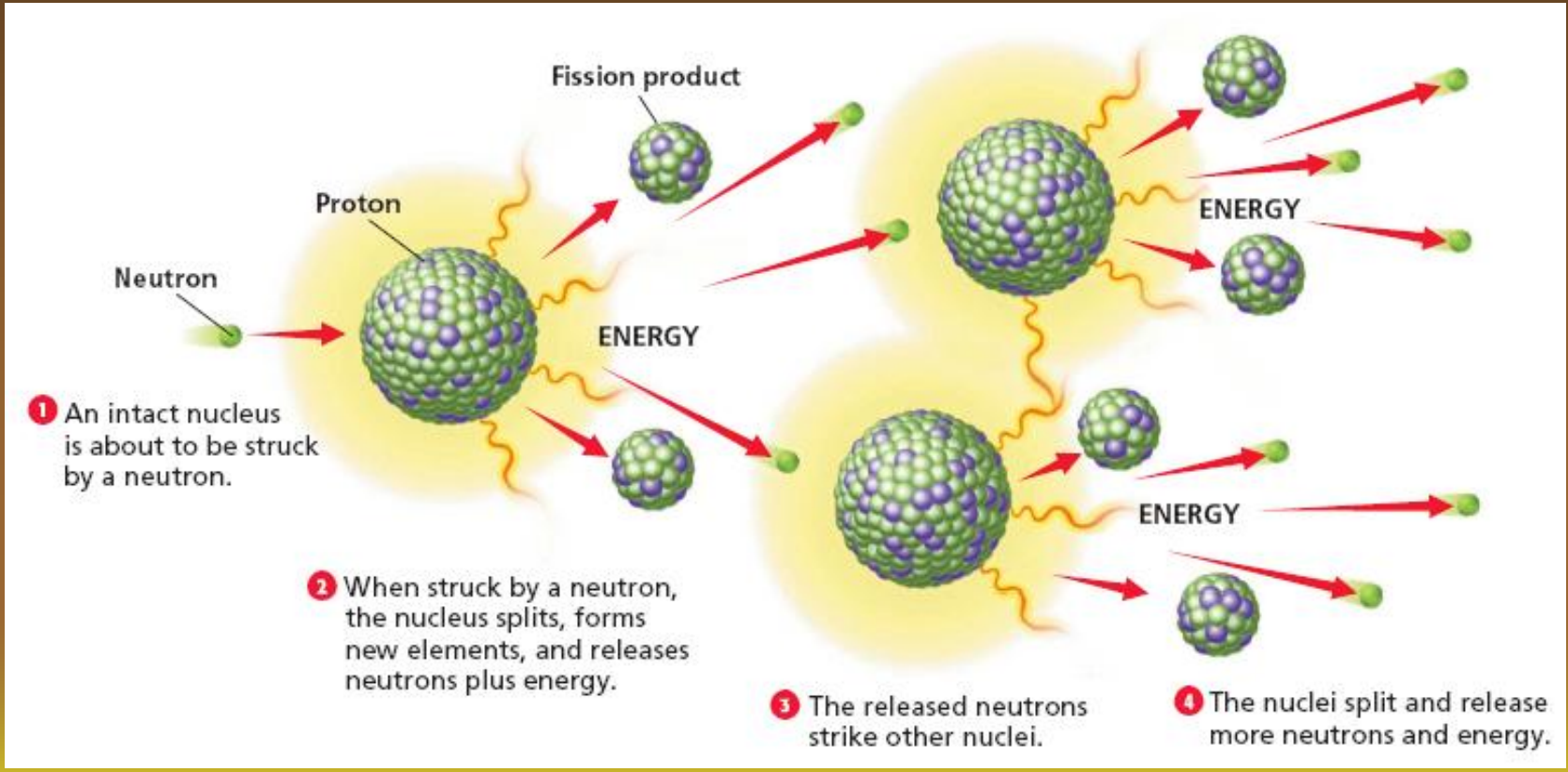


Many oil traps are anticlines, or upward folds in rock layers.

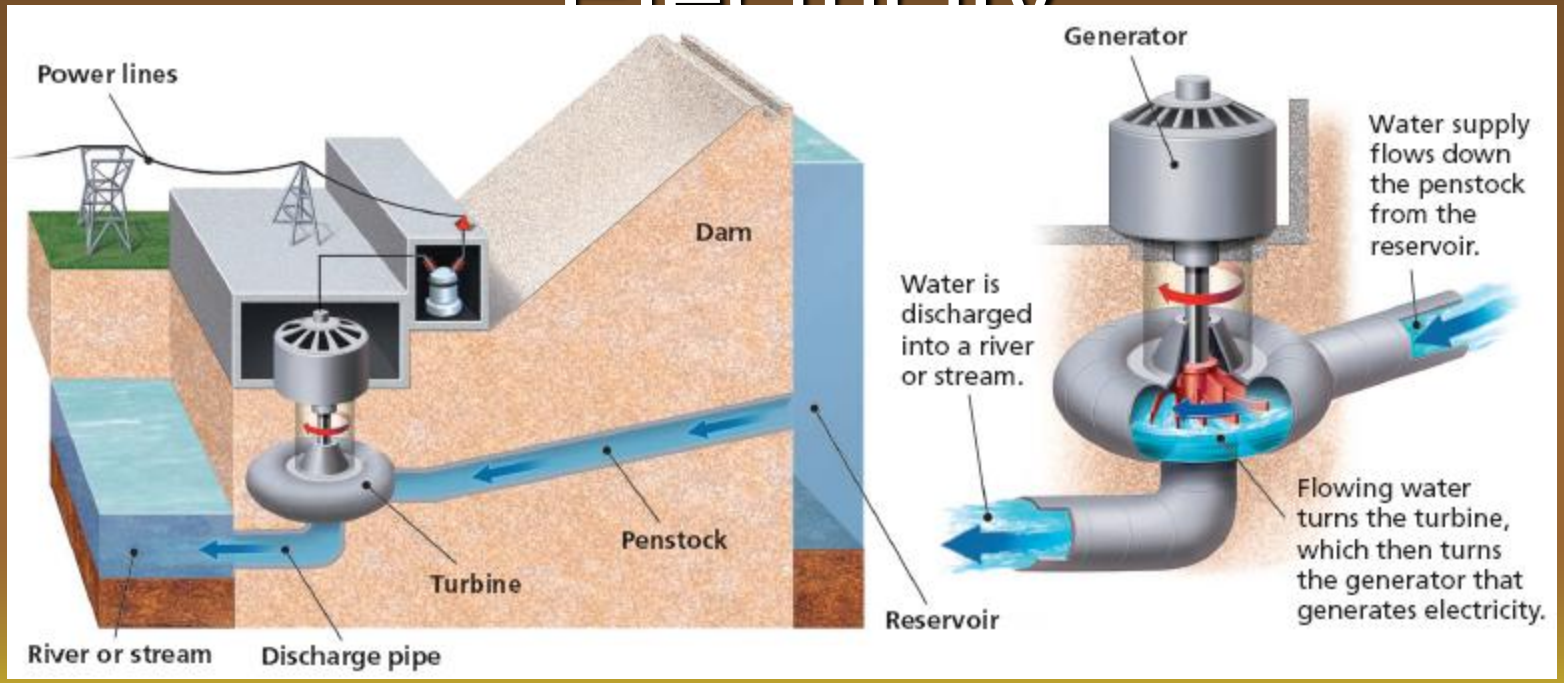


Another common type of oil trap is a fault, or crack, in Earth's crust that seals the oil- or gas-bearing formation.

A Nuclear Fission Reaction



How a Hydroelectric Dam Generates Electricity



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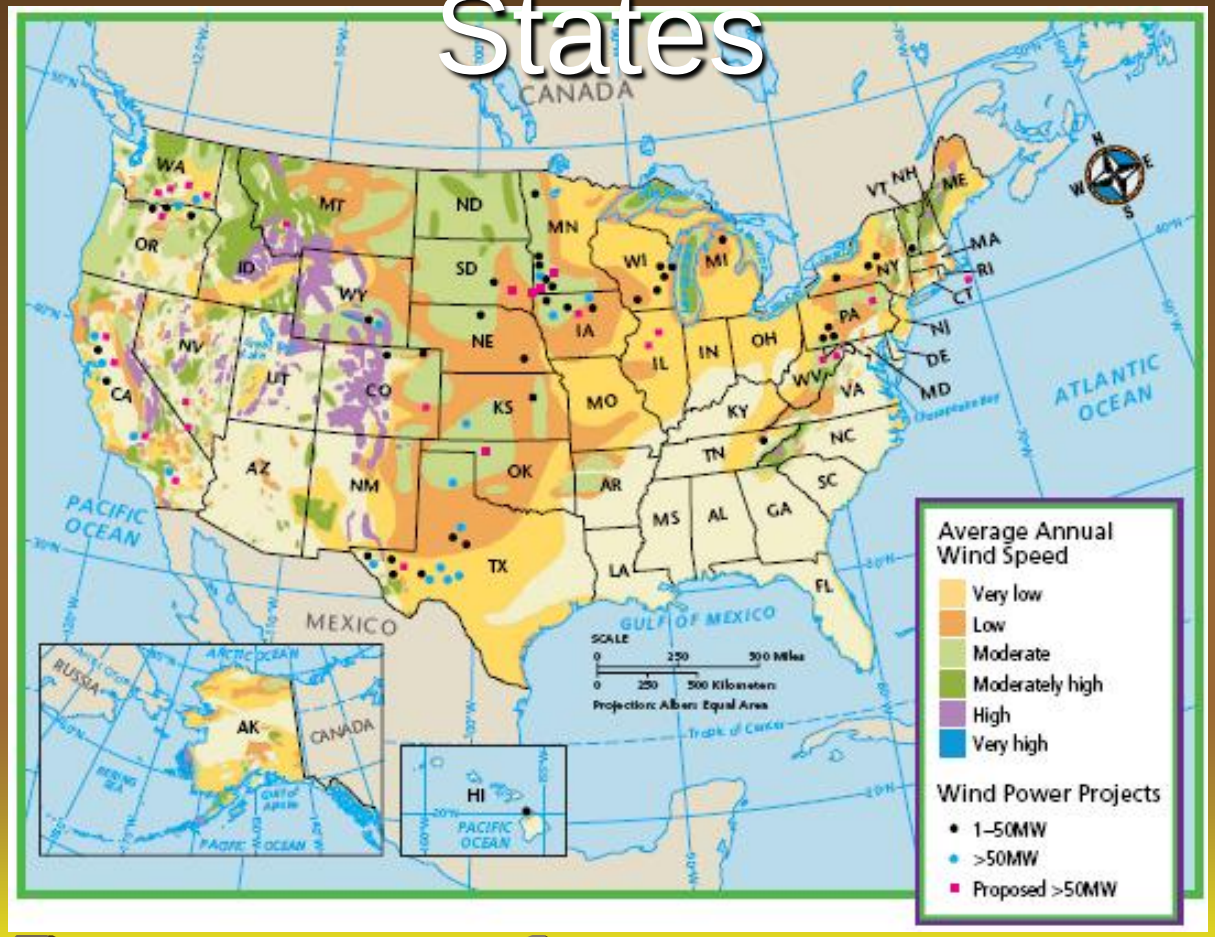
Wind Power in the United States



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