OKLAHOMA KEY BUSINESS SYSTEMS

ENERGY

POWERING OKLAHOMA

NEWSPAPERS IN EDUCATION
THE OKLAHOMAN
Marathon Oil
Energy & Environmental Services
Oilfield Chemicals & Coatings
OERB
D&L
OIL TOOLS

Table of Contents

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Types of Energy

Essential Questions:

What is Energy?

Energy is a broad term used to describe any type of power derived from the utilization of physical or chemical resources, especially to provide light and heat or to work machines. Simply put, the ability to do work. The types of energy we will be examining today will be oil, wind, and natural gas.

Wind:

Wind power is an alternative energy source that can be used without producing by-products that are harmful to nature. Harnessing the wind is highly dependent upon weather and location.

The fins of a windmill rotate in a vertical plane, which is kept perpendicular to the wind by means of a tail fin. As wind flow crosses the blades of the windmill, it is forced to rotate and can be used to generate electricity.

Two hollow half-drum-type wind collectors can also be used to generate wind power. This wind collector rotates in a single vertical axis, making this device independent of the wind direction, allowing it to generate more electricity.

The movement of the atmosphere is driven by differences of temperature at the Earth's surface. These varying temperatures of the Earth's surface are due to sunlight. Wind energy can be used to pump water or generate electricity, but requires extensive areal coverage to produce significant amounts of energy.

© howitwasinvented.org

Types of Energy

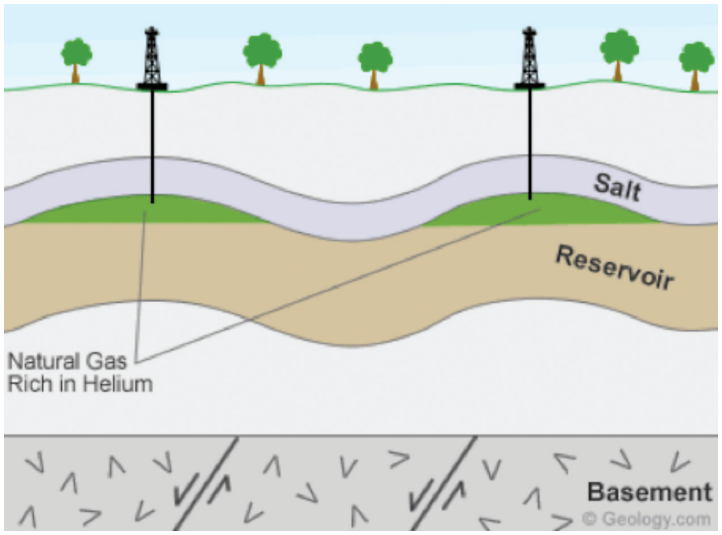
Oil:

Oil was formed from the remains of animals and plants that lived millions of years ago in a marine (water) environment before the dinosaurs. Over the years, the remains were covered by layers of mud. Heat and pressure from these layers helped the remains turn into what we today call crude oil. The word "petroleum" means "rock oil" or "oil from the earth."

Natural Gas:

Natural gas is one of the cleanest, safest, and most useful forms of energy in our day-to-day lives. Natural gas can be found by itself or in association with oil. It is both colourless and odourless and is in fact a mixture of hydrocarbons. While mainly methane, the other hydrocarbons include ethane, propane, and butane. Water, oil, sulphur, carbon dioxide, nitrogen, and other impurities may be mixed with the gas when it comes out of the ground. These impurities are removed before the natural gas is delivered to our homes and businesses.

Once removed from an underground reservoir, the natural gas is usually transferred to a gas processing plant to remove impurities and by-products. Some of these by-products, including ethane, propane, butane, and sulphur, are extracted for other uses. After being processed, the clean natural gas (almost pure methane) is transported through a network of pipelines and delivered to its point of use, including our homes.



© geology.com

Marathon Oil

Activity:

1) The power, P, generated in one hour by the windmill on the Brown's farm is proportional to the cube of the wind speed, V, where the constant is 0.015, as shown by the formula: $P = 0.015\ V^3$. Where P is measured in watts and V is measured in miles per hour. Byron says that if the wind blew at 4 mph for one hour and then 12 mph for another hour, the amount of power generated by the windmill would be the same as the amount generated by an 8 mph wind in two hours. Leslie disagrees. Use mathematics to show who is correct.

How Energy is Obtained

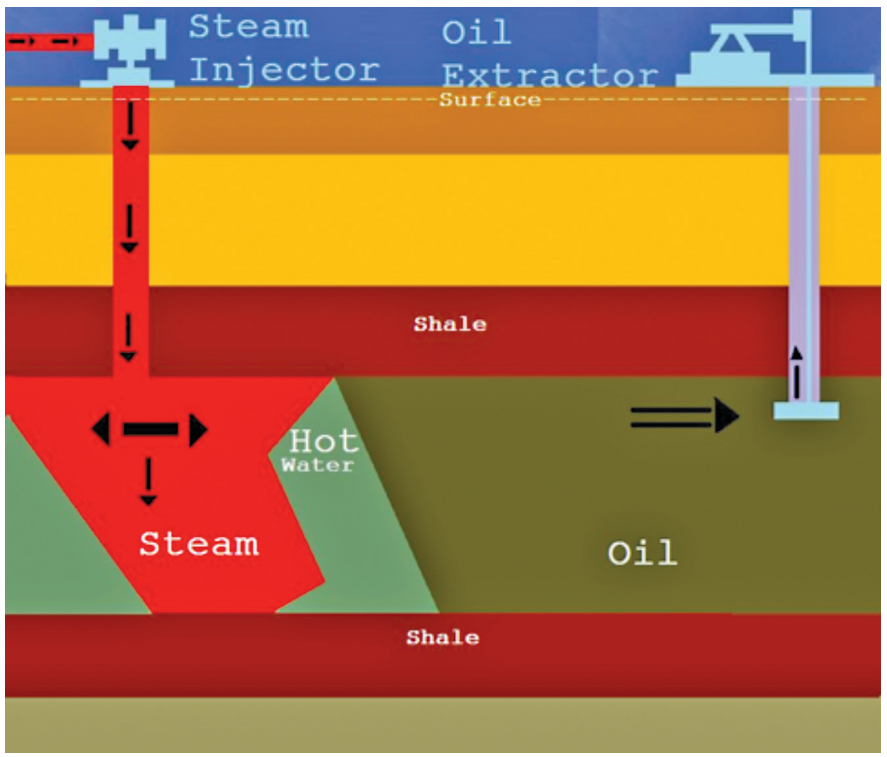
Essential Questions:

How do we get usable energy?

Oil:

Crude oil is a smelly, yellow-to-black liquid and is usually found in underground areas called reservoirs. Scientists and engineers explore a chosen area by studying rock samples from the earth. Measurements are taken, and, if the site seems promising, drilling begins. Above the hole, a structure called a 'derrick' is built to house the tools and pipes going into the well. When finished, the drilled well will bring a steady flow of oil to the surface.

In its natural state, oil does not have many uses. That is why we have to refine it. Refining oil means boiling it. As the temperature rises, different compounds in the oil begin to boil. When a compound begins to boil, we take it out. For instance, just before the oil reaches 104 degrees Fahrenheit, petroleum gas from the oil starts boiling, so we take it out. Then, before the oil reaches 752 degrees Fahrenheit, the compound gasoline begins to boil, so we take that out. The temperature keeps rising and the compounds are taken out as soon as they boil. This process of refining is called fractional distillation. In addition to making products, refining oil also creates waste. Refineries must treat the wastes involved in the process of making oil products in order to minimize air and water pollution.



© petroleum.co.uk

Marathon Oil

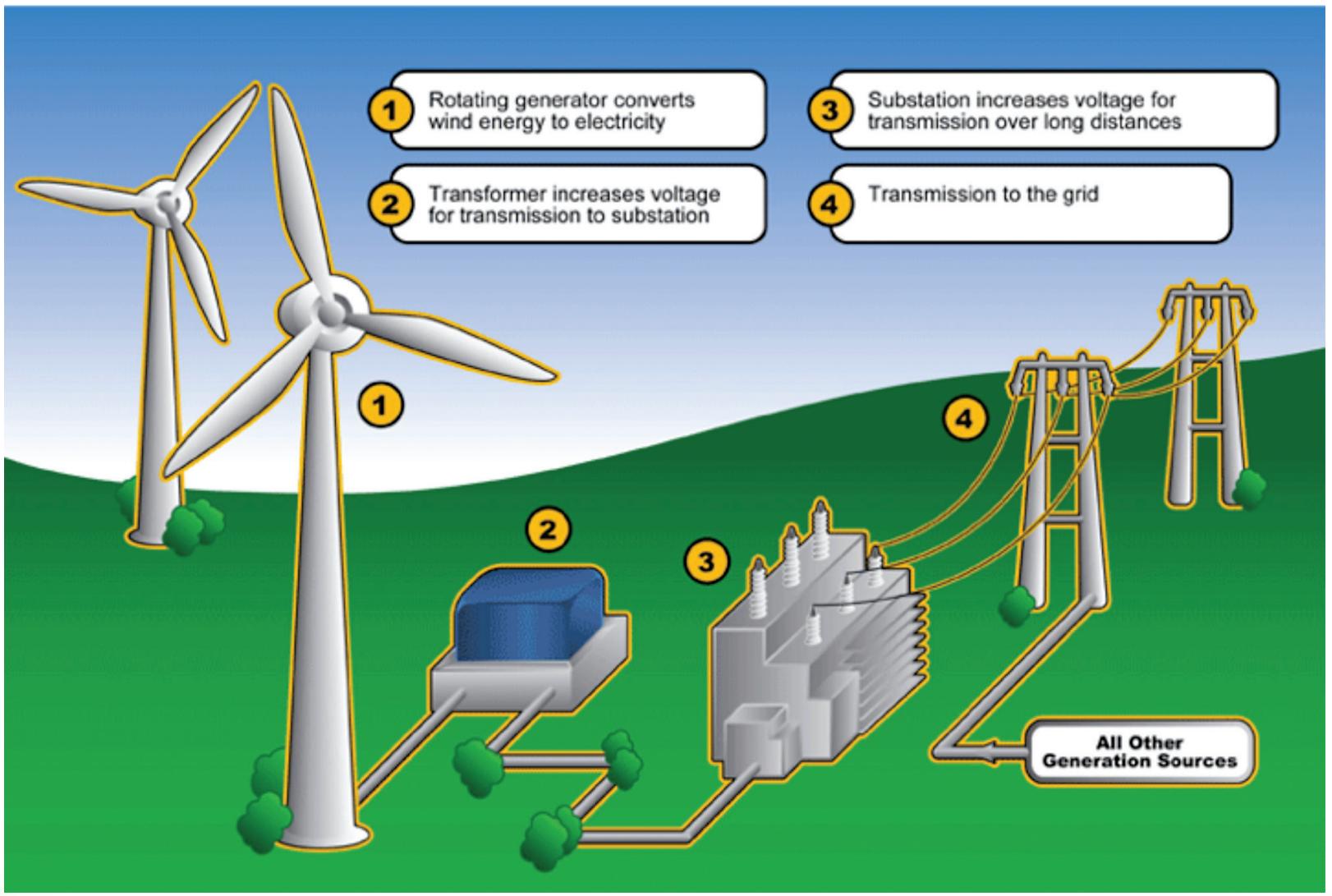
How Energy is Obtained

Wind:

The term “wind energy” or “wind power,” describes the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity to power homes, businesses, and schools.

Wind causes the blades of the turbine to spin due to kinetic energy, or the energy of movement. Spinning blades cause an axle and magnets to rotate inside a coil of conducting wire. Electricity is generated in the wire when the magnets spin around inside the coil.

Wind turbines are often grouped together into a single wind power plant, also known as a wind farm, and generate bulk electrical power. Electricity from these turbines is fed into a utility grid and distributed to customers, just as with conventional power plants.



© windeis.anl.gov

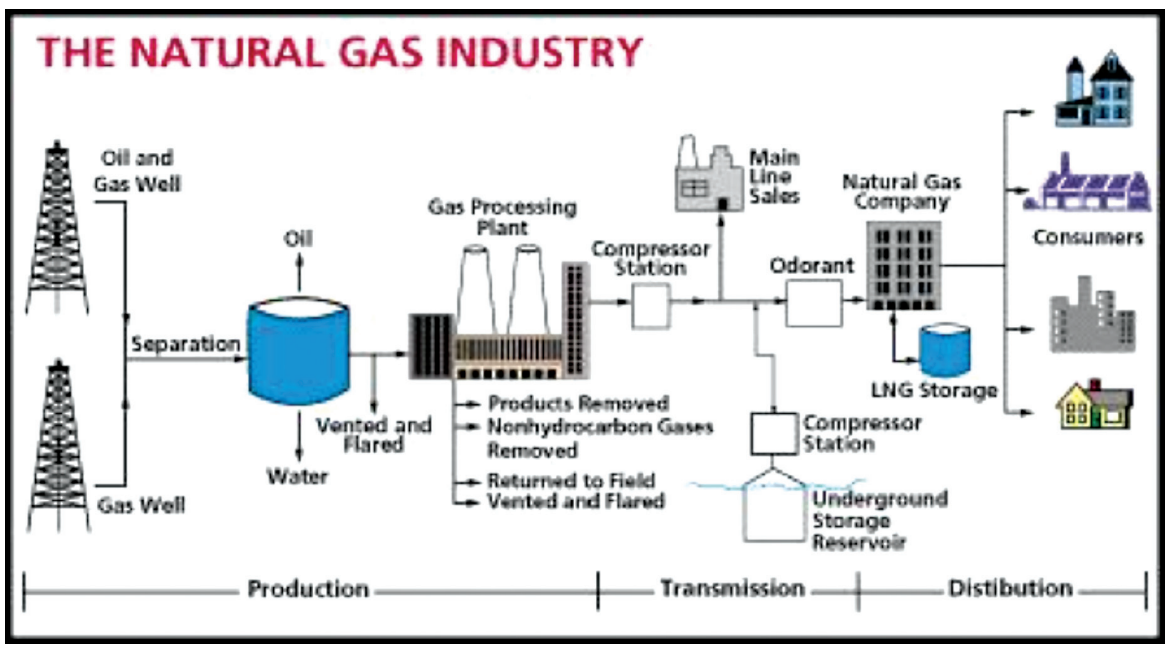
How Energy is Obtained

Natural Gas:

The transportation of natural gas from a gas well to our homes and businesses requires an extensive network of interconnected pipelines, designed to move natural gas quickly and effectively, sometimes over great distances. The pipeline system moves the natural gas from the point of origin to areas of high consumer demand.

There are essentially three main types of transportation pipelines: gathering pipelines, transmission pipelines, and distribution pipelines. Gathering pipelines transport raw natural gas directly from the wellhead to the gas processing plant. From the gas processing plant, the highly pressurized natural gas is gathered into increasingly larger pipelines, almost always underground, until it reaches the large transmission pipelines where it is often transported over large distances. From the transmission pipelines, the gas flows into a low-pressure distribution system. As a safety precaution, utility companies add an odorant to the gas (so we can smell it in the unlikely event of a leak) and then send it to us through a network of smaller pipelines.

To complete its long journey, the natural gas must go through a device called a regulator to decrease the pressure even further so it is safe to enter our homes. The gas travels through our meters to measure the amount of gas we consume. Now that it has finished its incredible journey of being extracted, gathered, processed, transported and distributed, the natural gas is finally ready to be put to good use.



© naturalgas.org

Activity

1) **Make a list of items that use energy in your lives.**

_____

_____

_____

_____

_____

_____

_____

_____

2) **A diesel engine oil pan can hold 7 gallons of oil. How man liters of oil can the pan hold? (one gallon = 3.785 liters).**

3) **The Keystone Pipeline XL has been in the news a lot lately. Do some research and make a list of pros and cons of the Keystone Pipeline XL.**

Pros	Cons

Energy in Oklahoma

Essential Questions:

What role does Oklahoma play in our country's energy?

Oklahoma ranked fifth in crude oil production in the nation in 2013.

Cushing is a major storage terminal with about one-fifth of the nation's crude storage capacity. On average about 30 million barrels of crude oil are stored at Cushing.

Oklahoma has five refineries with a capacity of over 500,000 barrels per day.

Oklahoma ranked No. 4 for total wind-energy generated in 2013 — 10.8 million megawatt hours.

About one-third of Oklahoma's natural gas production is consumed within the state.

Oklahoma is one of the top natural gas-producing states in the nation, accounting for 7.1% of U.S. gross production and 8.4% of marketed production in 2013.

In 2013, 14.8 percent of the electricity generated in Oklahoma came from wind-power.

Three of the 100 largest oil fields in the United States are within the state, one in south central Oklahoma, one in the Panhandle, and the third in the northeast.

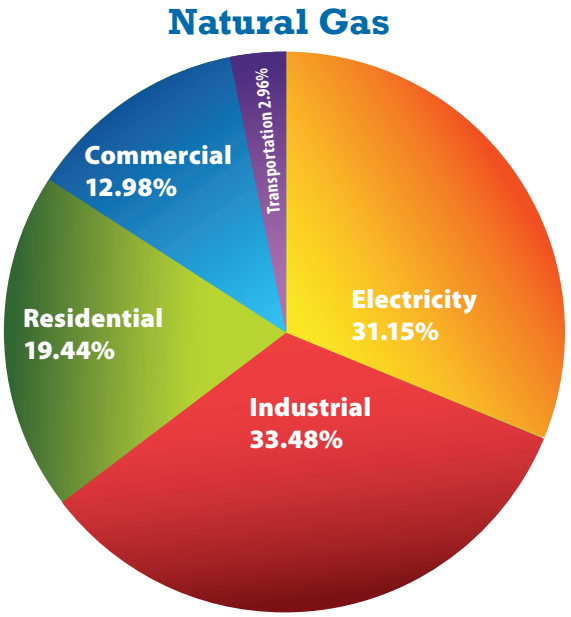
In 2013, Oklahoma ranked fourth in net electricity generation from wind, which provided almost 15% of the state's net generation.

How Energy is Used

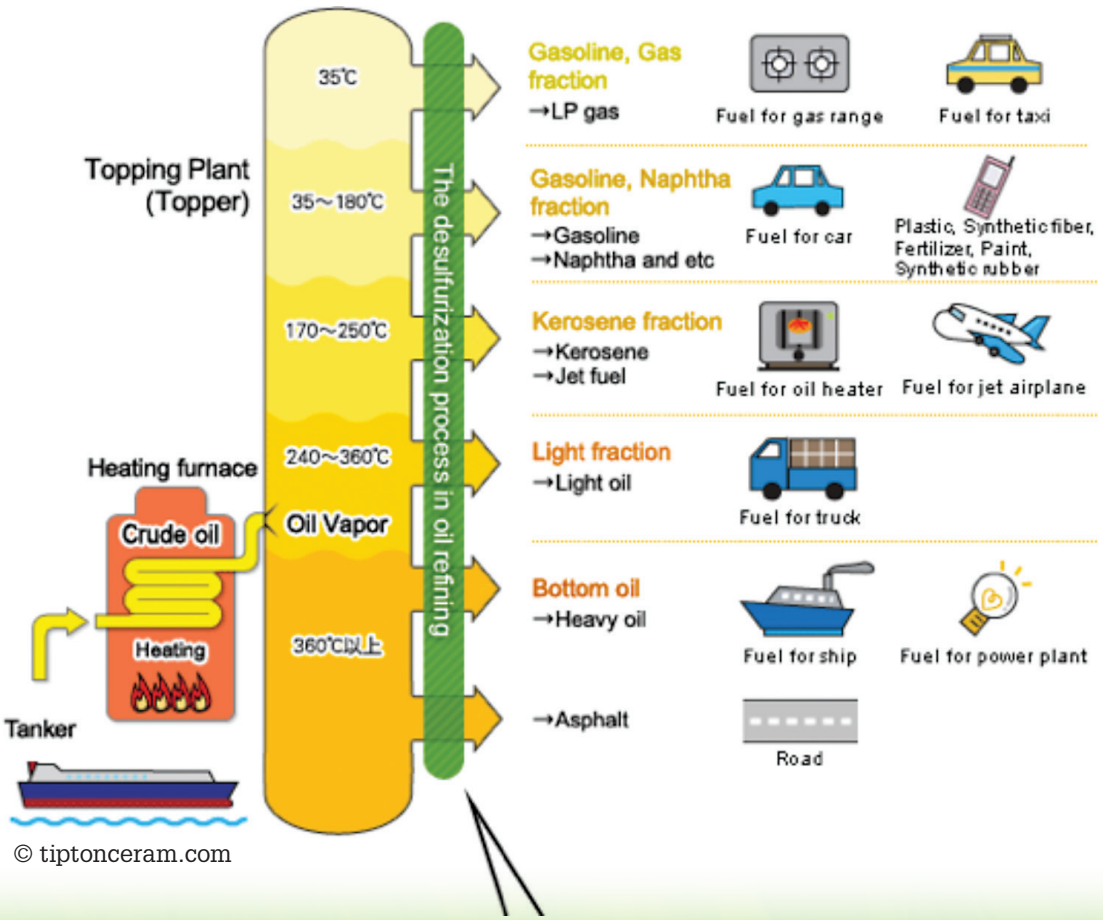
Essential Questions:

How do Oklahoma citizens use energy?

Natural gas has numerous uses in the petroleum refining, metal, chemical, plastic, food processing, glass and paper industries. The ingredients for plastic, anti-freeze, fertilizer, and fabric products are formed through the use of natural gas by-products. The fact that natural gas is one of the cleanest, cheapest, and most efficient sources of energy makes it easy to see why it is so commonly used.



(Data: Energy Information Administration)



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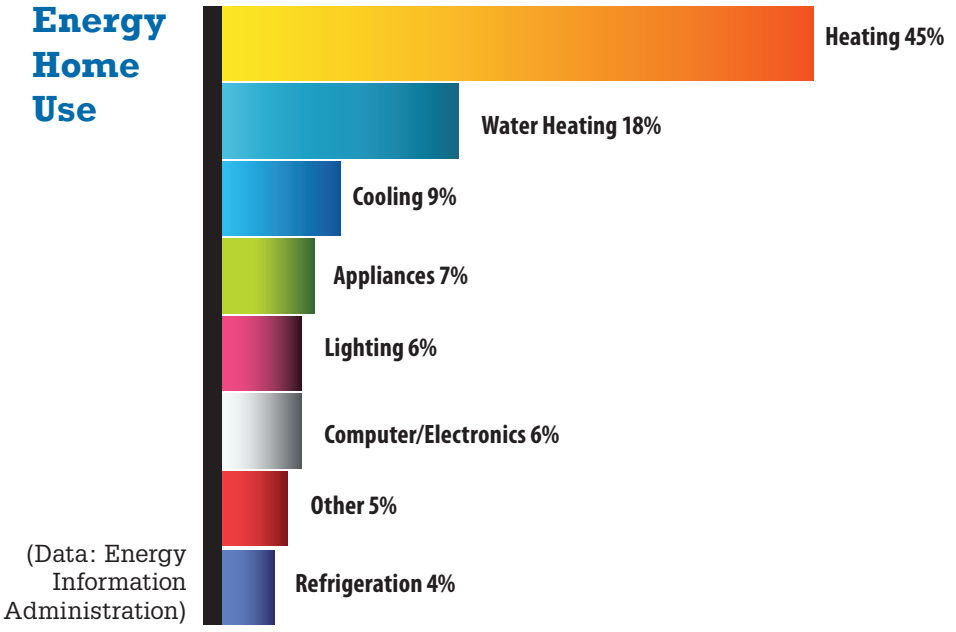
How Energy is Used



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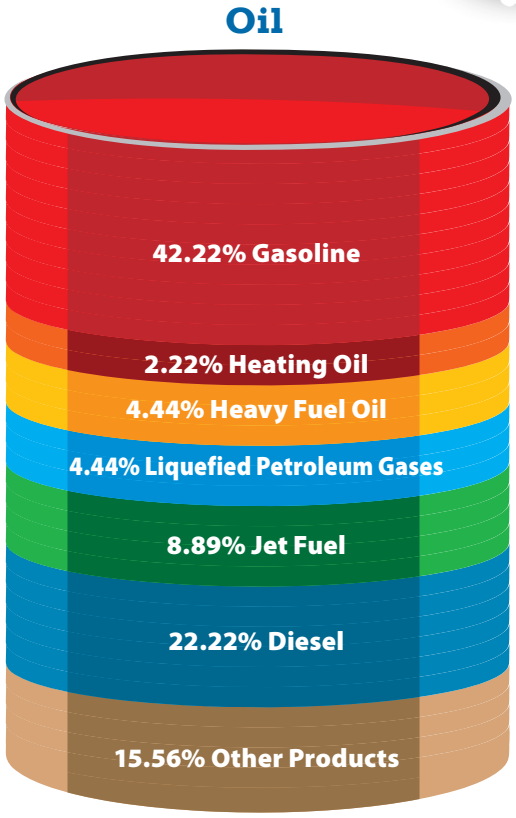
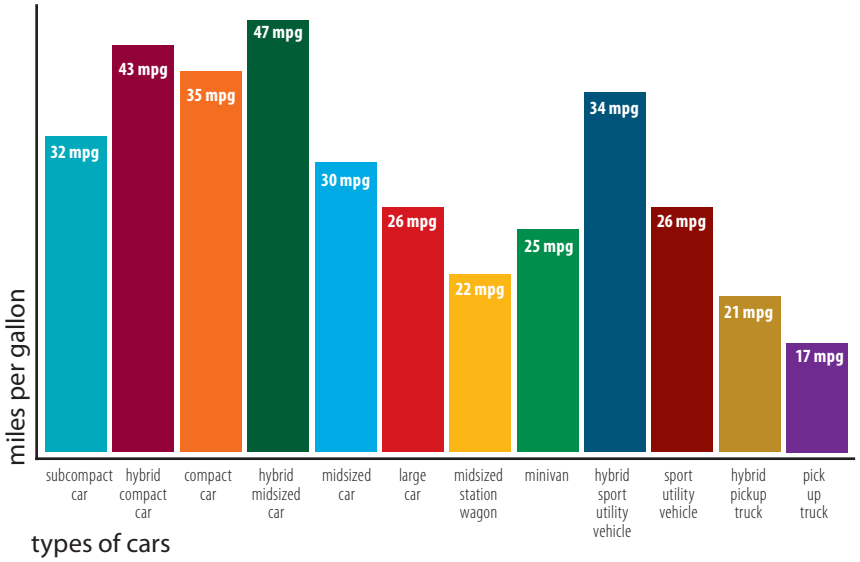


(Data: Energy Information Administration)

Activity:

1) Can you name at least five things that are made using oil?
2) Monitor your own use of energy, track it and make your own diagram.



1. What type of car gets the most miles per gallon?
2. What type of car gets the fewest miles per gallon?
3. How many miles can a compact car travel on two gallons of gasoline?
4. How many miles can a large car travel on three gallons of gasoline?
5. If a midsize car travels 60 miles, how many gallons of gas will it use?
6. If the gas tank of a minivan can hold 20 gallons of gas, how far can it travel on a full tank of gasoline?

History of Energy

Essential Questions:

How did we get to where we are today?

1859	Oil was first discovered when a homemade rig drilled down 70 feet and came up coated with oil. ***Where was it located and who made the rig?***
1890s	Mass production of automobiles began creating a high demand for gasoline. ***What was used before gasoline?***
1920	With 9 million automobiles in the United States, gas stations began opening everywhere.
1960	The Organization of Petroleum Exporting Countries (OPEC) was formed by Iran, Iraq, Kuwait, Saudi Arabia, and Venezuela. The group has since grown to include 11 member countries. ***What are the 11 countries in OPEC currently?***
1975	Congress passed the Energy Policy and Conservation Act of 1975 aimed at increasing oil production by giving price incentives. ***What was the intention of this act and what did it accomplish?***
1978–80	The Iranian Revolution, which began in late 1978, resulted in a drop of 3.9 million barrels per day of crude oil production from Iran from 1978 to 1981. At first, other OPEC countries made up for the drop in Iranian production. In 1980, the Iran-Iraq War began, and many Persian Gulf countries reduced output as well. ***What did this do to the gas prices?***
1986	In 1986, Saudi Arabia stopped holding back production, and other OPEC members increased production. ***What was the result for gas prices?***
1990–91	Iraq invaded Kuwait on August 2, 1990, causing crude oil and product prices to rise suddenly and sharply. Prices rose even higher when the United Nations (UN) limited the amount of oil that could be purchased from these countries. As UN troops began seeing military successes in Iraq, concerns about long-term supply problems were eased and oil prices dropped again. ***How much was the price of oil at the height of the price increase?***
1997–98	The Asian financial crisis that occurred in 1997 had worldwide economic effects. Their demand for petroleum products declined. In addition OPEC was reluctant to cut its production quotas. ***As a result, what happened in 1998?***

History of Energy

2001	U.S. petroleum consumption reached 19.7 million barrels per day, an all-time high. For every 10 barrels of petroleum consumed in the United States, more than 4 barrels were consumed in the form of motor gasoline. To meet demand, crude oil and petroleum products were imported at the rate of 11.9 million barrels per day. Net imports of crude oil and petroleum products more than doubled between 1985 and 2001. ***Who were the five leading suppliers to the United States at this time?***
2005	Gasoline prices broke $3.00 per gallon for the first time. ***Two things occurred in the United States in 2005 for gas prices to rise, what were they?***
2008	Crude oil price hit an all time high and gasoline prices broke $4.00 per gallon. ***How much was crude oil per barrel in 2008?***
2010	The European economy saw a sharp decline, caused a decline in crude oil demand. Average gas prices for consumers was $2.91.
2011	Political turmoil in Africa and the Middle East caused the price per barrel to jump to $103. ***What was the average gas price for consumers at this time?***
2012	Prices remained fairly stable until August 7th when prices experience a sharp increase. ***What happened in California to cause prices to increase?***
2013	With economic problems worldwide leading to low demand, gas prices fell 3 percent in April. On July 10, oil prices were the highest in more than a year as a result of lower supplies and trouble in Egypt. On December 27, due to a better economy in the United States leading to higher demand, oil closed at about $100 per barrel.
2014	The average price peaked on April 28, at $3.70 a gallon, and has slid 39% to the year's low of $2.26 a gallon, also the lowest price since May 12, 2009. The year's average was $3.34 a gallon. ***How do falling gas prices hurt Oklahoma?***

Data: US Energy Information Administration

Community Impact

Throughout the state of Oklahoma, there are 126 companies that are labeled as "oil and gas" companies. They range from towns as small as Beaver all the way to Oklahoma City. All of these companies help the state and the residents.

The most important impacts by the energy industry are:

- Economic Growth
- Jobs
- Community Development

How do the companies achieve this?

During the 2008 recession, the energy sector's jobs grew by 40%. This helps the economy as a whole. Because of this, Oklahoma's economy was not nearly as affected as the rest of the nations. According to the White House Council of Economic Advisors, "Every barrel of oil or cubic foot of gas that we produce at home instead of importing means more jobs, faster growth, and a lower trade deficit." Oil and gas have been some of the best growth drivers for the economy. The industry is helping the U.S. become more economically independent by creating long term jobs. Natural gas is being produced so effectively in the U.S. that we are now have a competitive global advantage both for domestic industries and exports. In fact, exports of petroleum have risen three fold since 2006. America's oil and gas industry has added $300-$400 Billion annually to the economy, without these monies, the nation would still be in a recession.

As a result of Oklahoma's abundant energy resources, both small and midsized businesses have been created in recent years; the average firm employs about 15 people. Growth in Oklahoma's energy sector was not a result of government aide or outside help, it occurred because companies began smart drilling. The industry was able to drill more effectively while being environmentally safe and surpassing the demand of the American people.

By keeping Oklahoma companies local, we are ensuring that the economic benefits are received by Oklahomans. It is important to remember that "for every direct job produced by the energy sector, there are, on average, three jobs created in industries such as housing, retail, education, health care, food services, manufacturing, and construction."

Education

Many Oklahoma Universities and CareerTech campuses have degrees and certificates focused on the many careers available in the energy industry.

The OERB, in collaboration with Francis Tuttle Technology Center and Tulsa Technology Center, has developed the PetroTech Certification Program.

What is the PetroTech Program?

PetroTech is a focused technical training program for individuals interested in acquiring the knowledge and certification necessary to pursue a career in Oklahoma's oil and natural gas industry. This certification can assist individuals in obtaining a position as a Geological, Engineering or Land Technician.

The PetroTech program is also a valuable training for individuals currently employed in the oil and natural gas industry who are looking to hone their skills, build their resume and/or seek promotions within their company.

Students will learn valuable applications in these core modules:

- Well & Production Data Management
- Land & Lease Records
- Mud Logging & Electric Logging
- Oil and Natural Gas Economics
- Geological Mapping

Program Features

- Courses are taught by instructors with significant industry experience
- 11 modules are required for a PetroTech certification
- Evening classes from 6-9pm are perfect for working professionals
- Classes vary in length from four to six weeks
- Students can complete the PetroTech program in as little as 10-12 months
- Course schedules and registration are conveniently available through OERB.com

Fees

- Each course ranges in cost from $45-$300 per module
- The complete certification average cost is $2,000-$2,500
- Scholarships are currently available on a limited basis

Requirements & Application

- Potential applicants who are not currently in the oil and natural gas industry must submit an official high school diploma, GED equivalent or college transcript
- Once accepted, students will be contacted by their participating campus and will be required to take and pass an online Windows Fundamentals test
- The PetroTech application can be found on oerb.com/careers

Petroleum Programs at Oklahoma Universities

The following is a list of some of the programs at four different Oklahoma Universities

University of Oklahoma

- College of Business, Department of Energy Management
- College of Earth and Energy
- School of Petroleum and Geological Engineering
- School of Geology and Geophysics

Oklahoma State University

- School of Geology

University of Tulsa

- Department of Geosciences
- Department of Petroleum Engineering
- College of Business Administration, Energy Management Program

Oklahoma City University

- Petroleum Land Management
- Master of Science in Energy Management
- Master of Science in Energy Legal Studies

Your Scholarship Awaits

Each year, up to $500,000 is awarded to students majoring in petroleum-related fields at the University of Oklahoma, the University of Tulsa and Oklahoma State University. Applications available November 2015. Visit oerb.com/scholarships or call 1-800-664-1301, ext. 216 for more information.

PETROLEUM SCHOLAR

Careers in Energy

Essential Questions:

What type of careers are available and how?

Oil/Natural Gas:

According to the Oklahoma Department of Commerce's experts on the economy, the oil and gas and oil rig jobs rank sixth on the list of the most sought after jobs in Oklahoma. If you are inspired, driven, and are looking to earn good money quickly, it may make sense to think about pursuing a career in Oklahoma's oil drilling industry. Careers on oilrigs show stability, never disappearing from the top list of the best jobs that can be found in Oklahoma. Even if you have never worked on an oil rig before and do not have education or training there are still many jobs available.

Wind:

The wind energy industry is growing and is in need of skilled and well-educated personnel. Opportunities range from engineering to meteorology, to wind turbine technicians to business development and much more. Oklahoma's universities, community colleges and Career Tech schools have numerous programs to choose from to get you started on this path.

Question: What drew you to the energy industry?

"I was drawn to the energy industry by the amount of opportunity it has to offer. The industry is unique in that energy companies around the world are all working towards a common goal and that is to provide safe, clean, reliable energy. This allows workers, like myself, the ability to not only work around the world, but also the chance to meet and network with people from many different, diverse regions."

-Evans Hadden, Reservoir Engineer, Marathon Oil

Question: What is the best part of working in energy?

"Being a part of a rapidly growing and developing shale play that is challenging and innovative, creating a wealth of experience."

-Brad Smith, Maintenance Lead, Marathon Oil

What is the best part of working in energy?

"The best part about working in the energy industry is knowing that what we do today is going to have a positive impact on future generations."

-Leon Joyce, Business Development Manager, Energy & Environmental Services, Inc

Careers in Energy

The energy sector in Oklahoma is thriving and will continue to thrive into the future. There are many critical occupations in the energy industry that require a wide range of education levels from short term on-the-job-training to a Bachelor's degree. Average earnings for a skilled worker in the energy industry in Oklahoma are $105,750. Below you will find a list of many of the critical occupations for the energy ecosystem.

Description	Median Hourly Earnings	Education Level
Petroleum Engineers	$83.70	Associate's Degree
Roustabouts, Oil and Gas	$16.84	Moderate-term on-the-job-training
Rotary Drill Operators, Oil and Gas	$22.74	Moderate-term on-the-job-training
Derrick Operators, Oil and Gas	$17.24	Short-term on-the-job-training
Inspectors, Testers, Sorters, Samplers, and Weighers	$11.94	Moderate-term on-the-job-training work experience
General Operations Managers	$38.20	Bachelor's or higher degree, plus
Wellhead Pumpers	$22.70	Moderate-term on-the-job-training
Geoscientists, Except Hydrologists and Geographers	$79.60	Bachelor's degree
Pump Operators, Except Wellhead Pumpers	$23.71	Moderate-term on-the-job-training
Geological and Petroleum Technicians	$32.00	Associate's Degree
Heave and Tractor-Trailer Truck Drivers	$17.24	Short-term on-the-job-training
Welders, Cutters, Solderers, and Brazers	$18.53	Postsecondary non-degree award
Maintenance and Repair Workers, General	$14.97	Moderate-term on-the-job-training
Electricians	$19.45	Long-term on-the-job-training
Plumbers, Pipefitters, and Steamfitters	$19.22	Long-term on-the-job-training
Team Assemblers	$14.47	Moderate-term on-the-job-training
Service Unit Operators, Oil, Gas, and Mining	$18.98	Moderate-term on-the-job-training
Petroleum Pump System Operators, Refinery Operators, and Gaugers	$25.52	Long-term on-the-job-training
Industrial Machinery Mechanics	$23.31	Long-term on-the-job-training
Machinists	$17.49	Long-term on-the-job-training
Architectural and Engineering Managers	$52.61	Bachelor's degree
Mechanical Engineers	$35.92	Bachelor's degree

Data: Oklahoma Department of Commerce

Site Clean Up

Essential Questions:

What is the process for cleaning oil sites?

A well is abandoned when it reaches the end of its useful life or is a dry hole.

The process to clear them is as follows: the casing and other equipment is removed and salvaged, cement plugs are placed in the borehole to prevent migration of fluids between the different formations, and the surface is reclaimed.

Removing the equipment is the easy part. Filling the hole with cement is incredibly important because this prevents the migration of fluids between the different formations. This also prevents the migration of gas or fluids to the surface. Reclaiming the surface helps to restore the land back to a usable state.

Why is it important to clean oil sites? Inadvertent environmental impacts associated with petroleum production can be the result of dirty oil sites. For example, natural saline-water removed from the subsurface when petroleum is extracted is sometimes spilled on the ground. The local effects of the spills include destruction of soil textures and deep erosion, stress or death of vegetation, and salinization of surface water and ground water. Additional effects of petroleum production at the sites include the saturation of soils with crude oil, weathering and dispersal of crude oil components.

OERB

The Oklahoma Energy Resources Board's (OERB) purpose is to conduct environmental restoration of orphaned and abandoned well sites and to educate Oklahomans about energy. The OERB is funded through a voluntary one-tenth of one percent assessment on the sale of oil and natural gas in Oklahoma, paid for by oil and natural gas producers and royalty owners.

The OERB voluntarily restores abandoned well sites - at absolutely no cost to landowners. Since 1994, the OERB has dedicated $90 million to restoring more than 14,000 orphaned and abandoned well sites across the state. There are two to three sites restored daily.

The OERB student education programs start with kindergarten and continute on to the collegiate level. By providing curricula, free training, materials, educational trips and in-class presentations, the OERB helps Oklahoma teachers reach students through entertaining activities and experiments. To date, more than 12,700 teachers have been trained in one of the OERB's eight energy education curricula. Teachers receive free supplies, free training and free field trips. Additionally, teachers are able to order free activity books, safety folders, and classroom DVDs to enhance their energy education training on OERBHomeRoom.com. This website is the OERB's newest teacher resource and hosts the curriculum, video labs, virtual field trips, industry information and much more.

Petro Pros brings oil and natural gas professionals into classrooms to show students the science and business side of the industry. The OERB also has a well site safety program to educate students about dangers of playing around oilfield equipment.

The OERB Petroleum Scholar Program offers up to $500,000 each year in scholarships to Oklahoma college students majoring in petroleum-related fields at OU, OSU, TU and OCU. The PetroTech Program is a certification program offered at Francis Tuttle and Tulsa Tech for Oklahomans interested in Geo Tech, Land Tech and Engineering Tech positions within the oil and natural gas industry.

More information about OERB's environmental and education efforts can be found on OERB.com.

Well Site Safety & Fracking

Fracking

Hydraulic Fracturing, commonly called fracking, involves injecting pressurized water combined with sand and small amounts of chemicals to crack open shale rocks so that they will release trapped natural gas. The shale rocks that companies are trying to reach are generally thousands of feet below the earth's surface.

Many people are trying to blame the recent earthquakes on fracking. However, the U.S. Geological Survey says, "Oklahoma's earthquakes are from wastewater disposal into injection wells, not fracking itself." This means that oil companies have been blamed for something that is completely out of their hands. To put it simply, William Leith, seismologist with the U.S. Geological Survey tells us, "Fracking itself does not put enough energy into the ground to trigger an earthquake. They're not a safety hazard."

Because of the movie Gasland, many people are under the impression that fracking poisons the water. This movie doesn't address the science or alternative causes for their methane water. A scientific paper from the Department of Earth Sciences in March 2015 debunked the movie's claims, stating, "There is no statistical significance between dissolved methane concentrations in groundwater from domestic water wells and proximity to pre-existing oil or gas wells." In addition, the Colorado Department of Natural Resources discovered that "there are no indications of any oil and gas related impacts to your water." They concluded that residents that could "light their water on fire" had water supplies derived from natural sources, the water source penetrated several coal beds that had released methane into the well.

Fracking itself is not dangerous. With the correct regulations, oil companies, like the ones in Oklahoma, are completely able to frack without instance. All of the reported "bad incidents" are due to neglect and cutting corners. Overall, fracking is good for the economy, as it has created over $140,000 per state that uses fracking. Fracking will also make the U.S. more energy secure. Dependence on foreign oil is something we need to move away from.

Safety

Between 2003 and 2010 there were 823 deaths reported in the oil field. Working in the oil field requires important and difficult training. As a result, Oklahoma energy companies have very strict safety standards for their employees.

Here are just a few training courses an oil field worker might experience:

- Motor Vehicle Safety
- Work Zone Traffic Safety
- Work-Related Roadway Crashes
- Crane, Derrick, and Hoist Safety
- Stability of Well Servicing
- Handling Materials
- Powered Industrial Trucks
- Crawler Locomotive and Truck Cranes
- Machinery and Machine Guarding
- Mechanical Power-Transmission Apparatus

By completing these training exercises and following through with the safety requirements, employees are able to stay safe.

Oil field equipment can be extremely dangerous and those who work in the industry go through a lot of training to make sure they are safe while at work. Playing on an oil field might look like fun, but it could leave you with serious injuries, or even the loss of your life.

Safety Facts:

Storage Tanks:

- The smallest spark by a storage tank – especially a cigarette or lighter – can cause an explosion from fumes or flammable liquids.
- Anyone opening a hatch of a storage tank may be overcome with fumes and pass out.
- The stairs and rails on storage tanks, which can be as high as two stories, can be covered with oil and be very slippery, causing someone to fall down the stairways or over the side.

Pumping Units:

- The counterweights on pumping units weigh up to 20,000 pounds, and will crush a human body without stopping. Anyone falling off the beam or trying to ride the weights can be seriously injured or accidentally killed.
- Anyone trying to grab the cable or the front of the pumping unit can have their hands cut off as the cable travels up and down.
- The numerous moving parts of a pumping unit can catch, injure, or even kill a person.
- Electrical boxes, wires and components operate at a high voltage around pumping units. Anyone touching them could receive serious electrical shock.

Other Equipment:

- Even if a pumping unit is stopped, it is not safe. Many units are on timers which can start without warning, causing harm if a person is on the unit.
- Some heater treaters (long, tall tanks) operate at extreme temperatures which could cause burns.
- Many fences around oil field sites are topped with barbed or razor wire, which could cause serious injury.
- Pipelines could leak or explode if tampered with by untrained personnel.
- Chemicals are sometimes used at oil field sites and could cause burns if touched.

How to Save Energy

Essential Questions:

What can I do to save energy?

Install a programmable thermostat to lower utility bills and manage your heating and cooling systems efficiently.

Lower the thermostat on your water heater to 120°F.

Air dry dishes instead of using your dishwasher's drying cycle.

Take short showers instead of baths and use low-flow showerheads for additional energy savings.

Plug home electronics, such as TVs and DVD players, into power strips; turn the power strips off when the equipment is not in use — TVs and DVDs in standby mode still use several watts of power.

Check to see that windows and doors are closed when heating or cooling your home.

Wash only full loads of dishes and clothes.

Air-dry clothes.

Turn things off when you are not in the room such as lights, TVs, entertainment systems, and your computer and monitor.

Drive sensibly; aggressive driving such as speeding, and rapid acceleration and braking, wastes fuel.

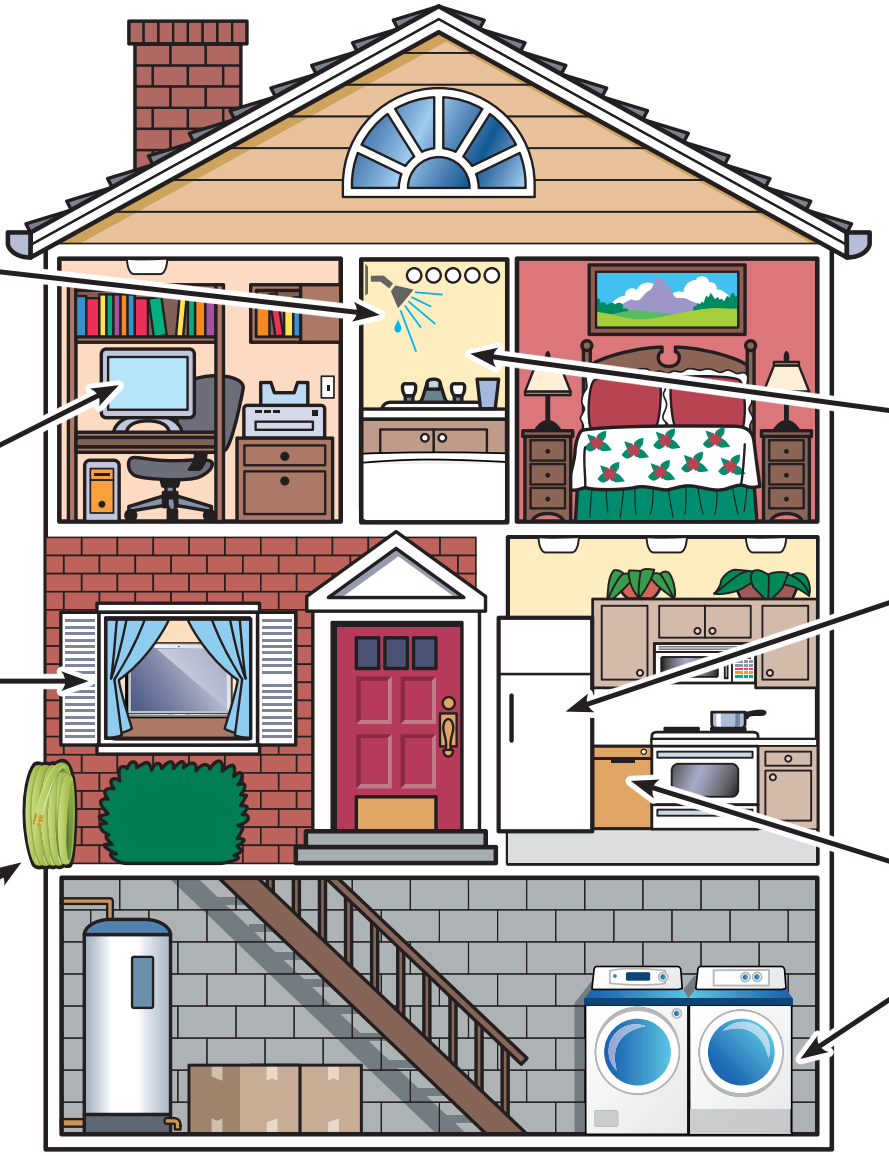
How to Save Energy

Shower: Use a "low-flow" pressure to save water, also take shorter showers (5 or less is best).

Electronic: Turn it off when you're not using it.

Windows/door: If the air/heat is on, close these tight! Don't let air out.

Water hose: Water your yard early or late in the day to prevent excessive evaporation.



Sink: Turn off sink while brushing your teeth or washing dishes to save water.

Refrigerator: be quick. Don't open it and look while wishing different food will magically appear.

Washer/drying/dishwasher: use only when you have a full load as to save water and electricity.

Activity

How could you save energy in your school? Do an audit of your school (how much energy is used daily?)

Research the options for increasing the energy efficiency. Look at school windows, lighting, and food service. Define the problem list options and include information about costs.

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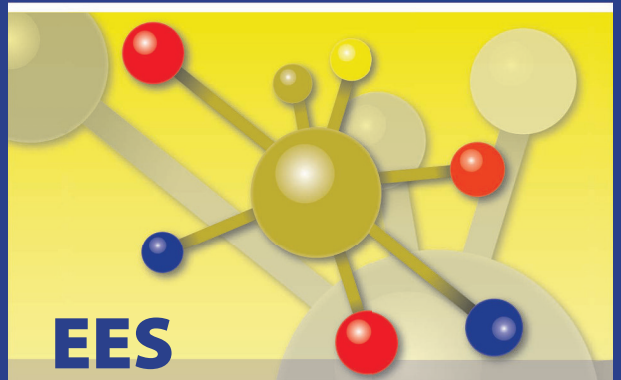

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