EARTH AND SPACE SCIENCE

Minnesota Standards		
Standard	**Benchmark**	**Code**
In order to maintain and improve their existence, humans interact with and influences Earth systems.	Identify renewable and nonrenewable energy and material resources that are found in Minnesota and describe how they are used. (For example: Water, iron ore, granite, sand and gravel, wind, and forests.)	**5.3.4.1.1**

Cross Curricular Standards		
Standard	**Benchmark**	**Code**

What do I need to know?

- **Ican identify renewable and nonrenewable resources that can be found in Minnesota and how they can be used.**
- **I can describe how renewable and nonrenewable resources in Minnesota are used.**
- **I can identify natural resources found in Minnesota.**
- **I can describe how natural resources found in Minnesota are used.**

HYPOTHETICALLY THINKING

What do you know about…

- ✓ **Renewable resources in Minnesota**
- ✓ **How renewable resources in Minnesota are used**
- ✓ **Nonrenewable resources in Minnesota**
- ✓ **How nonrenewable resources in Minnesota are used**
- ✓ **Natural resources in Minnesota**
- ✓ **How natural resources found in Minnesota are used**

What do you wonder…

- ✓ **What are renewable resources?**
- ✓ **What are nonrenewable resources?**
- ✓ **What renewable resources are found in Minnesota?**
- ✓ **What nonrenewable resources are found in Minnesota?**
- ✓ **What are some natural resources found in Minnesota?**
- ✓ **How are the natural resources found in Minnesota used?**

VOCABULARY INVESTIGATION

anthracite

bituminous

coal

energy

iron ore

taconite

granite

sand and gravel

wind energy

wind turbine

forests

solar energy

refinery

wind farms

biomass fuel

hydropower

energy

strip mining

oil

energy resource

geothermal

nonrenewable

renewable resource

refinery

fossil fuels

natural gas

lignite

gas

peat

water

Table of Contents

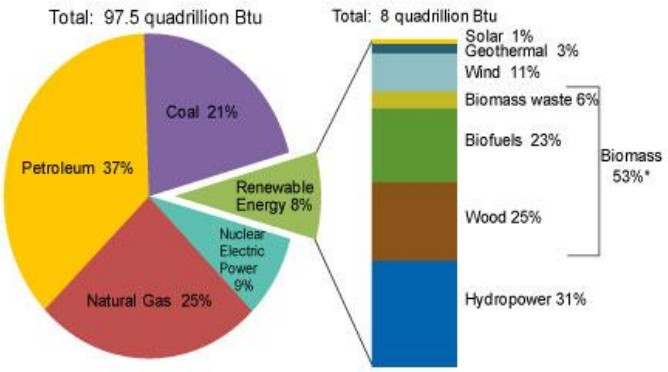
Vocabulary will be highlighted yellow

Introduction

Energy is the ability to do work. Energy is needed to power cars and factories, heat schools and homes, refine metals, and make many of the things we take for granted.

An **energy resource** is something we use to create energy. Wind, water, the sun, coal, petroleum, natural gas, ethanol, and geothermal steam are some of the Earth's energy resources. Energy sources are divided into two groups– **renewable energy** and **non-renewable energy**.

U.S. Energy Consumption by Energy Source, 2011



Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 10.1 (March 2012), preliminary 2011 data.

The chart shows what energy sources the United States used in 2011. Nonrenewable energy sources accounted for 91% of all energy used in the nation. Biomass, the largest renewable source, accounted for about half of all renewable energy, and 4% of the total energy consumption.

http://www.energyquest.ca.gov/story/chapter08.html

LINK to Hill City School

LINK to DNR

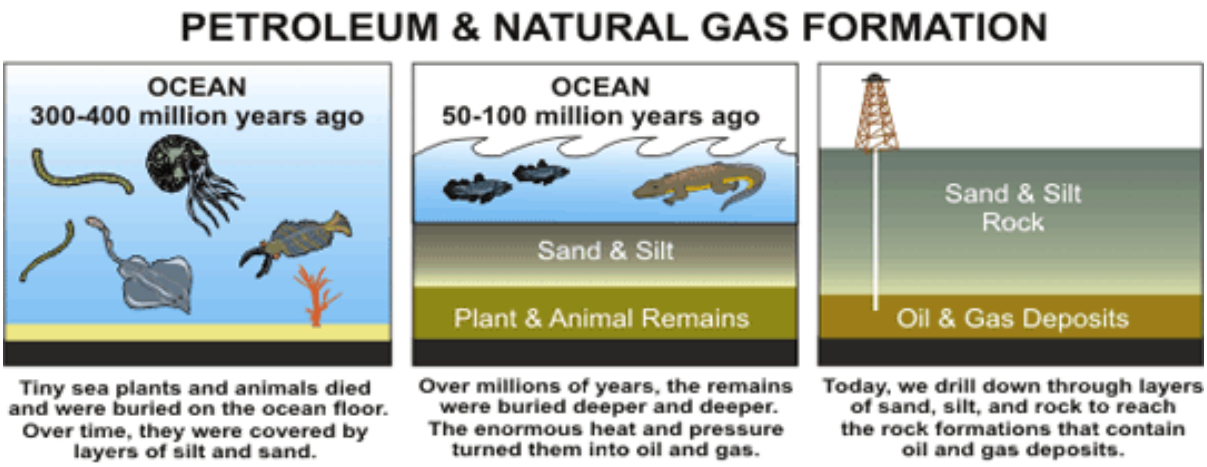
Nonrenewable Energy

Non-renewable energy resources are ones that will eventually run out and cannot be replaced. We get most of our energy from nonrenewable resources. Non-renewable resources include **fossil fuels**. They are called fossil fuels because they have been formed from the remains of prehistoric plants and animals. There are three major forms of fossil fuels**: coal, oil and natural gas.** All three were formed many hundreds of millions of years ago before the time of the dinosaurs.

Formation of fossil fuels

Fossil fuels were formed from the remains of animals and plants that lived millions of years ago in a marine (water) environment. Over millions of years, the remains of animals and plants were covered by layers of sand and silt. As the trees and plants died, they sank to the bottom of the swamps of oceans. They formed layers of a spongy material called **peat.** Over many hundreds of years, the peat was covered by sand and clay and other minerals, which turned into a type of rock called sedimentary.

More and more rock piled on top of more rock, and it weighed more and more. It began to press down on the peat. The peat was squeezed and squeezed until the water came out of it and it eventually, over millions of years, turned into **coal, oil or petroleum,** and **natural gas.**



Source: U.S. Energy Information Administration (Public Domain)

Oil or Petroleum

Crude oil is a smelly, yellow-to-black liquid and is usually found in underground areas called reservoirs. **Oil** and **petroleum** are used interchangeably.

Scientists and engineers explore a chosen area by studying rock samples from the earth. Measurements are taken, and, if

the site seems promising, the 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.

What fuels are made from crude oil?

After crude oil is removed from the ground, it is sent to a refinery by pipeline, ship, or barge. A **refinery** is a factory. Just as a paper mill turns lumber into paper, a refinery takes crude oil and turns it into gasoline and many other useful petroleum products, such as diesel, jet fuel, and gasoline.

Some other petroleum products are:

- ink
- crayons
- deodorant
- plastics
- CDs and DVDs
- tires
- ammonia
- heart valves

Although the total US crude oil production generally declined between 1985 and 2008, it has been increasing since 2008. More cost effective drilling technology has helped boost production, especially in North Dakota, Texas, and the offshore Gulf of Mexico. Later, you will be reading about how the sand found in Minnesota has helped with this new drilling process.

Watch a video of the formation of fossil fuels at http://www.youtube.com/watch?v=0PrSZMOCnWU

Natural Gas

Natural gas is another fossil fuel. Natural gas is usually found near petroleum underground. It is pumped from below ground and travels in pipelines to storage areas.

Natural gas plant liquids are liquids that are separated from natural gas at processing plants and are important ingredients for manufacturing plastics and gasoline. Propane is the only natural gas plant liquid that is widely used for heating and cooking. ?

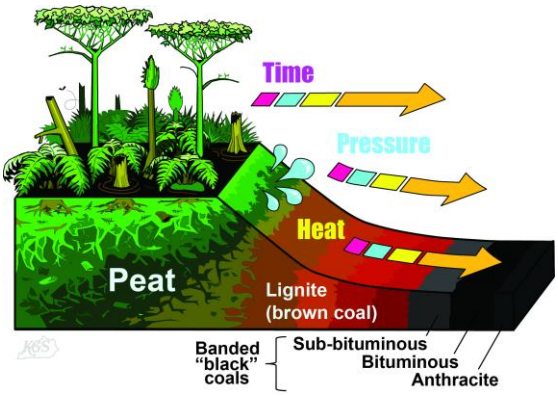
Natural gas is lighter than air. It is mostly made up of a gas called methane. This gas is highly flammable. Natural gas usually has no odor and you can't see it. Before it is sent to the pipelines and storage tanks, it is mixed with a chemical that gives a strong odor. The odor smells almost like rotten eggs. The odor makes it easy to smell if there is a leak.

Coal

Coals are classified into three main types: **lignite, bituminous,** and **anthracite.**

Lignite – is the lowest rank of coal, which means that it has the lowest heating value. Although lignite is more solid than peat, it crumbles when shipped long distances. Most lignite in the U.S. is in North and South Dakota, Montana, and Texas. Lignite is use to generate electricity. Other uses include generating synthetic natural gas and producing fertilizer products.

Bituminous – is intermediate in rank and sometimes called soft coal. It appears smooth when you first see it, but look closer and you'll find it has many layers. It is the most abundant kind of coal. It has a high heating value. More than 80% of the bituminous coal produced in the U.S. is burned to generate electricity. Bituminous coal byproducts can be changed into many different chemical forms, which we can make paint, nylon, aspirin and many other items.



Anthracite – is the highest rank of coal, which means that it has the highest heating value and highest carbon content. It is very hard, deep black, and looks almost metallic because it is brilliantly glossy. Anthracite burns longer, with more heat and with less dust and soot than other types of coal. The primary use for anthracite is for heating homes. Nearly all of the anthracite in the U. S. is in Pennsylvania, but there are some small beds in other states.

Peat Production in Minnesota

Peat is formed by partially decomposing plant material in wet environments. Peat is the beginning of the fossilization of the plants. Fossil fuels, such as coal, oil, and natural began as plant material too. Peat is used mainly in the gardening industry, but it is also used for compost, turkey litter, absorbing oil, and fuel. Next time you are in the gardening store, look for peat.

Minnesota has more than 6 million acres of peat land, which is more than any other state in the U.S. other than Alaska. This is over 28 percent of the peat land in the continental United States.

During the mid 1970's, the energy crisis prompted the state of Minnesota to closely examine the use of its peat resource as an energy alternative. In anticipation of the large-scale development of peat lands for energy purposes, the state created the Peat Program under the direction of the Minnesota Department of Natural Resources.

Some people think it will bring in lots of jobs and help boost the economy, while others are against it because poorly managed peat operations can cause water pollution, which will negatively impact the environment. Presently, there are ten operations in Minnesota under the Permit to Mine Peat Program.

Find out more about peat land and the mining of peat in Minnesota at
http://news.minnesota.publicradio.org/features/2004/01/14_robertsont_peat/

Drawbacks

Basically the main drawback of fossil fuels is pollution.

- Burning any fossil fuel produces carbon dioxide, which contributes to the "greenhouse effect", warming the Earth.

- Burning coal produces more carbon dioxide than burning oil or gas.
  It also produces sulphur dioxide, a gas that contributes to acid rain, which is rain that contains pollutants. We can reduce this before releasing the waste gases into the atmosphere.

Other nonrenewable resources in Minnesota

There are other nonrenewable resources that are not fossil fuels. There are many minerals mined in Minnesota. Find out which minerals and where they are mined in Minnesota by looking at

http://images.dnr.state.mn.us/education_safety/education/geology/digging/minmap.gif

Mining in Minnesota

Minnesota is the largest producer of **iron ore and taconite** in the United States. Even though nearly all of the high grade natural iron ore in Minnesota has already been mined, advances in technology have found a use for lower grade iron ore, called taconite. The taconite is crushed, processed into hard, marble-sized pellets, and shipped to steel mills. The taconite pellets are melted in blast furnaces and then blown with oxygen to make steel. Minnesota currently has seven operating taconite plants that make the pellets. About 44 million tons of taconite pellets were shipped from the state in 1996. **That's enough to fill over 500,000 railroad cars!** T**aconite Pellet Production for 2006:** 40,000,000 long tons

In the past, iron ore was mined on three iron ranges - the Cuyuna, Mesabi and Vermilion - and also in Fillmore County in southeastern Minnesota. Today, the number of active taconite mining operations in Minnesota is 6 mines – all of which are located on the Mesabi Iron Range.

only the Mesabi Range still has **iron ore/taconite** mining taking place.

Taconite is a low-grade iron ore. When the high-grade natural iron ore was plentiful, taconite was considered a waste rock and not used. But as the supply of high-grade natural ore decreased, industry began to view taconite as a resource. Dr. E.W. Davis of the University of Minnesota, along with other scientists and engineers, conducted years of laboratory tests and experiments to find a way to take the iron ore out of the taconite rock. After many years of hard work, a process was developed to create taconite pellets. Taconite saved Minnesota's iron ore mining industry.

The Hull Rust Mahoning Mine in Hibbing, Minnesota

- World's largest open pit iron ore mine
- First ore shipments in 1895 (still being mined today, 114 years later)
- Originally 30 separate mines
- Total area: 1,591 acres
- Total length: 3 1/2 miles
- Greatest width: 1 1/2 miles
- Greatest depth: 535 feet
- Total ore shipped: About 1 billion tons Total rock removed: About 2 billion tons (that's 4 trillion pounds!)

Let's look at how the taconite pellet process works.

1. Blasting
Taconite is a very hard rock. Using explosives, the taconite is blasted into small pieces.

2. Transportation
The taconite pieces are scooped up by electric shovels. Each shovel can hold up to 85 tons of rock! The shovels place the taconite into giant dump trucks. These trucks are as big as a house and hold up to 240 tons of taconite. The trucks take the taconite directly to the processing plant, if it is nearby, or to train cars if it is far away.

3. Crushing
At the processing plant, the taconite is crushed into very small pieces by rock crushing machines. The crushers keep crushing the rock until it is the size of a marble. The rock is mixed with water and ground in rotating mills until it is as fine as powder.

4. Separation
The iron ore is separated from the taconite using magnetism. The remaining rock is waste material and is dumped into tailings basins. The taconite powder with the iron in it is called concentrate.

5. Pellets
The concentrate (the wet taconite powder) is rolled with clay inside large rotating cylinders. The cylinders cause the powder to roll into marble-sized balls. (This is like rolling wet, sticky snow into balls to make a snowman). The balls are then dried and heated until they are white hot. The balls become hard as they cool. The finished product is taconite pellets.

6. Steel
The taconite pellets are loaded into ore ships. These ships sail on the Great Lakes to Gary, Indiana, Cleveland, Ohio and other steel-making towns. The taconite pellets are brought to the steel mills to be melted down into steel.

Taconite is mined from the Mesabi Iron Range, near Hibbing, MN. Then it is processed into pellets and moved by train--or on ore boats from Duluth--to ports and steel mills around the Great Lakes region.

Taconite process photos courtesy American Iron Ore Association and Hibbing Taconite.

Find out more about mining iron ore in Minnesota at Minnesota Iron range

Clay is mined in the Minnesota River Valley. Clay is used in making bricks, porcelain, tiles, and medicines. Companies are currently exploring Minnesota for higher grade kaolin (KAY-a-lin) clay, which is a fine, white clay used to add a glossy look to paper. Today, Georgia is the largest producer of kaolin clay in the United States.

About 11,000 years ago, glaciers covered Minnesota. These glaciers left behind large amounts of **sand and gravel.** There are sand and gravel mining operations in nearly every county in Minnesota. You may not think of sand and gravel as a valuable resource, but without it concrete could not be made. Highways, roads, bridges and many buildings are made of concrete. Sand is also used along with salt to melt ice on roads and to provide better traction in the snow.

Silica sand is very fine sand composed of quartz (a white to colorless mineral) and is mined in the southeastern part of Minnesota. In Minnesota, glacial drift and other bedrock layers commonly exist on top of the sandstone. Three sandstone formations in Minnesota have potential for producing high quality industrial silica san

Industrial silica sand or frac sand is found in the southeastern portion of the state. Eight mines are currently known to extract industrial silica sand. Mines may or may not process the sand on-site. Off-site processing plants that receive silica sand from various mining operations in Minnesota and Wisconsin are also found in Minnesota. To date, four counties, Goodhue, Wabasha, Houston, and Fillmore, have moratoria on new permits for industrial silica sand mining.

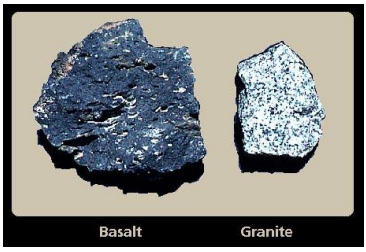
Industrial silica sand is used to make glass, golf course sand traps, and is used in oil drilling to improve the flow of oil to wells. Over the past decade, a sharp increase in demand for industrial silica sand corresponded with a rapid expansion of shale oil and gas development. An extraction method called hydraulic fracturing is used to produce oil and gas from oil/gas producing bedrock, which can require approximately 10,000 tons of industrial silica sand per well. Due to increased demand, there is interest to develop new industrial silica sand mines and expand existing operations in certain counties in southeastern Minnesota.

Gravel is small stones and can be found naturally, the result of crushing over time by glacier movement, but is usually man-made (milled, or crushed by machine). It can be made up from many kinds of rock.

Granite and limestone are used in the construction of homes, buildings facades, counter tops, roads, and tombstones. These rocks are often mined in large blocks from a quarry. When granite or limestone is mined this way, it is called dimension stone. Look at the buildings in your town. Are any made with limestone or granite?

Rocks are made of minerals. They can be made of a single mineral or a combination of several minerals.

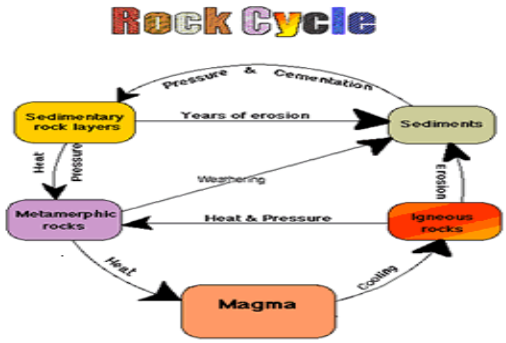
There are three main types of rocks:



1) **Igneous** (IG-nee-us) rocks are formed from hot, molten rock, called magma. Granite and basalt are examples of igneous rocks

2) **Sedimentary** rocks are formed from bits and pieces of rock which have broken off. These bits and pieces are called sediments. The sediments were carried by water and wind and dropped to a new location. The sediments are piled layer upon layer and pressed or cemented together to form a new kind of rock. The most common sedimentary rocks are sandstone, limestone, shale, and conglomerates.

3) **Metamorphic** rocks are igneous or sedimentary rocks, which have been changed by heat, pressure or chemical action. Examples of metamorphic rocks are slate, which is formed from shale and marble, which is formed from limestone.



Slate

These are the only minerals currently mined in Minnesota. **Manganese, copper, nickel, and titanium** have also been discovered in the state in minable quantities, but are not of high enough quality under today's prices to mine profitably. Exploration for additional resources, such as **gold, silver, platinum, diamonds, zinc, and lead**, continues today in Minnesota.

Renewable Energy

With the high cost and environmental issues surrounding the use of fossil fuels, more focus has been put on developing alternate forms of energy or renewable energy. **Renewable energy** resources are ones that won't run out. Some examples of renewable energy is wind, solar, hydroelectricity, and geothermal.

Wind Energy

American wind energy is powering the equivalent of nearly 13 million homes, including 770,000 in Minnesota. Generating wind power creates no pollution and uses no water. This is reducing our dependence on coal and oil and creating a cleaner, healthier future

for Americans. Using wind energy is avoiding as much carbon pollution as if 14 million cars were taken off the road.

Minnesota has become known for its efforts to generate clean, renewable energy from the wind and ranked 7th in the US in 2013 for percentage of electricity derived from wind. Minnesota gets nearly 13 percent of its electricity from wind power, a growing industry that employs 2,000 to 3,000 people across the state.

Southwest Minnesota has an area that is a glacier-deposited ridge that runs diagonally across the state. This is called Buffalo Ridge. A wind farm is an area of land with a group of wind turbines that produce energy. Because of the higher elevation, this area experiences continual wind speeds. Also, the open farm and pasture and make it an ideal place for wind turbines. The land where the wind farm is built is privately owned farmland. To acquire a piece of this land for the use of wind turbines, the wind developer rents or leases the plot of land from the farmer who owns the land. Each turbine takes up about 1/3 of an acre of land. The farmer receives a percentage of the revenue from the sale of the electricity from each turbine.

There are somewhere between 1000 and 1200 wind turbines in Minnesota. A wind farm is an area of land with a group of wind turbines that produce energy. Large wind farms in Minnesota include Buffalo Ridge, the Fenton Wind Farm, the Nobles Wind Farm, and the Bent Tree Wind Farm.

This glacial ridge and towers are spiking a new wave of interest in wind energy in Minnesota. Individuals, small businesses, and corporations are joining in to harvest watts from the wind.

In 1997, Lac qui Parle Valley School became the first Minnesota school district to build a wind turbine. The turbine provides energy to school buildings. Power that is generated when school is not in session is sold to Ottertail Power.

As mentioned wind energy doesn't cause pollution, it's renewable, and operational costs are low. Wind energy also has its drawbacks. Wind is an intermittent resource, it is not always there, so you have to have a back up plan for when all of a sudden you don't have any wind. For individuals who have their own turbine, this means being tied in to a local utility company. For utility companies it means having coal or some other power plants to pick up the slack. Initial installation of the turbines is a big investment for individuals and for large companies. The blades of the turbines have in the past killed bats and birds that get caught in their path. The effects of this can be damaging to ecosystems surrounding these turbines. Some people also are concerned about the noise that the turbines make, while others consider them to be an eyesore and not pleasing to look at.

Wind Turbines

The wind towers stand hundreds of feet tall. A 1650 kilowatt (KW) turbine costs over $2.5 million to set up. The energy in the wind turns two or three propeller-like blades around a rotor.

The rotor is connected to the main shaft, which spins a generator to create electricity. The energy is supplied to various electricity providers from all across the nation.

Wind turbines start operating at wind speeds of around 8 miles per hour (mph) and reach a maximum power output at around 33 mph. When there is not enough wind to turn the blades, or when there is too much wind the turbines shut down.

Fields of Energy: Wind Energy

Wind Power in Minnesota

What year did Lac qui Parle get its wind turbine?

Biomass Energy

Biomass energy that is made from organic material that is used to make to make electricity. The Minnesota Department of Natural Resources (DNR) Forestry's Biomass Program deals specifically with woody biomass. Woody biomass includes logging residue - tops and limbs left over from a commercial timber harvest, small-diameter trees and stems, dead standing trees, and down logs, mill residue, forest and land–clearing material, and brush land material.

In Benson, MN, the Fibrominn power plant uses poultry litter to produce energy. Most of the fuel used by Fibrominn is supplied to the plant by Minnesota turkey growers. By removing the methane from turkey litter, the plant significantly reduces the greenhouse gas emissions associated with turkey production.

Solar energy in Minnesota

Solar energy comes from using the sun as fuel to create heat or electricity. Solar energy is considered environmentally friendly because the sun is a natural energy source that does not require the burning of fossil fuels and air pollution that goes with them. In addition, it is considered renewable since the energy produced from the sun does not deplete any natural resources, and will never run out.

Solar energy falls into two categories: passive and active.

Passive solar energy

A passive solar heating design doesn't actually and mechanical heating device. Passive energy converts sunlight into energy. Rays from the sun enter a building through windows, heat the air and are absorbed by floors, walls, furniture, etc. Some materials, such as stone, brick and plaster, more effectively absorb the heat. As the air cools at night, the absorbed heat releases into the building and maintains a comfortable temperature. A passive solar heating design does not actually include any sort of mechanical heating device. Rather, passive solar heating

functions by incorporating building features that absorb heat and then release it slowly to maintain the temperature within the home. These building features, often referred to as thermal mass, may include large windows, stone flooring, and brick walls.

For passive solar energy to be utilized effectively there must also be a means for the heated air to circulate throughout the home. The natural circulation of air is usually enough as long as doors are left open throughout the home, however, sometimes fans are also incorporated into the design.

Active Solar Energy

Active solar heating is similar to passive solar heating, but it is a much more involved process and generates much more heat than passive systems do. An active solar heating system has three parts: a solar collector which absorbs the solar energy, a solar storage system and a heat transfer system to disperse the heat to the appropriate places in your home.

Active heating systems can be divided into two categories: air systems and liquid systems. The differences in the heating systems are in the way the solar energy accumulates in the solar collector. Liquid systems use a liquid to collect the energy in the solar collector; whereas air systems absorb the energy through the air.

By the year 2020 1.5 percent of the state's electricity has to come from solar.

Read more: http://www.homeadvisor.com/article.show.Solar-Heating-Environmentally-Friendly.9762.html#ixzz2WVoN4cN9

Read more: http://www.homeadvisor.com/article.show.Solar-Heating-Environmentally-Friendly.9762.html#ixzz2WVmfB2ax

Read more: http://www.motherearthnews.com/green-homes/about-passive-solar-heating.aspx#ixzz2WVivXEES

http://www.homeadvisor.com/article.show.Solar-Heating-Environmentally-Friendly.9762.html

Hydroelectricy

Hydroelectric energy is energy generated by moving water converted to electricity. Also known as hydroelectricity.
To harness energy from flowing water, the water must be controlled. A large reservoir is created, usually by damming a river to create an artificial lake, or reservoir. Water is channeled through tunnels in the dam.

The energy of water flowing through the dam's tunnels causes turbines to turn. The turbines make generators move. Generators are machines that produce electricity.

IN 2003, MINNESOTA HAS ABOUT 32 HYDROELECTRIC generating stations.

About 3% of Minnesota's energy consumption is

but most of this comes from Manitoba Hydro, a large

hydro project in Canada. Most of Minnesota's hydroelectric stations function as

run-of-river operations. Manitoba Hydro and many of the hydroelectric stations in

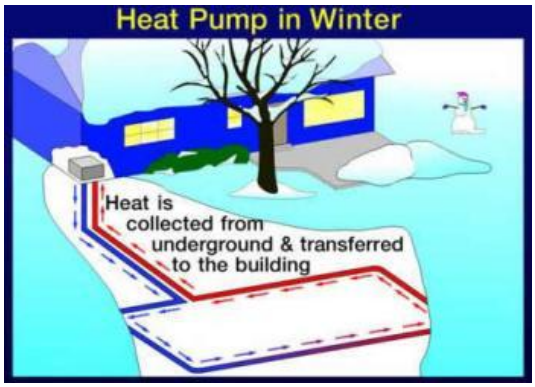
the Pacific Northwest operate in peaking or storage mode.

Hydropower Basics

Hydroelectric power plants convert the potential energy in water pooled at a higher elevation into electricity by passing the water through a turbine and discharging it at a lower elevation. The water moving downhill turns the turbine to generate electricity. The elevation difference between the upper and lower reservoirs is called the "head". Hydroelectric power facilities are typically categorized as either low head (under 60 feet) or high head. Most of the facilities in Minnesota are low head,

Geothermal Energy

Geothermal energy is energy that we get from the heat that is inside the earth. A geothermal heat pump system consists of a heat pump, an air delivery system (ductwork), and a heat exchanger-a system of pipes buried in the shallow ground near the building. Geothermal heat pumps can be used to heat and cool buildings. In the winter, the heat pump removes heat from the heat exchanger and pumps it into the indoor air. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger. The heat removed from the indoor air during the summer can also be used to provide a source of hot water.



Pros of Geothermal Energy

1. Geothermal energy does not cause significant amounts of pollution.
2. Geothermal energy is renewable .
3. Great for heating and cooling – even small households can benefit.
4. Small footprint on land – can be built partially underground.
5. Geothermal energy is available everywhere.
6. Recent advancements have lowered the costs.

Cons of Geothermal Energy

1. There are some minor environmental issues associated with geothermal power.
2. There are heavy upfront costs associated with both geothermal power plants and geothermal heating/cooling systems.
3. Geothermal power is only sustainable (renewable) if the reservoirs are properly managed.

HOW OUR CHOICES IMPACT THE ENVIRONMENT

We have many wonderful natural resources in our state and throughout the country. The daily choices that we make can influence the future of these resources and the environment that we live in. How much we drive, whether we recycle, whether we waste electricity, washing a half load of clothes at a time, or buying water in disposable bottles instead of using a reusable bottle — all these choices sound small by themselves, but altogether they have a big effect.

The 3 R's

There are three things that we can do that will have a positive impact on our earth and the environment – reduce, reuse, recycle.

- To recycle means that something passes through a cycle again so that it can be reused. For example, if you recycle all of your plastic water bottles, they can be made into something else. Recycling has many benefits - it limits pollution that can lead to global warming, saves energy,

reduces the amount of waste that goes into landfills, and reduces the use of our natural resources, such as timber, water, and minerals.

Paper makes up nearly 30 percent of all wastes Americans throw away each year, more than any other material. Americans recycled about 63 percent of the paper they used in 2010. This recovered paper is used to make new paper products, saving trees and other natural resources. Most community or office recycling programs accept paper and paper products.

Americans generated 31 million tons of plastics in 2010, about 12 percent of the waste stream. Only eight percent of plastics were recycled in 2010. Some types of plastics are recycled much more than others. Most community recycling programs accept some, but not all, types of plastics. Look for products made from recycled plastic materials.

To reuse something means that something can immediately be used again or used in a new way. Whether we recycle or reuse something, it will keep things out of our landfills. One person's trash is another person's treasure. Instead of discarding unwanted appliances, tools, or clothes, try selling or donating them. Not only will you be reducing waste, you'll be helping others.

By reducing the amount of natural resources that we use we can help the environment. Look for ways that you can reduce the amount you use. For example, bring your lunch in a lunch box or reusable bag instead of throwing away a bag each day. Also, using a refillable bottle instead of disposing of a bottle each time will save plastic from going into the landfills. Try to buy things that have less packaging. When manufacturers make their products with less packaging, they use fewer raw materials. This reduces waste and costs, which can be passed on to the consumer.

Wisegeek.com

www.dnr.state.mn.us
http://www.coaleducation.org/q&a/how_coal_formed.htm - Kentucky Coal Education

Tom Robertson, Minnesota Public Radio

American wind Energy Association

Environment Minnesota

http://www.pipestoneminnesota.com/visitors/windpower/

http://www.windpoweringamerica.gov/pdfs/wpa/35512_schools.pdf

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Review Question

Words to use:

Analyze, Hypothesize, Investigate, Communicate, Background Research, Report Results, Question, Procedure, Method, Data, Conclude, Observations, Predict, Evidence, Comparison/Contrast, Evaluate, Similar/Different

CONCLUSION

What do you know about…

- ✓

What do you wonder…

- ✓

ADDITIONAL RESOURCES

SCIENCE NOTEBOOK