

Name: _____

Energy Source: Natural Gas

NATURAL GAS IS A COLORLESS, odorless gas. The main ingredient in natural gas is methane, a greenhouse gas that warms Earth's surface. It is considered a fossil fuel because it is composed of ancient organic material. It takes millions of years to turn organic material into fossil fuels.

Natural gas can be drilled from below Earth's surface either on land or in the ocean. Pipelines are used to bring the gas up to Earth's surface, where it is stored or transported elsewhere to create electricity.

Burning natural gas to create electricity produces carbon dioxide and nitrous oxide emissions. Natural gas burns "cleaner" than coal and oil because it produces fewer greenhouse gas emissions and other pollutants. However, it provides less energy than coal.

Concerns about natural gas center around human and environmental safety. Natural gas is very flammable and can cause explosions if it leaks from pipes or storage containers. Drilling below Earth's surface for natural gas can cause erosion and landslides.

Description of natural gas:

Benefits of using natural gas for electricity:

Negative consequences of using natural gas:

Does natural gas used for electricity contribute to climate change? Explain your answer.

Could natural gas be a major source for future electricity production? Why or why not?

Energy Source: Coal

COAL IS A BLACK ROCK formed by decomposing organic material over millions of years. It is considered a fossil fuel because of the long time required to create it. Coal contains more energy than other fossil fuels.

Some coal is buried near Earth's surface, but often coal is located hundreds of feet below the surface. Underground mining is required to obtain coal buried far below Earth's surface. Mine shafts and elevators allow people to remove deeply-buried coal. Coal nearer to the surface can be removed through surface mining. This is cheaper than underground mining. One common type of surface mining is strip mining, which involves removing plants, soil, and rocks to reach the coal below. Another method of surface mining is called mountaintop removal, whereby entire mountain tops are removed to access coal.

Safety concerns about mining include lung damage to workers and collapse of mine shafts. Environmental concerns include damage to land, water, and air. Burning coal releases many air pollutants and creates solid waste called ash. Water is removed from surrounding environments and used to remove impurities from coal, as well as for cooling water at coal-fired power plants.

Using coal for electricity production releases more carbon dioxide than other fossil fuels and fossil fuel alternatives. Transporting coal from mines to power plants also relies heavily on fossil fuels to power trains, barges, and trucks. Transporting coal is expensive, but coal is generally affordable for consumers.

Description of coal:

Benefits of using coal for electricity:

Negative consequences of using coal:

Does coal used for electricity contribute to climate change? Explain your answer.

Should coal be a major source for future electricity production? Why or why not?

Name: _____

Energy Source: Nuclear Energy

NUCLEAR ENERGY IS ENERGY OBTAINED from splitting apart atoms in a process called fission. Uranium, a metal found in rocks, is used as fuel for nuclear fission. Neutrons hit uranium atoms, causing the uranium atoms to split apart. Energy is released when atoms break apart.

Nuclear energy doesn't result in any greenhouse gas emissions, other than those due to mining and transporting uranium to nuclear plants. Water is required for various steps in electricity production from nuclear energy.

Uranium is radioactive. It can harm living organisms if it is released into the environment. Radioactivity can cause illness such as cancers and even death. Radioactive wastes are dangerous for a very long time. Currently there is no known way to dispose of nuclear waste safely; it must be contained in special storage areas.

There are other safety concerns associated with nuclear energy. Uranium used for nuclear fuel can also be used to create nuclear weapons. Also, the extreme heat created by fission makes reactors susceptible to fires or explosions if safety measures malfunction.

Description of nuclear energy:

Benefits of using nuclear energy for electricity:

Negative consequences of using nuclear energy:

Does nuclear energy used for electricity contribute to climate change? Explain your answer.

Should nuclear energy be a major source for future electricity production? Why or why not?

Energy Source: Geothermal Energy

GEOTHERMAL ENERGY IS HEAT THAT comes from within the earth. Extremely high temperatures are continuously produced inside the earth. The heat from below Earth's surface can be used to create electricity.

Reservoirs of hot water, steam, and hot dry rocks can be used to generate electricity. Pipes are often drilled 1 to 2 miles below Earth's surface to reach these reservoirs of thermal (or heat) energy. Geothermal reservoirs are difficult to reach in places where they are far below Earth's surface.

Geothermal energy is not as renewable as solar or wind energy because a specific location can cool over time. However, geothermal energy is unaffected by weather, unlike solar and wind energy.

Construction of geothermal power plants can affect land stability in the surrounding region. However, after a power plant has been constructed, geothermal energy is inexpensive and clean. Geothermal power plants release less than 5% of the CO₂ emissions of a fossil fuel power plant.

The shallow ground of the earth provides another form of geothermal energy that can be used almost anywhere to heat or cool buildings. For most areas in the world, temperatures in the upper 10 feet of Earth's crust are warmer than the air in the winter and cooler than the air in the summer, kind of like a cave. Geothermal heat pumps transfer heat from the ground into buildings in the winter and reverse the process in the summer, transferring heat from the air into the cooler ground.

Description of geothermal energy:

Benefits of using geothermal energy for electricity:

Negative consequences of using geothermal energy:

Does geothermal energy used for electricity contribute to climate change? Explain your answer.

Should geothermal energy be a major source for future electricity production? Why or why not?

Energy Source: Wind Energy

WIND ENERGY IS ACTUALLY A form of solar energy. The sun heats different parts of the Earth at different rates. Also, different surfaces absorb or reflect sunlight in different amounts. This causes the atmosphere to warm unevenly, creating wind. Average annual wind speeds of at least 9-13 miles per hour are required to have successful electrical production from wind.

Wind-generated electricity requires wind turbines (sometimes called windmills). These are mostly made of steel. Steel is made of iron and other metals. Mining and processing these metals produces greenhouse gases. However, once the turbine is made, using wind energy to create electricity produces no land, water, or air pollution.

Costs of wind power have decreased steadily. Building and maintaining wind turbines are the major costs. Some farmers and ranchers have installed wind turbines on their land to make extra money.

Some people don't like wind turbines because they can harm birds and bats that might get caught in the blades. Others don't like the way they look or the noise that large wind farms can create.

Description of wind energy:

Benefits of using wind energy for electricity:

Negative consequences of using wind energy:

Does wind used for electricity contribute to climate change? Explain your answer.

Should wind energy be a major source for future electricity production? Why or why not?

Energy Source: Solar Energy

SOLAR ENERGY IS THE ENERGY FROM the sun that can be converted into electrical energy. Often, photovoltaic (PV) cells, which are made of metals and silicon, are used to convert solar energy into electricity. Solar-thermal technologies such as mirrors can also be used to concentrate the sun's energy.

Although the sun's light contains much energy, it is difficult to use all of this energy. The sun's energy is not concentrated into a single beam. Currently, PV cells are not very efficient. They lose over 70% energy collected when they convert light into electrical power.

The silicon used to make PV cells is often found in sand. Energy is required to remove the silicon from the sand. This process releases greenhouse gases. The solar cell itself doesn't release greenhouse gases after it is made.

PV cells are expensive to buy. However, because the sun's energy is free and people who get energy from PV cells don't have to pay an electricity company for solar energy, solar power can be cost-effective long-term.

Solar energy is used to provide electricity in many different places for many different purposes. For example, space shuttles, watches, homes, and office buildings all use PV cells.

Description of solar energy:

Benefits of using solar energy for electricity:

Negative consequences of using solar energy:

Does solar energy used for electricity contribute to climate change? Explain your answer.

Should solar energy be a major source for future electricity production? Why or why not?

Energy Sources: Hydropower

HYDROPOWER IS THE ENERGY GENERATED by moving water. Fast-flowing water and water that falls a great distance contain much energy. Often a dam is built to control flowing water and create electricity as needed.

Hydropower is a renewable energy source. Water is renewed naturally through Earth's water cycle. Hydropower is considered a clean energy source because it does not result in any carbon dioxide emissions, air pollution, or water pollution.

Water is a cheap energy source. The cost of hydropower lies in building and maintaining dams and channels. Dams have big impacts on environments. Sediments (soil, sand, leaves) can build up in reservoirs—the bodies of water held by dams. That sediment reduces water quality for organisms that live in the water and can choke out the sun's light. Migrating fish may have trouble swimming around dams. Changing the path of a stream affects any organisms dependent on that stream. It may also cause erosion along riverbanks.

Building dams can also affect human communities. Often people must be relocated from their homes if they live in an area where a dam and reservoir are to be constructed. People displaced by dams are often poor. One benefit of creating reservoirs is the opportunity for recreation, such as swimming and fishing.

Description of hydropower:

Benefits of using hydropower for electricity:

Negative consequences of using hydropower:

Does hydropower used for electricity contribute to climate change? Explain your answer.

Should hydropower be a major source for future electricity production? Why or why not?

RENEWABLE

NON-RENEWABLE

WILL NOT run out

WILL run out!