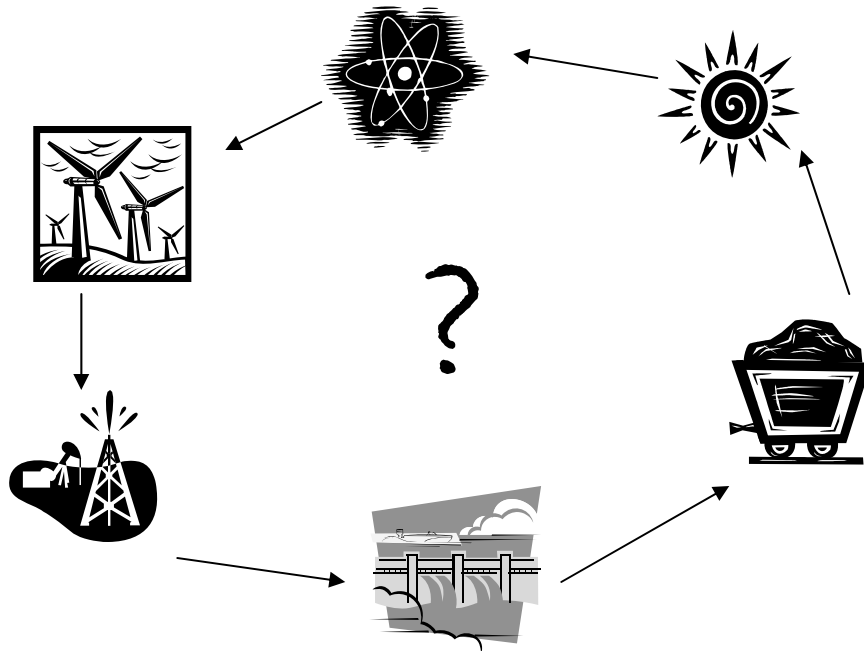


Great Energy Debate Game

SUBJECT AREAS
Science
Social Studies
Math
Language Arts

Students evaluate the advantages and disadvantages of the major energy sources in an innovative debate format.



Disadvantages



Advantages



STUDENT EDITION
- Intermediate -

Example



Solar

	<i>Advantage</i>	<i>Disadvantage</i>	<i>Just a Fact</i>
1. <i>Sol</i> means sun. Solar energy is energy from the sun.			✓
2. Solar energy is renewable. We will have solar energy as long as the sun shines.	✓		
3. The sun's energy is spread out and hard to capture. The energy is only available when the sun is shining, not 24 hours a day.		✓	



Biomass

	Relevant		
	Advantage	Disadvantage	Just a Fact
1. Biomass is a source of energy from plant materials, animal waste and garbage.			
2. Biomass is a renewable energy source; we can grow more biomass and will always create more garbage.			
3. Wood requires proper storage and seasoning. In addition, labor is needed to prepare wood for use - cutting, splitting and stacking.			
4. Biomass is found throughout the country and can be produced almost everywhere in the U.S.			
5. The amount of energy stored in biomass is less than the amount of energy stored in the same amount of a fossil fuel.			
6. Biomass can be made into ethanol and biodiesel, transportation fuels that are cleaner burning than gasoline or diesel.			
7. Burning biomass produces harmful emissions like ash and nitrogen oxides.			
8. Wood pellets are a type of wood fuel, generally made from compacted sawdust or other wastes from wood manufacturing.			
9. Scientists are cultivating trees that can be grown to full size in less than half the time of the average tree.			
10. Wood can be used as a fuel because it captures and stores radiant energy from the sun through the process of photosynthesis.			
11. Biomass provides 6% of the nation's demand for energy. In Maine, about 5% of our electricity comes from biomass.			



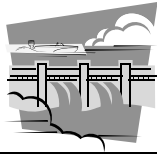
Coal

	Relevant		Just a Fact
	Advantage	Disadvantage	
1. Coal is a shiny black rock that found underground. It was formed long ago from ancient plants, which makes it a fossil fuel.			
2. Although coal is still being formed today, we are using it much faster than it is being formed. Coal is a nonrenewable energy source.			
3. Coal is the most abundant fossil fuel in the United States, so we do not have to import it from other countries.			
4. Coal is burned to make heat and we use that heat to make electricity. Coal-fired power plants make electricity at a low cost.			
5. Burning coal pollutes the air and releases carbon dioxide, a greenhouse gas and sulfur dioxide, which causes acid rain.			
6. We dig some coal from deep shaft mines. Coal mines can pollute our water if not carefully managed.			
7. An easier way to mine coal is called surface mining. This method removes the top layers of earth to uncover the coal, but disturbs large amounts of land.			
8. Surface mines can turned into grasslands or parks after the coal is removed but the land can never be completely restored.			
9. Coal can be made into other materials and products we use, such as steel, linoleum and insulation.			
10. Some cleaner coal technologies require less coal to produce the same amount of electricity.			
11. Coal mining can be dangerous for miners.			
12. About 37% of our electricity in the U.S. comes from coal. In Maine, about 5% of our electricity comes from coal.			



Geothermal

	Relevant		
	Advantage	Disadvantage	Just a Fact
1. Geothermal energy is heat within the earth. Examples of geothermal sites are hot springs, volcanoes and geysers.			
2. Geothermal energy is used to produce electricity and for a variety of other purposes including space heating, snow melting, aquaculture, and greenhouse production.			
3. Geothermal energy is renewable. Groundwater is replenished by rain and the earth continually warms the groundwater.			
4. High-temperature geothermal resources, capable of producing electricity, are not available in all parts of the country.			
5. Using geothermal energy does not create any air pollution because no fuel is burned.			
6. People in Maine typically access geothermal heat through their wells.			
7. It can cost a lot of money to install a geothermal system.			
8. Geothermal heat pumps are easier to maintain, last longer and are cheaper to operate than conventional heating systems.			
9. The most active geothermal resources are found along major tectonic plate boundaries, where magma is close to the Earth's surface.			
10. The temperature of the earth a few feet underground remains constant year-round: about 52°F in temperate climates like Maine.			
11. Geothermal heating requires the use of electricity to power heat pumps.			
12. In the United States, geothermal energy produces less than 1% of the electricity consumed. However, over one million homes have installed geothermal heating systems.			



Hydropower

	Relevant		Just a Fact
	Advantage	Disadvantage	
1. <i>Hydro</i> means water. Hydropower is the energy of moving water.			
2. Water is a renewable energy source. Water continuously evaporates from earth's surface and then falls back to earth as precipitation. This cycle replenishes our streams, rivers and lakes.			
3. Hydropower produces more electricity in the United States than any other renewable energy source.			
4. Hydropower allows us to make electricity without burning any fuels. Because of this, it is considered a clean energy source.			
5. Installing a hydro dam causes flooding upriver and creates a large lake called a reservoir. A reservoir can flood riverside communities and animal habitat.			
6. The reservoirs made by dams can be used for fishing, boating, and other sports. They can also prevent flooding downstream.			
7. Most of the good places to put dams are already taken in the United States. We will not build many more hydropower dams.			
8. Dams can block some fish species from swimming upriver, where they need to reproduce.			
9. Hydropower is a very cheap way to make electricity. Once a dam is built, the water flows freely.			
10. Dams can alter the natural flow of the river and change the amount of water that reaches communities downstream.			
11. The states that make the most electricity from hydropower are Washington, Oregon and Idaho.			
12. Only about 7% of the electricity we use in the U.S. comes from hydropower. In Maine, about 33% of our electricity comes from dams.			



Natural Gas

	Relevant		
	Advantage	Disadvantage	Just a Fact
1. Natural gas is a fossil fuel, formed millions of years ago from tiny sea plants and animals.			
2. Natural gas is nonrenewable because it takes a very long time to form.			
3. Today, natural gas is primarily used for heating and cooking. 56% of American homes use natural gas as their main heating source.			
4. Compared to coal and petroleum, natural gas produces much less ash, sulfur and carbon dioxide (a greenhouse gas) when burned.			
5. Natural gas must be transported via pipelines. These pipelines are expensive and take a long time to build.			
6. Hydraulic fracturing (also called fracking) is a method of breaking apart rocks to release natural gas.			
7. Fracking has resulted in the contamination of groundwater by dangerous chemicals.			
8. It is estimated that there are many years worth of natural gas available through fracking.			
9. We dig deep into the ground to get natural gas and send it to a plant to be refined.			
10. A renewable form of natural gas can be captured from landfills. When garbage and other materials decompose, they release natural gas.			
11. Most of our natural gas comes from here in the United States, so we do not have to import it from other countries.			
12. In Maine and the United States, about 30% of our electricity comes from natural gas.			



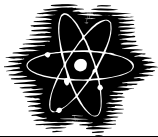
Petroleum

	Relevant		
	Advantage	Disadvantage	Just a Fact
1. Petroleum is a fossil fuel, formed over millions of years from tiny sea plants and animals.			
2. Although petroleum is still being formed today, we are using it much faster than it is being produced. It is nonrenewable.			
3. The word petroleum means “rock oil” as it is a liquid that can be found within the rocks.			
4. When petroleum is burned, carbon dioxide (a greenhouse gas) and other forms of pollution are produced.			
5. Petroleum products like gasoline and diesel are efficient, high energy transportation fuels. 93% of the transportation in the U.S. is fueled by petroleum products.			
6. We also use petroleum to make plastic, medicines, paints, soaps, wax, and many other important products.			
7. Drilling for petroleum can cause spills on the land and in the water. Oil spills are difficult to clean up and are a major threat to wildlife.			
8. Petroleum is transported by truck, tanker or pipeline. This allows oil to be brought to some of the most remote communities in the U.S.			
9. In the United States, we do not drill enough oil to meet our needs. About 45% of the oil we use comes from other countries.			
10. There are unused oil resources off the coast of California and in the Arctic National Wildlife Refuge (ANWR) in Alaska.			
11. The biggest petroleum-producing states in the U.S. are Texas, Alaska, California, Louisiana and New Mexico.			
12. In the U.S., about 1% of our electricity is made by burning petroleum. In Maine, that number is higher – about 6%.			



Solar

	Relevant		Just a Fact
	Advantage	Disadvantage	
1. <i>Sol</i> means sun. Solar energy is energy from the sun.			
2. The sun continuously shines on earth, warming the surface and fueling the wind and the water cycles.			
3. Solar energy is renewable. We will have solar energy as long as the sun shines.			
4. Solar panels do not pollute the air since no fuel is burned to make the electricity.			
5. Solar power cannot be captured at night and solar panels do not work well on cloudy days.			
6. We can use photovoltaic (PV) cells, also known as solar panels, to make electricity.			
7. The electricity made by solar panels can be stored in large, rechargeable batteries for use when the sun is not shining.			
8. Solar panels can be used in places where there are no power lines.			
9. Electricity from PV cells costs more money than the electricity you get from the power company because the solar panels and batteries are very expensive to purchase.			
10. The sun's energy is spread out and difficult to capture.			
11. We can use energy from the sun with no special equipment to light and heat buildings. This is called passive solar energy. An example of this is a greenhouse.			
12. Solar power currently produces less than 1% of the electricity we use in the U.S.			



Uranium

	Relevant		
	Advantage	Disadvantage	Just a Fact
1. Everything in the universe is made of tiny particles called atoms. In the center of each atom is a nucleus, which contains even smaller particles.			
2. The nucleus has energy that holds it together – nuclear energy. The nucleus of a uranium atom has lots of energy holding it together.			
3. Uranium is a metal, used to make heat in a nuclear power plant. It is a nonrenewable energy source.			
4. Nuclear power plants split atoms to create heat, to boil water, creating steam, to spin a turbine as in other power plants.			
5. Nuclear power plants produce a small quantity of radioactive waste. This waste can harm humans and animals and remains dangerous for a long time.			
6. Currently, the United States has no permanent way to store nuclear waste.			
7. Nuclear power plants need to be very safe and contain advanced equipment. Because of this, they are very expensive to build.			
8. We have lots of uranium in the United States, so we do not need to import it from other countries.			
9. Uranium is inexpensive and easy to transport.			
10. Uranium can supply a large amount of energy using a very small amount of fuel.			
11. Because no fuel is burned in a nuclear power plant, it does not create any air pollution.			
12. Uranium provides the U.S. with 19% of its electricity from 65 nuclear power plants.			



Wind

	Relevant		Just a Fact
	Advantage	Disadvantage	
1. Wind is formed by uneven heating of the earth's surface. The sun warms the land faster than it warms the water. Warm air over the land rises and the cooler air over the water rushes in, creating wind.			
2. Wind turbines take up a lot of land, but the land can still be used for growing crops and grazing animals.			
3. Wind will always be produced as long as the sun continues to warm the earth. This makes wind energy a renewable resource.			
4. No fuel is burned to make the electricity from wind power; wind energy does not pollute the air or water.			
5. Before building a wind farm, we must do environmental studies to avoid harming birds and bats.			
6. Some people do not like the noise or appearance of wind turbines.			
7. Wind farms can create electricity 24 hours a day.			
8. Wind turbines are expensive to build, but once the wind turbines are built the wind is free to use.			
9. Many places do not have enough wind to make consistent electricity.			
10. Offshore wind farms are being built because wind over water is stronger and more consistent than over land.			
11. Electricity from wind farms is transported to nearby communities through power lines.			
12. Wind turbines only produce around 3.5% of the electricity used in the U.S. Production of wind turbines is expected to triple in the near future.			