# Lesson Plan 050106

**Clean, Green Power (Target: Grades 1-4)**

## Time Requirements:

1. 30-minutes during science or reading time

## Objectives:

1. Create awareness for alternative energies
2. Create awareness for the disadvantages of current fossil fuels
3. Allow creative expression and reinforce lesson content through coloring

## Materials:

1. "Alternative Energy Facts & Choices" pages
2. "Clean, Green Power" Coloring Pages and Maze
3. Crayons and/or nontoxic, washable markers.
4. Digital Camera or still camera for taking pictures of finished designs and students as they are working on them. Great for local publicity, school newsletter, etc.
5. Some printed images of windmills, water wheels, hydroelectric dams, solar panels, corn fields, gas pumps, etc. from a Google image search.

## Methods:

1. (7-10 minutes) Read ""Alternative Energy Facts & Choices" pages to the students. Pass around photos of various forms of alternative energy as you read the text.
2. (15-20 minutes) Hand out copies of the coloring pages. To save paper, use both sides to print images. Hand out crayons/markers, or have students get out their own.
3. (5 minutes) Review alternative energies with students. Ask the following questions:

   - Why do we need alternative energy?

   - Which type of alternative energy can be used in cars and trucks?

   - Which alternative energy source gives us enough power in one minute to meet the energy needs of the Earth for a whole year?

   - Which type of alternative energy uses water power?

   - What state has enough wind to make 40% of our electricity using new windmill generators?

## Lesson Information:

1. "The extraction, conversion, and utilization of energy is the single largest component of air and water pollution, as well as emissions causing the change of our global climate." -Christine A. Ervin, Assistant Secretary, Energy Efficiency and Renewable Energy 'ca (Department of Energy), 1997
2. By the year 2100, it's predicted that there will be 12 billion people on Earth. That's twice the number on Earth today. If trends in technology and industrial growth continue at their present rate, our demand for energy will be 5 times greater than it is today.
3. Like us, all those people alive in 2100 will want transportation, comfortable living space and consumer goods and services. Even if we believe fossil fuel will last until 2100, using petroleum, coal and natural gas will raise the temperature of the Earth by as many as 4-7 degrees F. The result will be ecosystem disruption on an unimaginable scale: increased flooding, desertification, intense weather patterns, destruction of habitats and species on an accelerated scale.
4. For over 30 years, our governmental and industrial leaders have been dragging their feet on investing in alternative energies to replace fossil fuels. Oil, natural gas and coal-producing companies have such influence over government decision-making that research into alternative energy sources has been token at best.
5. What little research/development there has been into alternatives--largely funded by European nations and Japan--has produced far more efficient alternatives than were seen in the past three decades. Today, alternative energies such as solar, wind, hydro and biofuels are offering true long-term solutions to our growing energy problems.
6. This lesson is designed to introduce these four primary alternative energies to your students. Although there are other alternatives (geothermal, hydrogen, biomass, ocean currents, etc.), the four energy sources covered in this lesson represent the most currently viable for replacing our dependence on fossil fuels. Although there are hundreds of online links about these topics, the links listed below are specifically created for educators by the Renewable Energy Canada initiative. The links below provide both excellent information, as well as lesson plans, activities and suggested reading.

   http://www.re-energy.ca/t_teacher.shtml

   http://www.re-energy.ca/t_renewablebasics.shtml

   http://www.re-energy.ca/t_solarelectricity.shtml

   http://www.re-energy.ca/t_solarheat.shtml

   http://www.re-energy.ca/t_windenergy.shtml

   http://www.re-energy.ca/t_waterpower.shtml

   http://www.re-energy.ca/t_biomassenergy.shtml

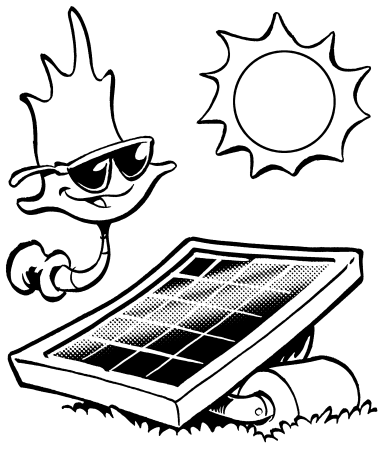
   http://www.re-energy.ca/t_otherclean.shtml

# Lesson Plan 050106

**Alternative Energy Facts & Choices**

## What is Alternative Energy?

Alternative energy is power that comes from sources which are not going to run out, do not pollute as much as fossil fuels (fossil fuels include oil, coal, natural gas), or do not create leftover materials that are dangerous to people and the Earth (such as nuclear power). Alternative energy includes solar power (from the sun), wind power, water power, and fuels made from plants. There are a few other alternative energies, but these four are the most popular.



## Why do we need alternative energy?

For 100 years, we have been living in a world where fossil fuel energy has been available at a very low price. Petroleum (crude oil), coal, and natural gas have been mined, drilled for and piped into tanks so they could be turned into fuel for cars and trucks, or into electricity to power our homes, schools, offices and businesses. Unfortunately, the low cost of fossil fuels is not as low as we thought. Burning fossil fuels creates a buildup of gasses that have started to make the Earth's temperatures warmer than they should be. This has led to problems of melting polar ice caps, more dangerous storms and more threats to nature. Also, because the number of people on Earth is growing more and more, we are starting to have so much demand for oil that it is becoming more expensive. The more people there are, the more energy all of them will need. Fossil fuel will eventually run out, and using up the rest of it will cause major problems because of how it makes the Earth too warm.

## What are our choices?

Our most important first step is to make people aware of alternative energies. Next, it is important for those people to tell their leaders to pass laws that help us move away from fossil fuels and toward other energy sources. Here is information about each of the four alternative energy sources we're learning about...

### 1. Solar Energy

The sun has been around, shining on us and giving our world warmth and light for many, many years. All this energy comes to us free, and will be there tomorrow and for millions of years to come. It's no wonder people have been trying to figure out how to capture and use energy from the sun.

Long ago, people realized that leaving things in the sun made them hot. This was the first type of solar energy people began to use. Today, this type of solar energy, letting the sun heat something up, is called "thermal solar" energy. People use it to heat water for their homes by passing cool water through pipes that are exposed to sunlight. As the pipes heat up, the water gets hot.

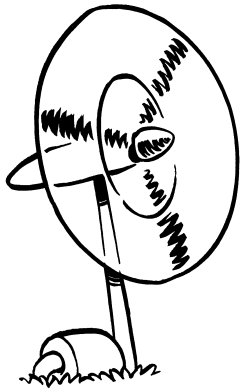
There is a second type of solar energy that has only been used since the 1950s. It's called "light solar" energy or "photovoltaic" energy. This type of solar power comes from changing sunlight into actual electrical current. Very thin photovoltaic cells, which contain layers of different chemicals, absorb light from the sun and change it into electricity. The electricity is then stored in large batteries for later use, or it is actually sent back through the power lines to the electric company, which pays you for making electricity! Photovoltaic energy is growing in popularity every year. New types of photovoltaic cells, called "thin films", are making solar electrical systems easier to put into homes, and less expensive than they were before.

Here's something that might surprise you: if we could capture just one minute's worth of all the sun's energy that falls on the Earth, it would be enough to provide all the power all six billion of us use for a whole year! Here's another interesting fact. If we could put solar panels over just 12% of the state of Nevada, they would create enough electricity to power our whole country!

### 2. Wind Energy

Wind energy has been used by people for thousands of years. For example, the earliest sailors realized that putting sails on their boats to catch the wind made their boats go faster. More than 100 years ago, many farms used wind power to pump water from underground up to a container where it could be used

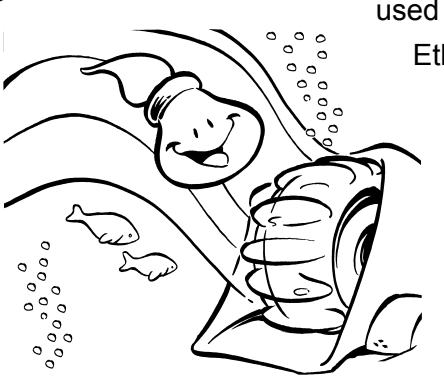
for their homes or to water their animals. Today, wind power is used to turn large propeller blades that are put on top of towers. As the blades turn, their movement turns a generator, which changes the movement into electricity, which is sent to power stations or stored in batteries. Today, more people are buying small wind towers that make enough electricity to run their homes.



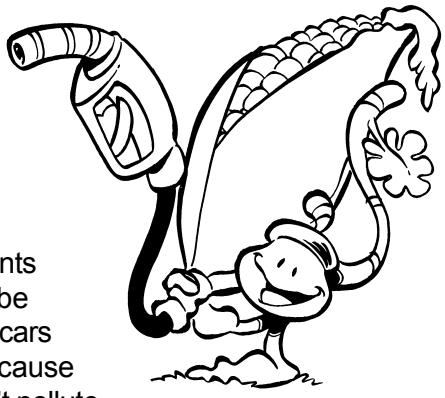
These days, very large windmills are being built in large groups. These are called windfarms. What's great about windfarms is that they can be located miles away from where people live, and then have their power sent back to cities and towns. Because wind patterns are very different from place to place, there are some places where windfarms won't work very well. But in very windy places, like the State of North Dakota, wind farms could create an amazing amount of electricity. In fact, if the wind energy from just North Dakota could be harnessed, we could create 40% of all the energy needed in the U.S.

**3. Water Energy (Hydro Electricity)**

Water energy is another type of alternative energy that was used by people long ago. Have you ever seen a water wheel next to a mill in an old painting or picture? The wheel was turned by the flowing water in a creek. The turning wheel was connected to a large millstone, that was used to crush grain to make flour and cornmeal. These days, flowing water is used to generate electricity. The way it works: large walls (called dams) are built to block the normal flow of rivers. But the dams are built with tunnels inside, through which the water can be directed as it continues to flow. Propellers are placed inside these tunnels, which turn as the water passes over them. The movement of the propellers turns a motor that generates electrical power. The power is either sent to a power station or stored in batteries. These days, even a small home can have it own water-powered electricity. If a home is next to a creek or stream, a "micro hydro" system can turn a very small wheel, which then generates electrical power.



Although there are concerns over building more of the very large dams that interrupt ecosystems and generate millions of watts of power, there is a lot of excitement about how micro hydro can be used without hurting a small stream or the plants and animals that live there.



**4. Biofuels**

It may sound hard to believe, but people are using corn and other plants to make fuels that can be put into the gas tanks of cars and trucks. It's great because burning these fuels won't pollute or cause global warming as much a using fossil fuels.

The oldest type of biofuel is called biodiesel. In fact, the inventor of diesel fuel first made it out of plants and vegetables. Today, biodiesel is made out of old cooking oil and other types of plant materials that are not needed for other things. When it's burning biodiesel made out of old cooking oil, the exhaust from a car's tail pipe smells like french fries! Really!

The second type of biofuel is called ethanol. Ethanol is created by distilling plant materials (corn is the most popular) into grain alcohol. This fuel is mixed with a little bit of fossil fuel (just 15%) and can be used in cars, trucks and vans!

Ethanol has people really excited because the large farming industry in the U.S., Canada and around the world. However, many believe that, unless farms stop using petroleum-based chemicals for fertilizer and for killing pests, growing crops to make ethanol fuels may be more damaging to the environment than other alternatives.