

# **Wind, Water, Sun: Energy for the long run.**

**TMP ENVIRONMENTAL SCIENCE**

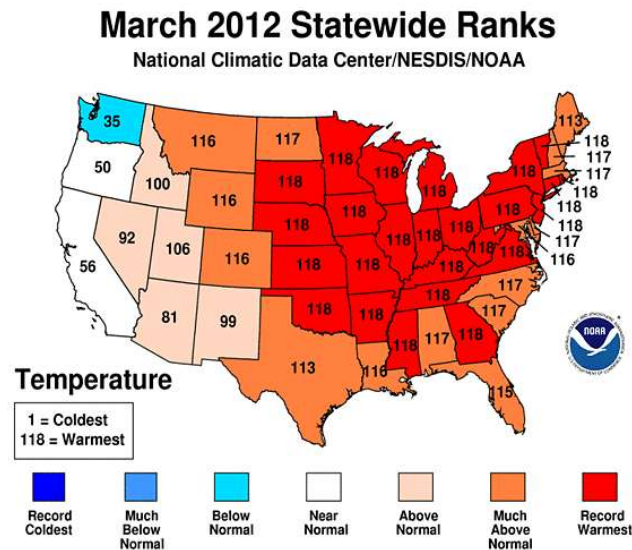
**SPRING 2012**



**Energy Alternators: Wind, Water, Sun: Energy for the long run.**

## INTRODUCTION

We must start turning away from our dependence on fossil fuels. **Burning fossil fuels creates greenhouse gases that continue to contribute to global warming.** Because of this global warming March 2012 experienced 15,000 record highs across the United States. The production of the world's oil is on decline. Some energy experts believe the U.S. is on the verge of an energy crisis, our utility grid runs at near capacity during peak demand barely meeting the needs of consumers and industry. Because of all of this our group decided to focus on alternative energy. Throughout the project we studied, hydroelectric power, solar power, electric cars, and the need to end fracking.



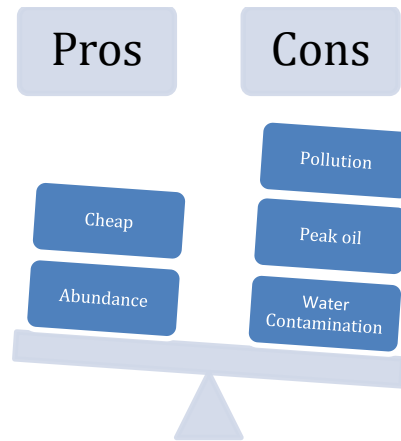
Past 12 months and first third of the year were warmest nation has ever experienced. U.S. records warmest March; more than 15,000 warm temperatures broken.

## BACKGROUND

There are both advantages and disadvantages to fossil fuels. However, some people say the disadvantages outweigh the advantages. A major advantage of fossil fuels is their capacity to generate huge amounts of electricity in just a single location. Fossil fuels are very easy to find. Transporting oil and gas to the power stations can be made through the use of pipes making it an easy task. Power stations that make use of fossil fuel can be constructed in almost any location. This is possible as long as large quantities of fuel can be easily brought to the power plants.

Pollution is a major disadvantage of fossil fuels. This is because they give off carbon dioxide when burned thereby causing a greenhouse effect. This is also the main contributing factor to the global warming experienced on the earth today. Environmentally, the mining of coal results in the destruction of wide areas of land. Mining this fossil fuel is also difficult and may endanger the lives of miners. Power stations that utilize coal need

large amounts of fuel. In other words, they not only need truckloads but trainloads of coal on a regular basis to continue operating and generating electricity. This only means that coal-fired power plants should have reserves of coal in a large area near the plants location. Use of crude oil causes pollution and poses environmental hazards such as oil spills when oil tankers, for instance, experience leaks or drown deep under the sea. Crude oil contains toxic chemicals which cause air pollutants when combusted.



Above are the pros and cons of fossil fuels. As shown there are more cons.

Something must be done to help end our dependency on oil. The solution? Renewable energy. There are tons of different ways to create energy without producing greenhouse gases.

### **HANDS-ON EXPERIMENTATION**

To better engage ourselves in our projects, we ordered in several kits for our group. Below are descriptions of these kits, what we learned from them, how they connected to our projects, and our recommendations for future use.

#### **Description of Kits**

1. Green Essentials Power House Kit: Learn about sustainability by conducting experiments and building energy-related models. The 10 building projects include the power house itself, a greenhouse, a solar cell array, a passive solar collector, a solar oven, an air conditioner, a refrigerator, a hydrometer, a lemon battery, and a wind power generator.



#### **What We Learned**

1. I learned that there is a lot more to sustainability than I thought. There are many thoughtful ways that my family and I could reduce our carbon footprint such as thinking about passive solar and planting our own garden.

## How This Connected to Our Projects

1. My project focused on decreasing our dependency on fossil fuels and making a turn towards alternative energy sources. This kit helped cement for me the ways that this can be accomplished in the average American household.

## Recommendations of Kits for Future Use

1. My kit's experiments were a bit too young for me and some of them did not work. Also, I needed more materials than what was included in the kit. Overall, I got some good data and had fun experimenting with all 100 activities so I would recommend the kit but I might work on expanding some of the experiments to make them more age-appropriate for me.

## DATA & RESULTS

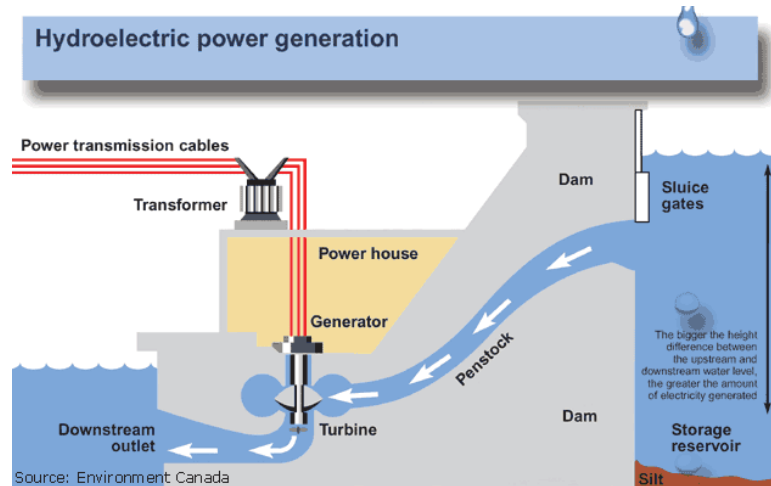
During our project we studied hydroelectric power, solar power, electric cars, and the need to end fracking.

**Fracking:** Fracking (aka, hydraulic fracturing or industrial gas drilling) is a dangerous way of getting oil and gas and a shortsighted energy strategy. It's poisoning our air and water and on its way to jeopardizing the health of millions of Americans. The first frack job happened in 1947. Many people don't aren't aware but fracking is actually more expensive than traditional drilling. Some wells require between 1 and 8 million gallons of water, and there is nearly 40,000 gallons of chemicals per fracked well. This mix can contain up to 600 mixed chemicals. 30% of all our domestic natural gas comes from fracking. Studies have shown that methane levels in groundwater near fracked wells can be 17x higher than normal.



The above diagram explains how fracking works.

**Hydroelectric Power:** Here we studied the benefits of hydropower. Hydroelectricity is now used by 7% of the population, most of which is coming from bigger companies/businesses. There are currently 7 major hydroelectric power stations in America, located in Washington, New York, The Columbian River, Virginia, Colorado, and Oregon.

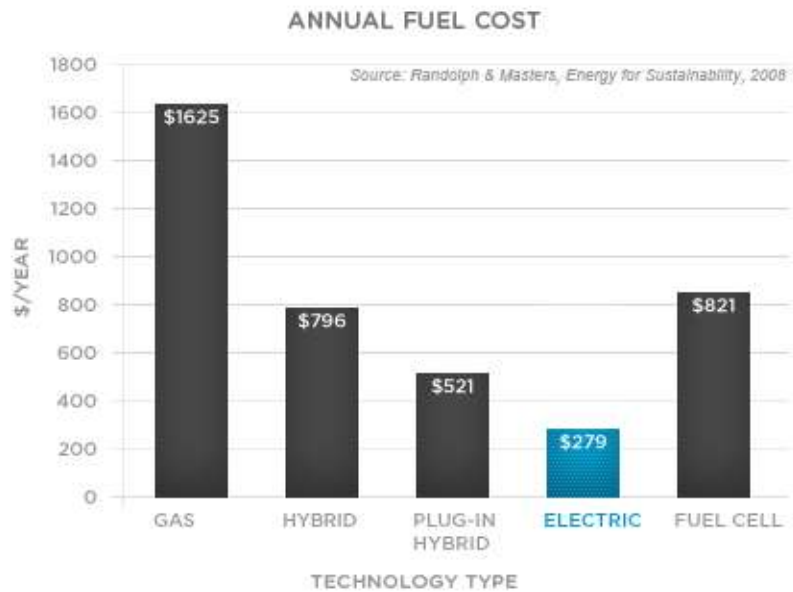


Above is a diagram of how hydroelectricity works

### **Solar Energy:**

### **Electric Cars:**

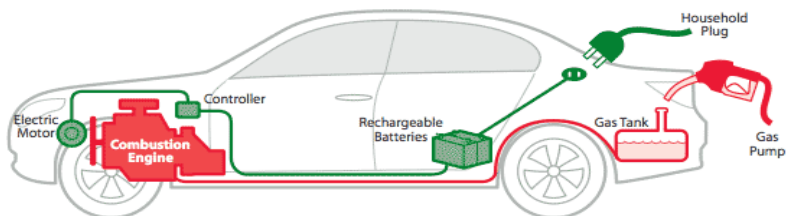
U.S cars and light trucks were driven 2.6 trillion miles in 2004, the equivalent of 10 million trips from the earth to the moon. U.S automobiles had an average fuel economy of 19.6 miles per gallon in 2001, for an average annual consumption of just over 600 gallons of gasoline. Fueling with electricity instead of petroleum is a sound financial decision. Alternatively, a gasoline-powered car rated to 20-mpg costs about \$0.15 per mile. The poll also found that Americans want Congress to boost fuel efficiency standards. Four out of five respondents, including 86 percent of Democrats and 76 percent of Republicans and independents, said that they would support "Congress taking the lead to achieve the highest possible fuel efficiency as quickly as possible" by raising the fuel-efficiency requirements for U.S. vehicles to achieve the goal of 40 mpg. Europe cars on average get 40 mpg, compared with 20.4 mpg for U.S cars.



Above is a comparison of different transportation technologies.

### Electric vs. Gasoline

<p>No Tailpipe Emissions </p> <p>Utility Company </p> <p>100+/- Mile Range </p> <p>Hours to Recharge </p> <p>2 cents per mile </p>	<p>Greenhouse Gases/Pollution </p> <p>OPEC </p> <p>300+ Mile Range </p> <p>Minutes to Refuel </p> <p>12 cents+ per mile </p>
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Above is a comparison of gas to electric vehicle.

### CONCLUSIONS SERVICE & FUTURE DIRECTIONS

Throughout this project, we have seen how huge of an impact CO<sub>2</sub> emissions have on our planet. Some people may get overwhelmed at the concept of alternative energy but it is environmentally responsible and in the end more cost effective. Each person can make a difference no matter how minimal. We can all make a difference in reducing CO<sub>2</sub> emissions. We can help by bringing an end to fracking by turning to alternative energies such as

hydroelectric power and solar power. Many things need to be changed in order to reduce our dependence on fossil fuels. The service that our group has done is public awareness about alternative energy. We have also informed our peers and public of future technologies. We have awareness brochures about fracking and its danger to the environment. Our group helped organize an awareness fair at SFCC put on by The MASTERS Program. We created a Facebook page to help spread awareness about Fracking. There is currently a Bill called S.587: FRAC Act. A bill to amend the Safe Drinking Water Act to repeal a certain exemption for hydraulic fracturing, and for other purposes. We also created a petition to help PASS THE FRAC ACT. Our group plans to send the petition and a letter to our representatives in Congress.

## REFERENCES

During the time that we studied alternative energy we found our information from the following websites.

- **Websites**
- [www.water.usgs.gov](http://www.water.usgs.gov)
- [www.govtrack.us/congress/bills](http://www.govtrack.us/congress/bills)
- [www.NOAA.gov](http://www.NOAA.gov)
- **Thames & Kosmos alternative energy and environmental science hydropower kit**

These websites were used to find alternative energy information, and facts.