Storing Electricity

Introduction

One of the many issues with human kind is their unwillingness to change. However, as evolution has shown, change becomes necessary at times. Over time, humans have created traditions and a set way of doing things. However, evolution requires change over time. We must be able to adapt to the earth as it changes around us. Currently, we are using natural resources at a rapid pace, which is resulting in damage to the earth.

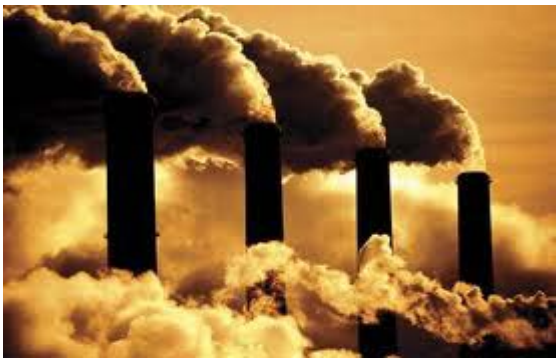
The earth offers a complex group of bio-systems that can and has been disturbed by the reckless and excessive use of natural resources. Our greediness is starting to have an effect on the world around us. Consider the weather patterns that we have been seeing in the recent years. Our weather is becoming bigger. The natural disasters such as the hurricanes, tornadoes, and tsunamis are a result of a disruption of the volatile eco systems of the world. While not all of this caused by our use of natural resources, a lot of it can be blamed on the way we are using these valuable sources the earth has to offer.

We are seeing the glaciers melt at a fairly quick rate. This is going to raise the water levels of the oceans on a global basis. When the water is higher, devastating changes in the climate will take place. This includes more floods, tsunamis, hurricanes and tornadoes. We are already starting to see the effects of the melting glaciers, imagine what it will be like in a hundred years.

Additionally, the population of the world is growing exponentially. Asia is one place in the world that is growing at a very fast rate. This population growth leads to more and more fossil fuels and construction materials being necessary.

A solution must be found and implemented in order to help save the fragile ecosystems around the world. There have been solutions found, but none have been implemented at a high enough level. The reason for this is because people are reluctant to change. There have been solutions found, but the huge demand for fossil fuels, (oil, coal, and natural gas) is so great and there is so much money involved that using new solutions is being pushed further and further back. The problem with this is that if we continue to use fossil fuels at this same rapid pace

we are going to wreck the ecosystems of our planet, likely in ways that are irreversible.



The United States of America is the richest country in the world. It is also one of the most wasteful. The consumption of fossil fuels in the United States is the result of wasteful transportation that is wasteful combined with electric power generation that is inefficient. Americans are used to a high standard of living and are stuck in their wasteful ways, making change to a more efficient system that much more difficult.

There is a complete lack of policies regarding energy control. This has resulted in a monopoly over the oil industry. In addition, it is difficult to implement a new industry quickly and funding to accelerate renewable and sustainable energy technologies is not considered.

The mindless use of fossil fuels has to stop and is going to require that everyone from politicians through the general public work together. Children need to be taught the harmful effects of continuing to use these natural resources in this way. Every effort should be made to promote the use of renewable energy technologies in order to help save planet earth for future generations.

The damage to the earth's ecosystems can no longer be ignored or put off for the future. The damage is of immediate concern. Scientific studies have shown that in the past 100 years the ozone has depleted by nearly 40 percent. There are also reports showing that greenhouse gasses have altered weather patterns throughout the world. Unfortunately, the majority of people throughout the world and especially the people in the United States are not educated about these facts and remain unaware of the disaster that is waiting for future generations.

Most people remain blissfully unaware of the fact that the situation is quite serious and that change needs to start happening now. Many people think that there is nothing that they can do alone to help, so they continue on the same destructive path. However, there are things that a person can do in their own lives to help conserve energy.

This book will show you how you can store energy and the many benefits of using energy storing techniques to your benefit. Storing energy can help you save money and is a step in the right direction when trying to save the limited amount of resources that are available. Another benefit of storing energy is that you can sell energy back to the government or to other companies.

Everyone needs to work together to do their part in helping to save the planet. Learning how to store and sell energy is one of the best places to start. The benefits of storing energy are great not only for the planet, but also for your pocketbook. Taking the time to read this information to learn more about energy and how we use it as well as the other greener options that are available is one step closer to becoming self-sufficient in case the need ever arises.

History of Electricity

In order to understand how to store electricity it is good idea to look back at the history of electricity and how we have come to use it today. The history of electricity dates back well over a hundred years ago. Recent discoveries have shown that the use of batteries may date all the way back to the ancient Egyptians. There have been ruins found that experts believe may have been used as an energy source. These ruins are strange pots that have copper cylinders that were glued into the opening. An iron rod was in the middle of the cylinder. These pots were excavated in 1936 and the person who found them is quite sure that they were primitive batteries. Reconstructions were done and showed that it was possible to create electricity from it. The use of batteries as far back as the ancient Egyptians shows just how energy dependent humans have been for a long period of time.

The history of electricity in the form that we know seems to begin with Benjamin Franklin and his famous kite experiment. Here are some important dates and events involving the evolution of electricity and its uses:

1752: Benjamin Franklin was one of the first people to realize that electricity existed. He tied a key to a kite to prove that static energy and lightning were the same form of energy. Franklin was the first person to use the terms positive energy and negative energy. His understanding that there was power out there paved the way for the future.

1800: Count Alessandro Volta who was from Italy created the Voltaic pile. This invention led him to discover a way to generate electricity. Volta also made other discoveries in pneumatics, meteorology, and electrostatics. He is credited with inventing the battery, which was technically the first of its kind. “Volt” a measurement of electricity is named after Count Volta.

1808: Humphry Davy is credited with inventing the first arc lamp that could be used effectively. The importance of this lamp was that it could be used in the coal mines. This lamp allowed for the mining of the deep coal seams, despite the presence of methane/firedamp.

There is some controversy regarding this invention. Another individual, George Stephenson created another type of safety lamp during the same year. He states that he had been manufacturing his lamps before Humphry came up with his.

1820: It was during this year that the relationship between magnetism and electricity was confirmed. There were three individuals that conducted separate experiments to confirm this connection. They were A.M. Ampere, Christian Oersted, and D.F.G. Arago.

1821: During this year, Michael Faraday is credited with creating what is considered the electric motor, which was the first of its kind. Faraday created two devices that produced electromagnetic rotation. The magnetic force was rotated around a wire.

1826: Ohms Law: Georg Ohm created a definition of how power, current, voltage, and resistance were all related.

1831: Back to Michael Faraday,in 1831 by using his invention the induction ring, Faraday was able to prove that by making changes in the electromagnetic field it was possible to induce electricity. This research about how electric currents worked led to further understanding about electric motors and electric transformers.

Joseph Henry did not publish his work, but also discovered the principles of electromagnetic inductions. In his work he described the electric motor as well.

1832: Hippolyte Pixxii used the principles of electromagnetic induction found by Faraday to create the "dynamo." The dynamo is an electric generator that has the capability to produce enough power for industry. The dynamo worked by cranking a magnet around iron that is wrapped with wire. The device used coiled wire to produce electric current spikes that were not followed by any type of current.

1835: This is when Joseph Henry created an electrical relay that could be used to send electric currents across long distances.

1837: This is a very important year in the history of electricity as it was during this time that Thomas Davenport is credited with inventing the electric motor. The electric motor invented during 1837 is still used in many electric appliances that we use today.

1839: Sir William Robert Grove created the fuel cell. This is a device is used to produce electrical energy by combining oxygen and hydrogen.

1841: James Prescott Joule is who the unit of thermal energy known as the Joule is named after. He was able to show that energy could be conserved in an electric circuit through chemical transformations, thermal heating, and current flow.

1844: Samuel Morse created a telegraph that ran on electricity. This machine was capable of sending messages very long distances using wire. His messages were sent using what is now known as Morse code, a serious of beeps in a certain order to mean specific words.

1860:J.C. Maxwell came up with the math theory of electromagnetic fields. This started a new era for physics. His theory brought together light, electricity, and magnetism. Maxwell's Equations included four laws and it was these theories that lead to the created of radios, televisions, and electric power.

1876: Charles Brush created the open coil dynamo. This generator was capable of producing a steady electrical current.

1878: Joseph Swan, an Englishman, created what was the first incandescent light bulb. This light was called the electric lamp. The lamp did not last for very long though.

Charles Brush created an arc lamp during this type that was powered by generators.

During this year, Thomas Edison established Edison Electric Light Company. The company was located in the United States in New York City. Edison bought several electric lighting patents and started experimenting on how to develop a light bulb that was practical and would last for a long period of time.

1879: After experimenting for a long time, Edison created a light bulb that would last for about 40 hours. By the following year, he created bulbs that would last for around 1200 hours.

The first public streets were lit using brush arc lamps or electric lights. The streets were located in Cleveland, Ohio.

In California, the Electric Light Company located in San Francisco begins selling electricity to consumers. This is considered to be the first electric company to sell electricity and they used two generators to power 21 lamps.

1881: E.W. Siemens invents the first electric streetcar.

1882:Thomas Edison founds the Pearl Street Power Station located in New York City. This was the first power plant in the world and it could power up to 5000 lamps. The power station used a direct current system. The systems that we use today run on alternating current.

In Wisconsin, a hydroelectric station opens.

The first electric lights were placed on a Christmas tree by Edward Johnson.

1883: The Tesla Coil was invented by Nikola Tesla. This coil could change electricity from low to high voltage, which made it easier to transport through long distances. This transformer is extremely important for the history of electricity as it plays a major role in the alternating current system, which is what is still used today.

1884: The electric alternator was invented by Nikola Tesla. This generator could produce alternating current. Up to this point in history direct currents from

batteries generated electricity. The alternating current system was better for sending electricity across long distances.

Sir Charles Algernon Parsons invents the steam turbine generator. This generator could create large amounts of electricity.

1886: The induction coil transformer as well as a system for alternating electric currents was invented by William Stanley.

1888: The polyphase alternating current system is created by Nikola Tesla. This alternating current system had everything necessary to produce electricity, the generator, transmission system, transformers, motor, as well as lights. Tesla sold the rights to this patent to this system to George Westinghouse who was the president of the Westinghouse Electric Company.

1893: The World's Fair held in Chicago, Illinois, was lit by an alternating current system from Westinghouse Electric Company.

An alternating current power line was opened and sent electricity 22 miles, from the Folsom Powerhouse located in California to Sacramento, California.

1896: an alternating current power line was built and transmitted power a distance of 20 miles, from Niagara Falls, New York to Buffalo, New York.

1897: Joseph John Thomson discovers the electron

1900: The 60 kilovolt becomes the highest transmitted voltage

1901: first power lines are opened between the United States and Canada.

1902: In Chicago, a 5 megawatt turbine was opened at Fisk Street Station.

1903: In France, the first gas turbine is created

In Chicago, the first all turbine station is created.

The largest generator in the world is installed along with the largest voltage line. It was 136 kilometers and 50 kilovolts.

1908: the first electric vacuum cleaner is invented by J. Spangler.

Fisher creates the first washing machine that runs on electricity.

1909: Switzerland opens a pumped storage plant, the first.

1911: W. Carrier invents electric air conditioning.

1913: “Cinder Catcher” a control for air pollution was created by T. Murray.

Goss invents the first electric refrigerator

1920: The FPC (Federal Power Commission) is created.

1921: In Wisconsin, the Lakeside Power Plant becomes the first to only burn pulverized coal.

1922: CONVEX (Connecticut Valley Power Exchange) begins. This is the first connection between utilities.

1923: discovery of Photoelectric cells

1928: Boulder Dam construction begins

1933: TVA (Tennessee Valley Authority) is started.

1935: This is the year where the federal government created the Federal Power Act, the Public Utility Holding Company Act, and the Securities and Exchange Commission. This was also the year that the first night time baseball game was held.

1936: the Hoover Dam was finished and the Rural Electrification Act was passed

1947: the scientists from Bell Telephone Laboratories invent the transistor

1953: In England, the first nuclear power plant is ordered. A transmission line for 345 kilovolts is opened.

1954: Russia opens the first nuclear power plant that generates electricity

The Atomic Energy Act is passed and allows nuclear reactors to be owned by private companies.

1957: Pennsylvania opens the Shippingport Reactor which provides electricity using nuclear power. This is the first plant to offer this type of electricity to consumers in the United States.

Since the fifties the amount of energy consumption in the United States has continued to grow. It has grown throughout the world as well. Most industrialized nations use power grids to supply the population with energy for heating, cooling, and lighting. From the time that Benjamin Franklin first discovered the unique properties of lightning and how this energy could be harnessed to today there have been many changes.

One of the problems that have developed over time is the fact that creating electricity was thought to require the use of fossil fuels, which has had a great environmental impact. The haste to start creating more and more energy has led to practices that are not particularly efficient or environmentally friendly.

How we Use Electricity Today

When it comes to electricity, most people do not give it a second thought. We come in our house and flip on our lights. We turn on the television or the computer and are instantly entertained. We even read books through electronic devices. Electricity is something that we all take for granted each and every day.

As seen in the history of electricity, it was well over two hundred years ago that Ben Franklin took his kite out into a storm. Since that time there has been much study and learning to get to where we are today.

Currently, the majority of our electricity comes from burning fossil fuels such as coal, natural gas, and oil. This production of electricity works by using the energy created from the fuels combustion to create a flow of electricity. This type of energy use has created a big problem in the world as these resources are non-renewable and are eventually going to all be gone. The consumption of electricity today is quite overwhelming and new fuel sources must be found in order for us to keep using our computers, air conditioners, televisions, and everything else that we have come to know and love.

The United States is second in energy

consumption in the world. In energy use per capita, the United States ranks 7th, behind several small countries and Canada. Most of this energy consumption comes from fossil fuels. In 2010, the EIA reported that 25% of the energy used in the United States came from petroleum, with natural gas and coal use at 22% each. 8.4% of the energy comes from nuclear power. Unfortunately, renewable energy sources only supply about 8% of the energy consumption in the United States. The majority of energy supplied by renewable resources comes from hydroelectric dams. Solar energy, geothermal power, and wind energy make up the rest of the eight percent.

Over the years, the consumption of energy in the United States has grown at a faster rate than production. This has resulted in the United States relying on imports to meet the energy needs of the people in the country.

Types of Electric Production

When it comes to how electronic devices work, it may seem almost magical to most people. Electrons move at such a high speed and the effects of electricity are invisible, which make it hard to imagine what is actually happening. Electricians and electric engineers have to study for a long time in order to fully understand the details of their work. However, the basic concept of how electricity works is a bit easier to understand. Simply put, electricity is just the movement of charges.

Electricity as we know it is made by converting a form of energy into a flow of electrons. There are several types of power plants that are used to make electricity and the source of the energy will depend on the type of plant.

For example, at a kinetic generating power plant the water or wind is the source of energy. This energy goes through a turbine and then to the drive shaft. It is then put through a generator and sent to the electric power grid. Motion is the key to kinetic generating power plants.

A thermal generating power plant will use heat from fuel the same way that the kinetic plant used water or wind. Thermal generating power plants can use all

types of heat sources in order to create energy. This includes heat from the sun. Solar energy is a form of thermal energy that can be used to create electricity.

In every type of power plant a generator is used. Generators are used to exploit the relationship between electricity and magnetism. In a large alternating current generator an outer shell made of powerful magnets will rotate around the armature, which remains stationary. This armature is wound with heavy water. As the magnets move they create an electric current in the wire.

The most important thing to remember about electricity is that it is not harvested or mined, it has to be manufactured. Storing electricity in large quantities is not easy, but in small amounts it is possible. Most electricity is manufactured as it is demanded. Power plants have to be able to keep up with the demand. Most power plants in the United States and in the United Kingdom have a very high rate of reliability. Consider how often your power goes out. This shows how reliable the power grids really are. It is this reliability that many of us simply take for granted and have come to expect. This is one of the reasons that changing the future of energy use is difficult.

Here is a closer look at the different types of power plants that are used throughout the world.

Thermal Generating Plants

A thermal generating plant uses the energy from heat to produce electricity. Water will be heated in a large boiler until it turns into steam of a high temperature. The steam will then be sent through a turbine. A turbine consists of several fan blades that are attached to a main shaft. When the steam moves the blades the shaft will start to spin. The shaft is attached to the generator through a rotor. The generator then creates electricity.

Fossil Fuel Plants

Fossil fuel plants are the most common types of energy producing plants. The reason for this is because they are fairly reliable and any problems that arise are typically confined to a relatively small area.

Fossil fuels are the remains of animals and plants that lived a long time ago. These remains have been exposed to high temperatures for millions of years under the ground and this pressure has transformed them into different forms of carbon including oil, natural gas, and coal. Fossil fuels can easily be stored in mass quantities.

There have been hundreds of years of research into developing fossil fuel energy plants. There are many electric utilities that run from these fossil fuel plants and have for decades. These plants are now typically fully paid for, which make them very profitable to run. The fossil fuel plants being paid for means that the utility companies make more money. This also helps keep the cost of electricity lower for their customers.

However, fossil fuel plants are part of the environmental problem. These plants are not very friendly towards the environment. Not only do they use resources that cannot be renewed, but they also produce nitric oxide and sulphur dioxide which pollutes the air. This requires scrubbers that are extremely expensive.

Another environmental impact of these types of energy plants is the pollutants that can be carried from the wastewater from the steam. This can enter the watersheds of the area and create environmental problems for the ecosystems throughout the area. Even when there is good pollution controls in place there are still numerous waste materials that are produced. The current main concerns are the ash and carbon dioxide gas that are produced from the plants.

One of the biggest problems with fossil fuel plants is the fact that they use resources that cannot be renewed. These fuels took millions of years to be created and they are going to run out eventually. Extracting the fuels creates many types of environmental issues. In addition, oil spills in the ocean and the strip mining of coal create catastrophic impacts for the ecosystems that they destroy.

The fossil fuel plants are currently producing the majority of the energy that is used. This needs to change soon as the environmental impacts alone are so great. Additionally, these resources are not going to last forever, which means that we need to start thinking about other sources of renewable energy.

Cogeneration

Most power plants cannot use oil because it has become so expensive. As a result, both natural gas and coal are being used as a cheaper option. Both of these types of fuels are being used in a more efficient matter in what is called a cogeneration plant. This type of plant is not a new idea, but simply takes advantage of the way most large electric users operate. There are many factories that utilize steam for their production process. The utilities will make steam and sell it to these customers and also use it to run their generators.

Instead of simply exhausting the wasted steam once it passes through the turbine, a co-generator is used to pipe the wasted steam into a commodity that can be sent to consumers located nearby. This is called a top-cycle co-generator. A bottom cycle co-generator works in the reverse and uses the wasted steam to help drive turbines. Reusing steam can raise the efficiency of a cogeneration power plant by over 50%.

There have been new developments for these types of plants using new designs and materials. The new designs help increase the reliability and help control both the atmospheric and thermal pollution that is created from this type of energy production. When these new technologies are part of the plants from the beginning, the installation is less expensive. Some examples of technologies being used include Zero Discharge, Selective Catalytic Reduction, and Circulating Fluidized bed boilers are all treatment systems that help control some of the environmental problems of this type of energy production.

Biomass Plants and Combined Cycle Plants

There are natural gas plants that produce electricity without using steam. These plants burn the natural gas to power the generator. A gas-turbine generator is extremely popular because it can be started fast and responds quickly to surges in demand for electricity. This is one example where the increase in demand for electricity has caused production that was not thought through carefully.

A newer type of plant called a combined cycle plant has been created to make the natural gas plant a bit more efficient. The combined cycle plant will channel the hot exhaust from the gas turbine into a boiler. This boiler then creates steam that is used to turn an additional rotor.

Additionally, these plants are now being created in a way that they can burn biomass. Biomass is the waste wood or other type of plant material. A biomass plant in Florida uses the waste from a sugar cane plant during part of the year and waste wood during the season where the sugar cane is being grown.

Nuclear Plants

A nuclear plant works in almost the same way that a fossil fuel plant does. Of course, there are significant differences in the way that energy is created. Instead of burning fossil fuels, a nuclear power plant generates steam using atomic fission. Atomic fission creates the steam that powers the generators, the same as in other types of thermal plants.

A nuclear power plant does not need to refuel very often and during normal operation the emission of air-borne particles and greenhouse gasses are minimal. This makes nuclear power plants attractive to those that are worried about air quality. The waste water from a nuclear power plant is much hotter than the waste water from fossil fuel plants and a cooling tower is used to help with this issue.

In the United States the drive to move towards nuclear power faltered as the general public became concerned about the economic, environmental, and safety issues that these plants portray. The cost of construction for this type of plant grew substantially as more safety mechanisms were required.

There have been some unexpected issues that have risen at nuclear power plants including the fact that boiler tubes start to wear out before they should. Nuclear engineers argue that these problems simply require small technical fixes. Currently, engineers are working on new plant designs with further safety features.

People that are opposed to this type of power plant argue that using plutonium and uranium comes with too many risks and problems. They state that the risks outweigh any benefit that this form of energy may have.

Another issue that has yet to be solved is the fact that there is no good way to dispose of the fuel cores and other accessories that are contaminated. These materials can remain dangerous for many thousand years. Currently, they are being buried in areas that are considered to be geologically stable. However, this plan is extremely controversial.

Another problem nuclear power plants face is high profile accidents. The accident in 1979 at 3 Mile Island as well as the 1986 Chernobyl incident did nothing to help the argument for this type of energy producing plants. The most recent Tsunami in Japan that flooded the nuclear power plant did not help the argument for nuclear power plants. While nuclear power is responsible for approximately 22% of the energy created in the United States, the future of these plants remain uncertain.

Kinetic Generating Plants

Wind and water can also be used to change energy into electricity. Wind mills and hydroelectric plants use kinetic energy instead of using heat energy. Kinetic energy is energy created from motion. The wind or water is used to spin a turbine. This turbine then spins the generators rotor. There is no fuel being burned, which means there is no air pollution from these plants. Both water and wind are renewable energy sources. There is a long history of using these resources in order to create energy. However, there are some issues that come with this type of energy.

Hydro-electric Plants

Currently, there are two types of hydro-electric power plants in service. The first type is called a run of river plant. This plant uses the energy from a current that is fast moving in order to turn the turbine. Water flow can vary greatly in rivers and the amount of rain fall affects the current of the river. For this reason, there are not very many sites that are suitable for this type of plant.

The majority of hydro-electric plants will use some type of reservoir to make up for times of drought. These reservoirs are also used to help boost the pressure of water in turbines as well. These reservoirs are man-made and take up a lot of area. The lakes are often combined with great recreational facilities. A large dam is required to control the flow of water and these are good for controlling flooding in the area as well. For this reason, the common assumption has been that the benefits of these reservoirs outweighed the costs.

The costs associated with building these large reservoirs is the loss of the land that is now submerged in water. The dams displace people as well as destroying the wild life habitats of the area. In addition, if one of the dams bursts, it can be

disastrous. Some of the environmental issues can be avoided by designing the reservoir thoughtfully. Fish ladders can be used in order to allow fish to travel around the dam is one example of an environmentally thoughtful design. However, there are other issues that have risen and there are protests that have risen against these types of power plants.

Pumped Storage is another type of hydro-power. There are some plants that will take advantage of time frames where energy demand is low and pump the water into a reservoir. When the demand for power goes up this water can be channelled through a turbine to create electricity. This is one way that the efficiency of the plant can be increased.

Wind Power

A wind farm does not need a reservoir and does not create any type of air pollution. A small wind mill can be used to provide power to your own home. However, air does not carry as much energy as water does so there is a lot more needed in order to spin the rotors. In order to operate a commercial wind farm there needs to be at least a few very large wind mills or several small wind mills to harness enough energy. The construction cost of a wind farm can be quite high.

One of the main problems with wind farms is that there are not very many suitable locations for them. Winds have to blow predictably in order for this type of energy to be utilized. Even in places where the wind blows on a predictable basis the windmills will often need to have special gears to keep the rotor turning at a constant speed despite the speed of the wind. Another issue that many people have is the fact that they feel that the installation of these large windmills can turn a beautiful ridge into a steel forest that is quite ugly. They also feel that this can be detrimental to bird life.

Alternative Generation

There are many types of alternative energy technologies that are currently under development and have been for decades. These types of power plants use equipment that is not traditional in order to produce electricity. Advocates for this

type of technology believe that the political and technical situation will finally start to bring these alternate sources of energy into the market place.

Geothermal Power Plants

Molten rock, radioactive decay, and pressure deep under the crust of the earth make it extremely hot. One of the natural phenomenon's that shows this heat that is available under the ground is geysers that erupt. These geysers send hot water and steam high into the air. There are also hot springs that show just how much heat and energy can be found just in the ground. Power engineers have been looking into natural sources of hot water and steam for many years.

Using this natural thermal energy a geothermal plant can provide electricity with very low levels of pollution. There are many varieties of plants along with the product from the geothermal site that can be used for electricity production as well as heating.

One of the main issues with the geothermal power plant is finding suitable sites for them. However, technological innovations are being made that make finding other sites more practical. Additionally, tapping into these geothermal resources can result in natural geysers being "turned off" and this is something that needs to be taken into consideration when planning this type of plant.

Solar Power

Photo voltaic or Solar Cells are the generator of electricity, meaning that they do not need a generator in order to work. Solar cells are typically arranged in panels and take advantage of light's ability to cause current flow in certain substances. Cells are wired together and the current then flows from the panel as the sunlight hits it. There is no pollution created by operating these types of cells. In addition, scientists predict that this fuel supply will be around for at least the next 4 billion years.

One problem with solar panels is the cost to make them as well as the fact that they do not work when the weather is bad or during the night. There have been manufacturing issues as well as the fact that not all light that strikes the panel is converted to electricity. However, harnessing the power of the sun offers a

powerful driving force to create better, cheaper, and more efficient ways to use this type of energy.

Fuel Cells

Fuel cells work by combining chemical substances to create energy. This sounds like it is similar to how a battery works, but the difference that the fuel cell is powered by a continuous flow of fuel. For example, fuel cells used on the United States Space Shuttle combined oxygen and hydrogen to produce electricity and water.

The cost of making a fuel cell has been relatively high, making them unsuitable for installing on a large basis. However, there is a modular technology available that can be added in small increments. The research for this type of technology is showing promise, with a test installation showing production of 200kw using the gas that was created in a wastewater treatment plant. Japan has started using fuel cells for central power.

Decentralized Generation

Ultimately, the usefulness of using photo-voltaic and fuel cells may not be in creating large centralized generating plants. In the years before the large networks of spanning wires, a small generating station located on the premises made more economic sense for many industrial power users and business owners. As equipment and motors were improved and a new energy supply was created, many homes and businesses began to use electricity.

During the 20th century, the smaller generating companies began to consolidate and the independent plant started to disappear. Economically, it made more sense to buy power from a utility that was centrally located rather than generate it on location. Large companies started to connect and create systems that shared their reserve capacity.

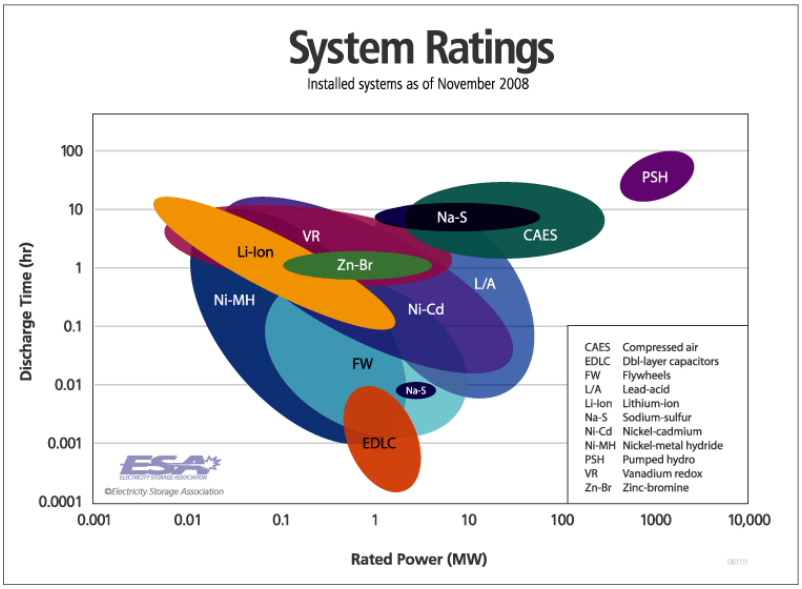
The use of energy may start to see a change in the 21st century. Technological advance in generating electricity are starting to improve. In addition, concerns for the environment are on the rise. The concept of using a centralized generating station is being questioned. In many cases it is not economical to heat a home and

business from a central location. An individual furnace will provide the heat for different buildings. Fuel can be provided by different types of distribution systems.

Additionally, improvements in technology and design of both fuel cells and photo-voltaic could change the way that people receive energy. As the cost for designing and making these cells improve, the use of them will increase.

Storing Electricity

One of the main things that make electricity different from other types of energy is the fact that it cannot be stored and simply accessed as needed in large amounts. The unique feature of electricity requires that many different controls and reserve capacities must be used in order to keep the system stable while also meeting the fluctuating and ever changing demand.



There are several ways that electricity can be stored. Most of these storage techniques are for small amounts of energy and can be used for electronic purposes. However, these techniques are not great for providing for entire electricity needs. Here are some of the different storage techniques that are currently developed or in the process of being developed and improved.

SMES (Superconducting Magnetic Energy Storage)

This is a system that can be used to store energy. It works by using a magnetic field that is created through the flow of a direct current created in a superconducting coil that is cooled to a temperature that is lower than the critical superconducting temperature.

Typically, SMES has three parts, which consist of the superconducting coil, the conditioning system, and the cryogenically cooled refrigerator. The coil is charged and afterwards the current does not decay and the energy can be stored for an indefinite amount of time.

When the energy is needed it can then be released into the network through discharging the coil. The power system will transform the alternating current power into a direct current or vice versa. The inverter/rectifier makes up for around 2 to 3% energy loss for each direction. Out of all the methods for storing energy, SMES loses the least amount of electricity during the process. The round trip efficiency of the system is greater than 95%, which makes the system extremely efficient as far as energy storage systems are concerned.

One of the biggest problems of this type of energy storage is the fact that the superconducting wire cost a lot and the refrigeration process takes a lot of energy. For this reason, SMES is typically only used for energy storage in short durations. Most commonly, SMES is used to help improve the quality of power. If utilities used SMES it would only be used as a diurnal storage device and charged from the base load of power that occurs at night and would help meet the peak load times during the day.

The main advantage of using SMES over other types of storage devices is the fact that the time delay between the charge and discharge is very short. The power that is stored is available almost immediately and can put out a high amount of power for a short amount of time. The other big advantage of this type of storage is that it loses less power than the other storage methods that have been found because the currents of electricity have almost no resistance. In addition, the main components of an SMES storage system remain motionless, which means that these storage devices are highly reliable.

Currently, SMES storage units are available for commercial use. These units are very small and there are larger units being tested. There are technical challenges to using this type of storage method. The large size of the mechanical structure that is needed for this type of storage poses a problem for many places. There are manufacturing issues as well. The first manufacturing issue is the fact that the superconductors that can be used for the bulk cable are typically delicate, which

makes it difficult to create. The second issue is a matter of infrastructure. The wire has to be kept in a vacuum flask containing liquid nitrogen.

One of the main reasons that this type of electric storage has not been utilized and researched more is because of the high cost of maintaining the operation of the devices. Additionally, there are normal conductors that are being developed that offer adequate techniques for electricity storage.

Battery Storage

A battery uses electrochemical cells to change chemical energy that is stored in the cells of the battery into electricity. A primary battery contains a chemical that will hold the charge and then starts to dissipate as the energy is used. These types of batteries cannot be used for storing excess energy and do not have the ability to be recharged.

Primary batteries have been designed to be used once and then simply discarded. This type of battery is used in all types of electronic devices such as remote controls and toys. There is a range of standard sizes that primary batteries come in such as AAA through C and D.

The primary factor that affects the life of a primary batter is that while they are used they become polarized. This simply means that the hydrogen will accumulate at the cathode and reduce how effective the cell is. A chemical depolarization method is used to help extend the life of a battery.

Another type of battery is the secondary battery. Secondary batteries are more environmentally friendly as they can be recharged. When an electric charge is applied to the battery the chemicals are then restored and the battery returns to the previous state. The battery will then hold the stored energy once again. There are

Storage Technologies	**Main Advantages** (relative)	**Disadvantages** (Relative)	**Power** Application	**Energy** Application
Pumped Storage	High Capacity, Low Cost	Special Site Requirement		●
CAES	High Capacity, Low Cost	Special Site Requirement, Need Gas Fuel		●
Flow Batteries: PSB VRB ZnBr	High Capacity, Independent Power and Energy Ratings	Low Energy Density	◑	●
Metal-Air	Very High Energy Density	Electric Charging is Difficult		●
NaS	High Power & Energy Densities, High Efficiency	Production Cost, Safety Concerns (addressed in design)	●	●
Li-ion	High Power & Energy Densities, High Efficiency	High Production Cost, Requires Special Charging Circuit	●	○
Ni-Cd	High Power & Energy Densities, Efficiency		●	◑
Other Advanced Batteries	High Power & Energy Densities, High Efficiency	High Production Cost	●	○
Lead-Acid	Low Capital Cost	Limited Cycle Life when Deeply Discharged	●	○
Flywheels	High Power	Low Energy density	●	○
SMES, DSMES	High Power	Low Energy Density, High Production Cost	●	
E.C. Capacitors	Long Cycle Life, High Efficiency	Low Energy Density	●	◑

six common types of secondary batteries that are currently available. Most of the common batteries that are found within a home and can be recharged are made with alkaline, nickel cadmium, or nickel metal hydride.

Lead Acid: the lead acid battery has been around since 1859 when Gaston Plante, a French physicist invented it. This is considered the oldest kind of rechargeable or secondary battery. The lead acid battery has a low ratio of energy to weigh and a low ration of energy to volume. This means that a lead acid battery can supply a high surge current which means that the batteries can maintain a large ratio of power to weight. These features combined with the low cost make the lead acid battery very attractive for use in motor vehicles because they can produce the high current that is required for a starter in an automobile.

During the discharge state the lead acid battery plates, both positive and negative, become lead sulfate. The electrolyte loses the sulfuric acid and turns into mostly water. When the lead acid battery is charged it contains positive plates made of lead oxide and negative plates of elemental lead. The charging process uses forcible removal of the electrons from the positive plate and forces them to be introduced to the negative plate.

The main use for lead acid batteries is for motor vehicles. These batteries are not designed to be used for a deep discharge. They are created with thin plates to create a larger surface area and have a maximum current output. The battery is charged by use of the alternator in the vehicle. Additional uses for lead acid batteries include using it in gel form for hospital equipment, computer backup systems, security systems, and in wheel chairs. The gel form holds a charge for longer than the liquid form.

Lithium Ion: The lithium ion battery is often referred to as a Li-ion battery or LIB. This type of batter refers to a family of rechargeable batteries where lithium ions will move from the negative electrode to the positive electrode when discharged and then move back when the battery is being charged. The electrode material used in this type of battery is made intercalated lithium compound. There are non-rechargeable lithium batteries and they use a metallic lithium instead.

The history of the lithium ion battery dates back to the 70s, when first proposed by M.S. Whittingham. He was working for Exxon at the time. The proposed battery used by Whittingham used lithium metal and titanium sulfide as the electrodes.

Lithium-ion batteries are extremely popular for use in electronic devices. This type of battery is one of the most popular forms of battery used in portable electronic devices. One of the main reasons for this popularity is the fact that they offer a top energy density. These batteries also do not have an effect on memory and when they are not in use they have a slow charging loss. Aside from being used in electronic devices, the battery is gaining in popularity for use in electric vehicles, for military applications, and for use in aerospace applications. Research is being done on more applications and uses for this type of battery. The research for uses of lithium ion batteries is focused on the durability, energy density, cost, and safety.

The performance, chemistry, cost, and characteristics of lithium ion batteries vary through the different types. The majority of lithium ion batteries that are used in handheld electronics are typically based with lithium cobalt oxide. The reason for this is because of the high energy density. However, there are safety concerns with this type of battery, especially if it is damaged. Lithium nickel manganese cobalt oxide, lithium manganese oxide, and lithium iron phosphate all offer a lower energy density along with longer lives. These types are also much safer. These types of lithium ion batteries are being used more and more in electric tools and for medical equipment as well as in other roles. Lithium nickel manganese cobalt oxide is one of the leading contenders to be used in automobiles.

One of the main benefits of using lithium batteries is the fact that they can store more energy in relation to their size than other types of batteries. In addition, these batteries can be recharged more times than other types of batteries and the charge will last for a lot longer. One downfall of lithium ion batteries is that they cost a bit more.

Lithium Polymer: this is a relatively new battery type and there has not been a lot of testing conducted on it. The lithium polymer battery can be used in similar ways as the lithium ion battery. When the testing is completed on this type of battery this type of battery will cost a lot less than the lithium ion battery.

One of the biggest advantages of this type of battery is that manufacturers can shape this battery almost any way that they want to. This fact alone is extremely beneficial, especially to companies that are making mobile phones and other electronic devices. Mobile phone manufacturers are continuously trying to make phones that are smaller and lighter, and the lithium polymer battery can be extremely beneficial for this process.

The lithium polymer battery may also be used in the next generation of electric vehicles. While the cost of an electric car is somewhat higher than those that run on petrol, this cost could start to come down with an increase in production and new technological advances in the development of batteries. The lithium polymer battery is currently being used by Hyundai for some of their hybrid motor vehicles.

Nickel Cadmium: The technology for this type of battery has been around for quite a while. This type of battery is perfect for times when rechargeable batteries are not available. The nickel cadmium battery is capable of discharging large amounts of energy, but do not have the mass energy ratio that is seen in lithium batteries.

This type of battery was invented in 1899 and has a terminal voltage of about 1.2 volts. This amount does not decrease until the discharge is almost completed. There are a wide range of sizes and capacities of nickel cadmium batteries available. In comparison with other types of rechargeable batteries that are available nickel cadmium batteries have a good life cycle and capacity. They also offer quality performance at a relatively low temperature. These batteries also work well with high discharge rates.

At one time sealed nickel cadmium batteries were used widely in portable photography equipment, power tools, for emergency lighting, in flashlights, and were commonly used in portable electronic devices. However, the environmental impact of disposing these batteries has led to a decrease in their use.

Nickel Metal Hydride: this type of battery is very similar to the nickel cadmium batteries. They use positive electrodes made of nickel oxyhydroxide, the same as the nickel cadmium cell battery, but instead of using cadmium for the negative electrodes they use hydrogen absorbing alloys. The nickel metal hydride battery has replaced the nickel cadmium battery in many types of applications, most

notably in small rechargeable battery applications. AA batteries are commonly this type of battery. In 2010, nearly 22% of rechargeable batteries that were sold in Japan were nickel metal hydride.

The first nickel metal hydride batteries were introduced to the market for consumer use in 1989. This was after the technology had been researched and developed for over two decades.

One of the problems with the nickel metal hydride battery is the fact that it can easily be overcharged. The best way to charge this battery type is by using a trickle method. The trickle method uses a fixed current that is low. It is a good idea to set a timer when charging this type of battery. Another charging option that is faster than the trickle method is by using a charger that knows when to turn off or turns off automatically when it senses that the battery is fully charged.

Nickel metal hydride batteries can be found in stores in the sizes of AA and AAA. There are adapter sleeves available that allow the AA size battery to be used for applications that require a C or D. C and D sizes are available in some places, but are usually just the AA core wrapped in an external shell. These types of batteries do not cost a lot and the performance is similar to that of a primary alkaline battery. Typically, a nickel metal hydride battery will be used for things like digital cameras or other devices that have a high drain rate.

It is important to note that some devices have been designed to run with a primary alkaline battery may not work appropriately when a nickel metal hydride battery is used in its place. However, this is quite rare and the majority of devices will work just fine using this type of rechargeable battery in place of the nickel metal hydride battery.

Low Self Discharge: this type of battery is relatively new. Currently the low self-discharge battery is available in both AA and AAA sizes. One of the biggest advantages of using this type of battery is the fact that they do not lose their charge as fast as some of the other types of batteries do when they are not being used. The low self-discharge battery is quite useful in devices that you do not use on a regular basis, but need to have ready and working when you need to use it.

Reusable Alkaline: the reusable alkaline battery was first introduced in 1992 to be used as an alternative to the wasteful disposable batteries. The goal of this type of reusable alkaline battery was to be a low cost power source for regular consumer goods. There were attempts made to use these batteries for wireless communications and in the defense and medical fields. However, the big breakthrough for their use did not arrive. The reusable alkaline battery currently only occupies a very small market and is somewhat limited to use in flashlights and portable entertainment devices.

It is somewhat regrettable that this type of battery lacks market appeal because the cost for creating this battery is only a bit higher than the cost for making primary cell batteries and it would be greatly beneficial to the environment to have fewer batteries being thrown away each year.

One of the problems with recharging regular alkaline batteries is that they can only be charged effectively if they are discharged to less than half of their capacity. In addition, the number of recharges that an alkaline battery has is limited based on the depth of the discharge. There are typically only a few cycles of recharges available.

Reusable alkaline batteries are designed to be charged repeatedly. However, even with the new design there is still a loss of charge every time these batteries are recharged. This means that there is a limit to the number of times this type of battery can be charged; this limits the life span of the rechargeable alkaline battery greatly.

There are several advantages of the rechargeable alkaline battery. First, the cost of this type of battery is relatively inexpensive. This battery can be used as a direct replacement for other primary or non-rechargeable batteries. These batteries are more economical than primary batteries as they can be used more than once. The discharge of the alkaline battery is low and energy can be stored for as long as ten years when the battery is not in use. In addition, these batteries are maintenance free there are no memory and no need for cycling.

The main disadvantage of the rechargeable alkaline battery is that it has a limit current handling. It is only available for light duty applications such as flashlights and portable home entertainment devices. The other issue with this battery is that it

has a limited cycle life, it is best to recharge the battery before it gets too low for best results.

Flywheels

One of alternative ways to battery storage is through the use of flywheels. Flywheels can be used to store a small amount of electricity. These devices are created using a steel cylinder that is hollow attached to a motor that is set on low friction bearings. This is then spun in a chamber in order to minimize friction. The flywheel spins continuously to store energy. In order to release the energy from the flywheel the rate of the spinning is slowed down. A flywheel can be optimized for a large output in a short amount of time or to put out a low amount of energy for a longer amount of time. Currently, the flywheel is mainly used as a way to bridge a gap in service while another emergency generator is brought up to work.

Thermal Electricity Storage

Thermal electricity storage is a combination of different technologies that are used to store energy for use at a later time. This type of energy storage is often used to adjust for differences in the demand for electric usage during high use times and low use times. The electricity is stored inside a reservoir that is either made of ice or water and is kept at a temperature that is different from the air outside. When the temperature is changed the electricity is discharged. There are many power plants that use this type of energy storage facility and have the capability of transferring the holding component to receptacles that are insulated to keep the energy for longer.

There are several forms of thermal storage available for use. One of the most popular types of energy storage is a pumped hydro scheme. This type of storage system uses motors to pump water into a reservoir. Typically, the reservoir is a dam that is located in an upland valley. When the demand for electricity is at its peak the water will go back down and drive the generators in order to supply the generators with the energy needed to produce the needed electricity. When the demand is low the reservoir will fill back up.

In the year 2003 there was more than 90 GW of pumped storage operating throughout the world. This accounts for about 3% of the capacity globally. During this time pumped hydro schemes were the most widespread and popular forms of energy storage systems being used on power networks.

Another type of thermal energy storage is solar energy storage. A practical solar storage unit will be able to store enough energy for a few hours up to a day's worth of energy. There are a growing number of thermal storage units available that are seasonal thermal stores. These units are used to store energy from the summer to be used for space heating during the winter months.

Molten salt is now being used as a way to maintain a high temperature thermal storage unit. These are used along with concentrated solar power to use for later generation of electricity. This allows solar power to provide electricity continuously, making it usable as a base load energy source. Molten salts include calcium nitrate, lithium nitrate, sodium nitrate and potassium nitrate. These molten salts can absorb the heated energy from the water and then be transferred back into energy as it is needed.

Another form of thermal energy storage is in concrete, hot rocks, pebbles, and the like. While water has a very high thermal capacity at about 4.2 J. This is one of the highest heat capacities available. However, concrete has about a third of this. One of the benefits of using concrete for thermal energy storage is that it can be heated to a much higher temperature, up to 1200 degrees Celsius. This means that the volumetric capacity of concrete is higher overall.

Using concrete for thermal energy storage could be utilized by homes as an insulated cube that is around 2.8 m would be able to provide enough storage for a single home to store about half of their heating demand. Essentially, this method could be used in order to store extra PV heat or wind energy to be used at a later time.

European homes are often equipped with thermal storage heaters that run on electricity. These are typically made out of a high density brick made from ceramic that is heated to a very high temperature using electricity. The ceramic block is well insulated and then releases the heat over a number of hours.

Storing energy is one of the most important aspects of developing renewable energy resources for modern use. Commercially, there are several types of energy storage systems in use today. These storage units can be categorized as thermal, biological, chemical, electrical, and mechanical.

Renewable energy has to be stored in order for it to be useful. Wind does not blow at all times, so there needs to be a way to store the energy when the wind is blowing so there can be enough energy to use at times when the air is calm. The same can be said for solar energy. The sun does not shine during the night and when days are cloudy people will still need to use electricity.

Each of the current storage techniques has both pros and cons. One of the most difficult aspects of energy storage is the cost. Most energy storage units come at a relatively high cost. However, for a person that is looking to store energy to run the electricity in just there home, it is possible to make a storage unit that can be used instead of relying on energy from a large centralized unit.

There are several different ways to make a personal storage unit for electricity. There are benefits of using these storage units, such as being able to sell back the excess energy to the government or utility company as a way to save and possibly make money.

Energy Conservation Basics

When considering storing electricity it is important to first look at the basics of energy conservation. The first concept that a person must fully understand is that energy cannot be created or destroyed. This means that energy is always around it simply changes its form. There are a number of different forms of energy such as electrical energy, chemical energy, kinetic energy, and mechanical energy.

The main issue that arises when storing energy is the loss of energy that occurs during the process. This rate of losses determines how efficient a storage technology is. When it comes to being a good storage technology there are many factors to consider. Some of the properties to consider when choosing an electricity storage method are the costs, ratings, and the size and weight of the storage unit. In the end the storage unit needs to be able to meet the demand and need.

For regular electronic devices battery storage will typically work. Batteries put out a set amount of electricity, which is perfect for devices that are small. However, storage for electric loads to be used for a home or area, there will be times where a high discharge is needed and other times when lower levels will be utilized. For this reason, a storage method that allows for this is necessary. Here is a chart that compares the advantages, disadvantages, along with the power and energy applications of the different storage technologies that are available.

Storage Technology	Advantages of this type of Storage Unit	Disadvantages of this type of storage unit	Energy applications	Power applications
Pumped storage	Comes with a low cost and offers a relatively high capacity.	The site requirements for this type of unit are specialized, so this type of storage cannot be used everywhere	Energy application is capable and fairly reasonable	The power application is not economical or really possible.
CAES	This unit has a low cost along with a high capacity	The storage will need gas fuel to run and has special site requirements	The energy application is reasonable and fully capable	The power application is not really practical or economical
Flow Batteries	Have an independent power and energy rating and a high capacity	The energy density is low	Energy application is reasonable and fully capable	The power application is reasonable for this type of application
Metal - Air	Has an extremely high energy density	Charging the electric is very hard	Very capable and reasonable	Not economical or possible
NaS	Highly efficient high	High cost of production	Reasonable and capable	Reasonable and possible

	power density High energy density	Safety concerns		
Li-ion	High power density High energy density Very efficient	High cost of production Needs a special circuit for charging	Possible to use, but not quite economical or practical	Reasonable and possible
Ni-Cd	Highly efficient High energy density High power density		Reasonable for this application	Reasonable and possible
Advanced batteries	High power density High energy density High efficiency	High cost of production	Possible, but not quite economical or practical	Capable and reasonable
Lead Acid	Low cost of capital	Limited life span when it is deeply discharged	Possible, but not quite economical or practical	Capable and reasonable
Flywheels	High power	Low energy density	Possible, but not quite economical or practical	Capable and reasonable
SMES DSMES	High power	High production cost Low energy density	Not practical or economical	Capable and reasonable
E.C. Capacitors	High efficiency Long life cycle	Low energy density	Reasonable for the application	Capable and reasonable

As this chart shows there are many different types of storage devices that a person could utilize. The main problem with the storage devices that are currently

available is that most of them are not cost effective. The cost to create the storage device often outweighs the benefits that a person would have from using the device. In addition, many of the storage units take up a lot of room, which a lot of people may not have. However, there is some storage devices that can be created and used that will help lower the cost of your energy bill and that can be used effectively and efficiently. It is important to research the different energy storage options that are available to find one that will work best for your particular situation.

Creating your Own Energy Storage Device

There are many different ways that you can create your own energy storage device. Many people are considering energy storage devices for the home as a way to save on energy costs. Utilizing green energy such as solar and wind energy can help offset heating and cooling costs, not to mention are much better for the environment. One of the other benefits of creating your own energy storage device is the fact that if you have excess energy you may be able to sell it back to the government or utility company, offsetting your energy costs even more. Here are a few different ways that you can create an energy storage device for your home.

Wind Power

Wind offers a great source of renewable energy that a person can implement into their home. Creating your own wind energy storage device will take a bit of work and dedication, but storing the energy provided by the wind can be extremely beneficial. Wind energy can be used in combination with your current electricity system. In order to harness wind energy you are going to need a windmill. This includes a generator and blades. The energy that is harnessed can be stored using several types of energy storage devices.

In order to create a generator for wind energy you are going to need a stator. The stator consists of a steel core located on a plastic ring. There are coils of copper wire that surround the core. The copper wire is what will be used to generate the electricity. Three types of wire sizes are used, 0.6 mm, 0.8 mm, and 1 mm.

The next item that is necessary is the magnetic hub. This consists of a ring of magnets in a plastic hub. The magnets will pass near the coils, which pushes a current through the copper coils. A stainless steel shaft is used to help the hub spin. Flat and bumped stator rings are used to protect the stator from becoming damaged.

After you have created the windmill to generate the energy, you will need a way to store it. Since wind is not available constantly or at a steady rate, you are going to have to have the resources available to store the energy created to be used as needed. The wind blows when and where it wants, which is why it is important to research where to best place a windmill. Remember, wind energy is great for many reasons, but it is not the ideal source of renewable energy for everyone.

It is important to choose a system for wind energy that will exceed your estimated or current usage of energy. You must know how much energy that you are going to be able to generate with the windmills that you have created. If you cannot live without electricity for long periods of time, it is important to consider storage for far more power than what you typically use.

One of the most economical choices for storing wind energy is by using a deep cycle battery. Most deep cycle batteries are made out of lead acid and are very similar to the batteries that are used in cars. The reason that the battery has to be a deep cycle battery is that it has to be able to be charged and discharged over and over again at over 80 percent capacity.

The battery will need to be placed in a safe place. It has to be away from temperatures that are extreme and it must remain accessible so it can be properly maintained. The battery should not be used near living spaces or by electronics. The reason for this is because these batteries have dangerous chemicals in them and they give off a high amount of oxygen and hydrogen. Depending on how much energy you are going to use and store, you may need to have more than one battery to use for storage.

Once you have found an appropriate place for your batter you are going to need to find a charge controller. Charge controllers are used to regulate the energy flow from the wind generator to the battery. There are charge controllers available that

come with protection from power loads. This can help extend the battery life. The cost and the features of charge controllers vary greatly.

Next, you will want to pick your power conditioning equipment. This will include an inverter that can change the direct current to alternating current. Alternating current is necessary for use in homes. This equipment will also control the frequency and the voltage of the electrical current that is being used.

You will also want to install a metering system to keep track of the amount of energy and voltage that you use. The metering system will also need to keep track of how charged your battery is. If your home remains connected to a grid from the power company, the utility company may require you to have a separate meter for your wind energy consumption. There are some electric companies that allow you to use net metering. This means that your current electric meter will record the amount of energy that you use and then will run backwards when energy is sent back to the grid from your power source.

There are many advantages of using wind energy. The first is quite obvious and it is that wind is a renewable resource. We are never going to run out of wind. The air is always going to be moving around us creating energy that can be harvested.

Another great advantage of wind energy is the fact that it is green. This means that it is an energy source that does not produce any type of greenhouse gas. In fact, the environmental impact of wind farms is minimal.

One thing that people should consider, when thinking about creating a wind energy storage unit is the fact that wind is free to use. The initial set up and cost may be substantial. However, once the equipment is in place and the initial costs are paid, the energy source can supply you with electricity at no additional cost. There is very little maintenance required for wind turbines. Typically, the turbines need to be checked out about twice a year to keep them running properly and producing the most amount of energy.

While the benefits of harnessing and using wind energy are great, there are some disadvantages of this type of energy as well. The obvious first disadvantage is the fact that the wind does not always blow. You cannot just make the wind blow when you are in need of electricity. For this reason, wind energy is not completely

reliable. However, using solar, wind, and hydroelectric energy can provide a person with a reliable system of clean energy that can be used to generate electricity for the home almost for free once the initial set up costs are met.

Another problem is that there are not very many good wind sites. Most of the sites that are ideal for harnessing wind energy are not very close to where the electricity is needed. The infrastructure that is required to carry wind energy across long distances is expensive.

Solar Energy

Solar energy is considered to be the holy grail of all the renewable energy sources that are available. Considering that scientists believe that the sun will be providing us with light for at least another four billion years, this type of energy is ideal for use. The one big problem with solar energy is the issue of how to store it. In order to have electricity during the night and on days where the sun does not shine, solar energy has to be stored.

Batteries can be used to store solar energy, but they cannot be used on a large scale efficiently. One of the ways that scientists are trying to store the energy from the sun is by using the heat that the sun generates. Heat can be stored efficiently, consider the thermos that you keep your coffee in. A thermos can store close to the amount of energy that is stored in the average battery of a laptop. Using thermal storage for solar energy is the most ideal form of storage.

One of the ways to create a storage system for solar energy in your home is to create a packed bed. Packed beds can be very small or very large, depending on the amount of stored energy that is needed to heat, cool, and generate electricity for the home.

There are three types of solar panels that are typically used for collecting solar energy. They are passive collectors, focusing collectors, and flat-plate collectors. These plates all convert the radiation of the sun into energy. The heat from the sun can also be turned into energy if it is collected. Storing heat can be done in several ways including by making a packed bed.

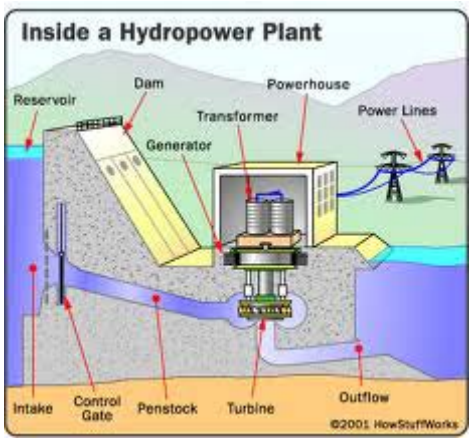
To make a packed bed a person will simply create a frame out of whatever material they have, such as two by fours. Inside the frame, place stones or cement blocks.

The packed bed could also be filled with water. The main purpose of the packed bed is to collect the heat from the sun. The bed should be insulated so that once the heat hits the bed it remains there. This is why using rocks is a good idea as they can store heat for a very long time.

These types of storage units can be used as they are needed, such as when the sun is down at night or during a cloudy day. Energy from the sun can also be used to heat a home. To heat a home using solar energy there is a lot of energy needed. Large solar panels will need to be installed. Typically, a heat of fusion unit will be used for storage. However, water tanks and packed beds can be used to help store the solar energy as well.

One of the biggest problems that people have with solar energy is the cost of the panels can be quite expensive, especially if they are going to be used for a large home or building. The storage systems for solar energy can also be quite costly.

Hydroelectricity



One of the main ways that energy is stored throughout the world is through pumped hydro storage. Water acts as a very good storage device for energy. The reason for this is because it can be heated to temperatures that are quite high and the heat and steam produce energy quite easily.

Pumped hydro storage uses two dams that are placed at a specific height difference. When the demand for electricity is high the water from the higher dam will be released. When the demand is lower, water is pumped back into the higher dam.

While a pumped hydro storage unit works well for large centralized utility companies, it is typically not very practical for an individual to use this type of electric storage device at home. Building a dam is likely not possible for most people. However, this type of energy storage may be utilized for farming by using irrigation ditches to control the flow of water and thus the flow of power.

Perhaps one of the best ways to store electricity is the flywheel. Kinetic energy is used in order to store electricity in the flywheel. This type of device is not new as it has been used for many other applications such as in transportation.

The concept of a flywheel is fairly simple. The wheel must be accelerated at a high speed and by keeping the wheel at this speed kinetic energy is created. All of the extra energy that is created is then used to charge the flywheel. When energy is needed from the storage the speed of the rotation is slowed down.

There are many benefits of using a flywheel as a storage device, especially over a battery. The main advantage is the fact that there are no chemicals used for flywheels. Another benefit is the fact that the flywheel is not affected by the discharging and charging cycles, which means that they will last for a much longer time. In addition, a flywheel can provide a fast response to electricity needs.

One of the main problems with flywheels is that they are quite large and the constant motion can be quite loud. It is possible to make a smaller flywheel for use in other applications, but when considering it as a way to store electricity for the home.

The basic flywheel can be made quite simply. In order to make a flywheel you will need a rotary table, pieces of birch plywood, a chisel, a drill, a router cutter, a milling machine, and cellulose paint.

The first step is to take the chisel and peel away the first few layers of the birch plywood. The ply should be about 1.75 mm thick. Place the wheel pattern on the wood and then place the entire set on the rotary table and use a ply disk to in order to drill a hole directly in the middle. A milling machine can be used to impress the pattern onto the board. On one side of the spokes of the flywheel make a radial cut. Do the same thing on the other side. After you cut the sides remove the triangle piece. Next, taper the spokes by putting up the sides of the table. Use the router cutter to curve the spokes corners. Finally, use the cellulose paint to paint the wheel.

This flywheel can then be attached to a motor and used to maintain a rotational energy and store energy that can be used at a later time. Flywheels can be used to store many different types of energy sources including green energy sources such as wind and solar.

Other Types of Energy Storage

There are other ways of storing energy from primary sources that are not in the electricity form. The first way is called compressed gas storage. This type of storage can store amounts of energy that are similar to those stored in a pumped hydro plant. Similar to the pumped hydro plant, the compressed gas storage plant has been created in order to help handle heavy usage loads.

A compressed gas storage unit stores extra power by pushing air through a reservoir. The reservoir is most often located underground for safety reasons. When the energy is needed compressed gas is used in order to spin the turbines that then drive the generators. The main advantage of this type of storage is that it can be started quite quickly and that they are easy to control.

Another type of non-electric storage is liquid air storage using cryogen. The idea behind this type of storage system is to use the excess energy to compress dry air to create a liquid that is called cryogen. The cryogen can then be stored in a tank that is well insulated. This equipment that is needed for this type of storage is well understood and has been in use routinely for the past 50 years.

This type of plant would be safe and quite small. There is no high pressure storage systems needed and the entire process operates at low temperatures. There are plans for a pilot plant to be in operation sometime in 2012. Highview Power Storage is developing this method of storage.

Another type of storage that is available is metallic energy storage. In 2005, Dave Beach and Solomon Labinov conducted research that shows that one way of storing energy and releasing it is through powdered metal. This method offers a non-polluting and viable option for storing energy. Metals such as aluminum, boron, and iron, can all be safely stored and then moved at room temperature if they are coated with oxide. The metals will burn if they are heated to 250 degrees C. The combustion temperature is 800 degrees C, allowing the metals to be burned

in a conventional engine. The speed of combustion can be controlled and will form clusters using the nanoparticles. The burnt particles can be retrieved and then recycled using hydrogen. They can then be burnt again. The entire process does not pollute and there are not waste products.

Methanol offers another way to store energy that can be easily transported. This is an alternative to using hydrogen. While methanol is more toxic than hydrogen, it is easier to store and transport in its liquid form. Methanol can use the same transport system that is currently in place for oil, unlike hydrogen. Other benefits of using methanol include the fact that the majority of technology to use it as a fuel is already in existence. Similar to hydrogen, methanol can be used in fuel cells directly to create energy. In addition, a combustion engine can be altered in order to run using it.

Why Store Electric Energy?

Storing electricity is extremely important in order to ensure that the supply of electricity remains reliable. By storing energy companies can keep up with the demand when it is high. Utilizing excess energy when demands are low is essential in keeping up with the energy consumption for the world. In the United Kingdom the reliability of the supply is currently at 99.99% and in the United States the reliability rate is at 99.97%. This rate is extremely good when considering that the system has to be properly managed in order to understand when and where the spikes of use may occur.

Introducing other types of energy sources into the system can create issues with estimations. For example, if a neighbourhood decided to add solar panels to all of the homes in the area, their use of electricity from the company would go down. This means that the power company would then need to store less energy for use during peak times. However, if these homes that use solar panels for energy are hit with several cloudy days in a row, they may use the power grid for backup. This would create a spike in the energy consumption that the power grid may not be prepared for.

The power grid must have a good system of storage in place in order to ebb and flow with the usage of its consumers. As a consumer we sometimes take for

granted how reliable our energy system really is. When our power goes out it is easy to become disgruntled as we have come to rely on our energy sources so heavily.

Using storage devices offers a way to help balance out the power supply. Utility companies benefit greatly from the use of these electric storage devices as these units are what help them maintain their reliability.

Homeowners can also benefit from using power storage systems. Generators can create energy should the power go out in the home for a long amount of time. Using a green energy system such as solar panels or wind energy offers a great back up plan to relying on the utility company. Another great benefit of utilizing green energy in the home is the fact that the cost of your energy bills will be lower.

It is possible to use solar energy or wind energy to heat and cool your home. You can also remain a part of the power grid as well. This way if you run out of saved energy you will be backed up by the power plant. If you have excess energy you can feed it back into the grid and lower your energy costs and possibly even be paid by the government or the power company for use of the energy that you have generated.

Green Energy and Why We Need It

When it comes to energy, we all need to really stop and think about where our electricity comes from. In the United Kingdom nearly two thirds of electricity is generated by burning fossil fuels. This is similar in the United States. Burning fossil fuels is bad for many reasons. First, fossil fuels are non-renewable, which means that we are going to run out of them at some time, likely in the near future. Another issue is the environmental impact that burning fossil fuels has. Burning these fuels releases carbon dioxide into the environment, which is the gas that is most responsible for the changes in the climate that we are seeing every year.

Nuclear power currently supplies about a third of the power in the United Kingdom and a bit less in the United States. While nuclear power is more efficient, it comes

with its own severe environmental impacts as well as dangers.

It is for these reasons that green energy sources must be considered. There are several methods of green energy that could be used and must be researched more so they can start to be used on a larger scale.

Wind energy uses the wind to move a turbine that then can provide electricity. There are more wind farms popping up in the United Kingdom and throughout the United States. Wind energy is one of the fastest growing natural energy resources. While there are issues with using wind energy, such as the inconsistency of wind patterns, the benefits of this type of energy far outweigh the negatives.

Solar power is beginning to get more and more attention. The main issue with solar power is trying to figure out the best storage method for this energy. Using solar power means that there has to be enough energy stored to power a home during the night and on days that are cloudy. However, solar energy offers one of the best natural resources because it is not going anywhere.

Hydro power uses water to create energy. This type of power has been use for well over a hundred years. The main problem with using hydro power is the lack of water sources to provide the necessary type of power needed to create electricity.

Wave Power is another energy source that could be further looked into. Using the waves and tides from the oceans and sea for energy is being researched.

Geothermal energy comes directly from the earth. There are some areas where steam rises directly from the ground and can then be used to run a steam turbine to directly produce electricity. In other areas, water can be pumped into the earth down to the hot rocks below the surface. The rocks heat the water to create the steam needed to produce electricity.

Biomass uses agricultural waste or plants that are specially grown in order to create fuel that can be used to run a small power station. When a plant is growing it absorbs carbon dioxide. The carbon dioxide is released back into the atmosphere when the plants are burned. Since this gas was already in the atmosphere before the plant started to grow, there is no extra carbon dioxide being put into the air as a result of biomass.

Incinerating waste is another way that energy can be created. There is a large amount of waste being created and space at landfills is quickly diminishing. Burning this waste can offer another way to produce needed energy. The main problem with this is that there could be harmful toxins being released into the air as the waste is burned. While the waste is already there, so this is considered to be a green energy form, the fact that when landfills are burned you do not really know what is burning causes concern.

Green energy has come a long way in the past few years, but there is still a really long way to go. The amount of energy that is used around the world is growing and is only going to continue to do so. This means that finding new ways to create energy and store energy are becoming absolutely necessary. The earth simply will not be able to keep up with the current consumption of fossil fuels and other non-renewable energy sources.

There are many options available and hopefully more will become available soon. People are going to have to be willing to accept new forms of energy and also be willing to implement the necessary changes in order for these green energy concepts to continue to grow and become more efficient. This will require individuals to start really thinking about where their energy comes from and how to make the whole process more efficient.

If more people would just start thinking about energy consumption, changes would be easier to obtain and maybe the environmental impact that we have had could be stopped and possibly reversed.

Conclusion

Clean energy advocates in Europe have long considered the feed-in tariff a solution to the industrial world's fossil fuel dependency. Now, the United States and Canada are starting to catch on as well.

Feed-in tariffs (FITs) guarantee that anyone who generates electricity from a renewable energy source - whether they are a homeowner, small business, or large electric utility - is able to sell that electricity into the grid and receive long-term

payments for each kilowatt-hour produced. Payments are set at pre-established rates, often higher than what the market would ordinarily pay, to ensure that developers earn profitable returns.

The FIT is credited for the swift deployment of wind and solar power among world renewable energy leaders Denmark, Germany, and Spain in the last ten years. Similar policies have since been adopted by many other countries, leading the FIT to become the most prevalent tool for promoting renewables.

The United States of America has no feed in tariff policy. However, each day that passes without a unified energy policy is another day that chance slips through the fingers of the American market. The solar radiation resources available in the darkest corners of the US are 50% higher than the best that the world market leader, Germany, has to offer. Thousands of investors are waiting patiently for the market to move in a direction that makes solar a profitable venture.

Since the market is so broken and scattered, there is trepidation for investors to enter the market. Either they are holding back, or they are chasing hot spots (usually counties or specific states like California). Until the US is able to adopt a coherent renewable energy strategy that isn't dependent on tax breaks, the market will remain underdeveloped.

Also, since chasing the most unstable and fractured market in the world for up to date information is a task better left to someone else, we would like to introduce you to www.dsireusa.org where all information concerning programs in the US is contained. Hopefully the political process will be more open to renewables, but until then we will be waiting patiently.