Turning up the heat: Geothermal Energy

2/16/2015 [Edition 1, Volume 1]

How does Geothermal Energy Work?

The Raw Materials Involved

Geothermal energy is heat from the inside of the Earth. This energy can be obtained from fairly shallow ground to hot water, hot rock, and even magma. Geothermal heat pumps can tap into these sources to heat and cool buildings. Geothermal heat pumps have a heat pump, air delivery system (ductwork), and a heat exchanger. The heat exchanger is a system of pipes buried in the ground near the building. During the winter the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. During the summer the heat pump moves from the indoor air into the heat exchanger. This removed hot air can be used as a source of free hot water.

(Geothermal energy escapes a hot spring in Nevada. Credit: Sierra Pacific and renewableenergy.com)

Visit renweableenergyworld.com for more information on geothermal heat pumps, usage, electricity production, and more.

Wells will often need to be drilled into several reservoirs for the generation of electricity. The steam from a reservoir can power a turbine and generator. These reservoirs are found in the western states like Hawaii and Alaska.

Waste Products/ Environmental Impact

(The West Philadelphia Enterprise Center uses geothermal energy for 31,000 square feet of space. Credit: Geothermal Heat Pump Consortium and renewableenergy.com)

Geothermal energy is clean and sustainable. Geothermal heat pumps use much less energy than conventional heating systems because they draw energy from the ground. They are also more efficient when cooling your house and they do not have any harmful waste products. Besides saving energy and money geothermal energy reduces air pollution.

1)CBS news. The five geothermal companies to watch. 2012.http://www.cbsnews.com/news/the-five-geothermal-companies-to-watch/

2)Scott Cooney.The use of geothermal energy.2015. http://greenlivingideas.com/2007/10/22/the-uses-of-geothermal-energy/ 3)epa.geothermal.energy production.2012. http://www.epa.gov/radiation/tenorm/geothermal.html 4)renewableenergy.com

Why is Geothermal Energy Better than other forms?

Government Support and History

In a closed loop geothermal energy system there is no waste product other than hard water. The only concern with the closed loop system is that it takes a lot of energy and electricity inside of the plant that may come from a "dirty source " such as another coal plant instead of a clean source such as another renewable energy plant that does not release green house gasses(epa). In an open loop such as the geysers in Yellowstone there are waste products such as brine, mineral salts and gaseous products released. Geothermal energy is a clean and renewable source of energy. there are currently 200 geothermal projects in 15 of the western states that individually that have a capacity of 7800 megawatts. Geothermal energy produces little to no waste products(Natural resource...).

(Geothermal energy heats waters to allow alligators to thrive in Colorado. Credit: Warren Gretz and renewableenergy.com)

Summary/Opinion:

Home owners, farmers and industries use geothermal energy. The home owners may use geothermal to keep their homes cool in the summer time. Hot air would be pumped from the house into the ground and then returned to the house after the air has been cooled by geothermal energy(Scott Cooney). Farmers use geothermal to provide heat for their crops. Geothermal energy is used to keep green houses warm during the winter months. The energy source allows for the farmers to produce foods year round(Cooney). Industries often use geothermal technologies to dry fruits, veggies, wood and wool products. They also use geothermal to extract gold and silver from ores(Cooney). All in all geothermal energy is a sustainable and clean energy that we should use more. We both think geothermal energy is innovative and many people benefit from it.

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1)CBS news. The five geothermal companies to watch. 2012.http://www.cbsnews.com/news/the-five-geothermal-companies-to-watch/ 2)Scott Cooney.The use of geothermal energy.2015. http://greenlivingideas.com/2007/10/22/the-uses-of-geothermal-energy/ 3)epa.geothermal energy production.2012. http:// www.epa.gov/radiation/tenorm/geothermal.html 4)renewableenergy.com

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Geothermal Energy-that's hot!

How Does a Geothermal Energy Work?

Geothermal energy is the heat from the Earth. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock called magma. Geothermal energy is known as a clean and sustainable source of energy.

Geothermal electricity is produced by wells that are deep in the ground and which let hot water rising up to the surface. The water's steam drives turbines which produce the electricity.

The energy system for heating or cooling down buildings for example, consists of a heat pump, an air delivery system (ductwork), and a heat exchanger-a system of pipes buried in the shallow ground near the building. In winter the pump removes heat from the exchanger and transports it to the delivery system of the building. In summer the whole process is in reverse. The heat from the building is removed by the delivery system and is brought to the exchanger. A benefit is that the removed heat in summer can be used to heat up water for free.

In the United States, most geothermal hot water reservoirs are located in the western states, Hawaii, and Alaska. [6]

History

The Ancient Romans and Chinese were among the first people in the world to use geothermal energy, in the form of natural hot springs, for bathing, cooking, and healing. Ten thousand years ago in North America, the Paleo-Indians began using hot springs as a source of warmth. Hot springs in Yellowstone and Arkansas were discovered by European settlers in 1807 as they moved west. They became a sort of business in the 1830s when people would pay money to bathe in them. In 1847, William Bell Elliot discovered what he named Geysers in California, which a few years later turned into a resort hotel visited by very powerful people like JP Morgan and Theodore Roosevelt. Just before the end of the Civil War, people began moving to the Geysers and building their homes nearby because the Geysers provided them with a natural source of heat. The first place to have a district heating system run off of geothermal energy was Boise, Idaho in 1892, where they piped the hot springs water to buildings in the town. Towns such as Klamath Falls, Oregon followed suit and starting piping the hot springs water to local homes at the turn of the century. The first geothermal power plant in the world opened in 1904 in Larderello, Italy, and in 1921, the United States' first geothermal power plant opened near The Geysers. Here, drilling into the earth accumulated enough steam to produce the electricity needed to run the streets and buildings within the resort. Five years later, the first greenhouse to use geothermal energy is established in Boise. In 1930 at Klamath Falls, the first down-hole heat exchanger is created by Charlie Lieb to heat his house. The first ground-source heat pump was developed in 1948, and in 1951, work began on a geothermal power plant at The Geysers, which was operated by Pacific Gas and Electric for large-scale use. In 1970, a group called the Geothermal Resources Council was established with the goal of inspiring others worldwide to learn more about and further develop geothermal energy. In this same decade, the Geothermal Steam Act was passed, the Geothermal Energy Association was created, the Geothermal Energy Research, Development and Demonstration Act was enacted, and the Energy Research and Development Administration was created with its own specialized Geo-Heat Center. [4] Geothermal fluids were used in Nevada in 1987 to power the process of gold-mining. In the many years since, the Government and private companies have begun investing in geothermal energy to run their businesses. The U.S. Department of Interior's Bureau of Land Management says that enough geothermal energy was generated in 2005 to power the annual energy used in 1.3 million American homes. The government has encouraged more geothermal research and use by small businesses, giving out large amounts of money to start these initiatives. Today, geothermal energy helps produce electricity in 21 countries, including America. [5]

Raw Materials

The actual source of energy is heat energy. Deep in the Earth's core, there is a natural, never-ending cycle of radioactive decay that generates heat that rises towards the Earth's crust. As this heat rises to the crust, it melts rocks in magma. Geothermal energy does not require one to retrieve the radioactive decay itself or any raw material; the ultimate source of this heat is the Earth's high-pressure core. As the heat rises towards the surface of ground, it comes in contact with underground water sources and creates steam. It is this steam that naturally surfaces through geysers and hot springs or is pumped from the ground and used for heating. [3]

Waste Products/ Environmental Impact

Geothermal energy is a pretty reliable and clean source of energy because it occurs naturally and does not require the burning of fossil fuels. Thus, it does not emit carbon into the atmosphere and is unaffected by weather patterns. However, if it does not surface naturally like in a hot spring, a plant has to be created to drill it out. The actual creation of the plant requires fossil fuels for the transportation of materials that make the drills. This could possibly contribute to air and water pollution and global warming. A positive aspect of geothermal energy is that geothermal plants do not require a large amount of land, thus reducing the amount of habitat lost while making the plant. The one negative component of geothermal energy is that geothermal fluids from deep in the Earth contain some gases that may be harmful to the environment, like carbon dioxide, ammonia, and methane, which can contribute to global warming and acid rain. The water from the steam may also contain traces of harmful toxins mercury and arsenic from below the Earth's crust. More than anything, the action of drilling a well can cause subsidence, sinkholes, earthquakes, and upliftment. [3]

Why Geothermal energy is better than current energy sources?

Geothermal energy is cleaner, more efficient and more cost-effective than fossil fuels, the US's main source of energy. It releases less carbon dioxide and is more reliable than coal and nuclear energy because these plants can run constantly. It is renewable and there is more energy available then being used right now, but in comparison to other energies, it is harder to reach, because of it's difficult location and it is expensive to drill. They can be used in NJ through pumps, if the soil or water is about 50 degrees Fahrenheit and binary cycle plants to heat buildings and generate electricity. [2]

Government Support

The US Department of Energy dedicates a department to the Geothermal Technologies Office that supports research and development through system analysis, low-temperature and co-produced resources, enhanced geothermal systems and innovative exploration technologies. Their short term goals are to lower the risks and costs for development and research, lower the cost of electricity to 6 cents/kWh by 2020, accelerate development of 30 GWe of undiscovered hydrothermal resources, and demonstrate a 5 MW reservoir creation by 2020. [7] They currently are working on 244 projects. They raise money for research and are working to find ways to make this energy easier for use. Their featured project is the Development of an Improved Cement for Geothermal Wells in for safer drilling in Arkansas. [8]

Where to go for more information…

http://energy.gov/eere/geothermal/geothermal-technologies-office

http://www.cleanenergyworldnews.com/geothermal-energy/

http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/how-geothermal-energy-works.html#.VOGBbCD9H6E

Summary/Opinion

Geothermal energy is a sustainable and clean source of energy, and could be a big benefit for the future. It wouldn't produce as much waste products and is not as dangerous as nuclear energy. We wouldn't have many problems finding the right spot for building energy plants because the earth's heat can be reached almost everywhere. We believe it is a good source of energy because geothermal energy is an inexhaustible energy source and will still be available in the future. The popularity of geothermal energy is growing more and more over the time more energy sources are needed that could replace nuclear reactors and other energy sources that might not be as sustainable as geothermal energy.[1]

Strokkur Geyser, Iceland[3]

Vulkane Island Geothermal Power Plant[3]

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Riley and Toby

Hybrid and Electric Cars: More Shocking Than They Seem

What is a Hybrid Car?:

A hybrid car is defined as, "any car that uses more than one fuel source".

History - From Start to the Finish Line:

Early 1800's- First Small-Scale electric cars, and first crude electric vehicles are developed.
1889-1891- William Morrison creates the first electric car in the U.S. While no more than an electrified wagon, it sparks interest in electric vehicles.
1901- Many innovators including Thomas Edison, take note of electric car's high demand and explore ways to improve the technology. Porsche created the Lohner-Porsche Mikte the world's first hybrid electric car.
1900-1912- Electric vehicles are in their Heyday with 1/3 of all vehicles running off of electricity.
1908-1912- Model T affordability deals major blow to electric vehicles because of how expressive electric vehicles are.
1920-1935- Better roads and discovery of cheap Texas crude oil help to contribute to the decline to electric vehicles. By 1935 they have all but disappeared.
1960's and 70's- gas prices soar through the roof creating an interest in electric vehicles.
1971- NASA's Lunar rover runs of electricity helping to raise the profile of electric vehicles.
1973- Many automakers begin exploring options for alternative fuel vehicles.
1974-77- 2,000 CitiCars are produced by Serbing-Vanguard making it the sixth largest U.S automaker by 1975.
1979- Due to draw backs interest declines again.
1990-92- New federal and state regulations create a renewed interest in electric vehicles thus having automakers modifying popular vehicle models that perform close to the standards of gas operated vehicles.
1996- General Motors releases the EV1 which quickly gains a large following.
1997- Toyota's Prius becomes the first massed produced hybrid.
1999- Scientists work to create new and improved electric vehicles.
2006- Tesla Motors announces it will produce a luxury electric sports car with a range of 200 plus miles. Other automakers take note, accelerating work on their own electric vehicles.
2009-2013- Energy Department invests in nationwide charging stations.
2010- GM releases the Chevy Volt making it the first commercially available plug-in hybrid. Nissan also launches the LEAF an all-electric, zero tailpipe emissions car.
2013- Electric Vehicle battery costs drop.
2014- Consumers have a multitude of choices, today there are 23 plug in and 36 hybrid models available.
2015 and beyond- electric cars have a huge potential because of the lowering prices

How Much Gas and Electric Is Used?: Traditional hybrids store power in batteries, which allows the vehicle to run on a smaller engine without compromising performance. These traditional hybrids do not require plugging in to charge the batteries. Traditional hybrids use between 30 and 60 percent less fuel than traditional cars while getting upwards of 48 miles to the gallon. Plug-in hybrids use electricity to recharge the car while using 40 percent less gas than traditional cars. When operating on electricity plug in cars can travel upwards of 100 miles on a single charge. When using gas they can get around the same miles per gallon as a traditional hybrid.

What Comes Out of the Tailpipe?:

One of the most popular features of the fully electric Nissan Leaf is its tailpipe-free rear end. Cars that are advertised as 100% electric are assumed to produce no emissions, while hybrid car engines drastically decrease the amount of greenhouse gases that pass through the tailpipe. The only harmful environmental impacts that electric cars contribute involve the batteries' electricity and the actual disposal of engine batteries. The United States retrieves the majority of its electrical power from coal-burning plants, which is an environmentally harmful process in itself. Likewise, the increasing popularity of electric vehicles can only yield more

dangerous car batteries that are not recycled or are disposed of improperly after vehicles are retired.

Do Hybrids and Electrics Compare to the Competition?:
Hybrids and electric cars often struggle to live up to the range abilities and total cost factors of gasoline-powered, economy class sedans. The average baseline sedan costs roughly $21,000 and can travel just over 400 miles on a full fifteen gallon tank of gas. Many quality hybrid vehicles have a base price of around $30,000, and most full-electrics cannot travel more than 100 miles on a single charge. Because of these fiscal and technological inefficiencies, a buyer who wishes to own a car for less than five years will find the best yield of their dollar through the purchase of a gas powered, entry-level sedan. As eco-friendly wheels become a more integral part of the automotive industry, hybrids and electric cars will most likely face a price fall to more reasonable levels. Additionally, the longevity of electric car batteries increases with every new year of research.

More Information - In Case You are Still Interested:

- http://www.plugincars.com/cars
- http://auto.howstuffworks.com/fuel-efficiency/hybrid-technology/history-of-hybrid-cars.htm
- http://cleantechnica.com/car-answers/
- http://electricvehicles.caa.ca (Canadian Policy)

Government Intervention:
Federal governments in developed countries often provide grants and incentives to consumers in return for purchasing a fuel efficient or electric automobile. For example citizens of British Columbia in Canada have the opportunity to receive a grant of up to $8500 just for purchasing a necessary materials to drive and charge an electric vehicle for personal use. Rather than focusing on direct grants for consumer persuasion, the United States promises tax breaks for certain environmentally conscious drivers under conditions such as the Alternative Fuel Tax Exemption. By offering financial relief for families who make the effort to drive eco-friendly, countries like the United States are helping carmakers to produce the increasingly efficient vehicle lines of tomorrow.

Hybrids/Electrics In a Nutshell:
Hybrids and electric cars have serious potential to dominate the automotive industry within the next few decades. Steep price tags continue to hold the eco-friendly transportation movement back from its fullest potential, which will easily be solved as producers continue to limit their vehicles' factors of production. While today's solar cars can only reach speeds of up to 45 miles per hour, the vehicles will be subject to the ever-increasing efficiency of future panels. And once Earth's known fossil fuel sources run dry, electric powered vehicles will take their place as the keystone breed of energy-efficient vehicles for the remainder of the millennium.

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http://cleantechnica.com/car-answers/
http://www.afdc.energy.gov/laws/fed_summary
http://energy.gov/articles/history-electric-car
http://homeguides.sfgate.com/can-save-gas-hybrid-79570.html

Riley and Toby

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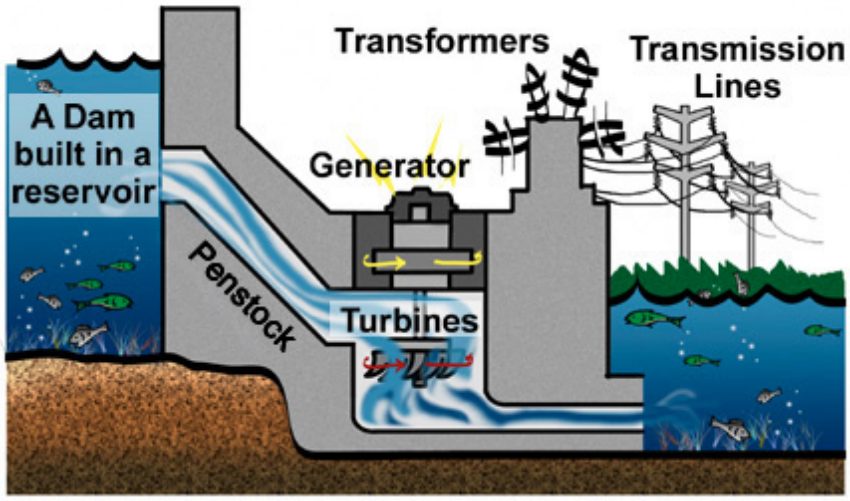
Wet n' wild Hydropower

How does Hydropower work?

Hydropower is electricity generated by using the energy of moving water. It is used by the use of dams and reservoirs. An area is flooded behind a dam, then that water is pushed through the bam by the force of gravity. As it goes threw a tunnel it spins a large turbine. This powers a generator and creates electricity is then spread out over the area. When the water is done being used it is then pushed out of the dam and flows into a river at the bottom. This may cause a number of problems to the environment such as killing of fish population and poisoning a water supply. Over all the energy is clean and a good step towards the future.



Hydroelectric - How Solar Plants Work. 2015. NextEra Energy Resources, n.p.

Where to go for more information…

1.http://environment.nationalgeographic.com/environment/global-warming/hydropower-profile/
2. http://water.usgs.gov/edu/wuhy.html
3. http://www.renewableenergyworld.com/rea/tech/hydropower
4. http://www.eia.gov/todayinenergy/detail.cfm?id=16731

Raw Materials

Water: used to power generators and create electricity. Occurs naturally but needs to be pooled in one area to be used. Causes flooding in one area and changes the down river portion.

Generator/turbines: used to generate the electricity. Takes a lot of energy and fossil fuels to create. Can be cause of negative production of energy.

Concrete and steel reinforcement; the material most dams are made of. They have negative impacts on the environment when it is installed. Can poison water and kill of wildlife.

Fossil fuels; used to power the machines used to build the dam and reservoir. Can negatively affect the air and water in the area and in counterintuitive to the point of clean energy.

Waste Products/ Environmental Impact

There is no solid or liquid waste that comes from this process. However during the building of the dams it is possible from both solid and liquid waste like oil, concrete, and other hazardous materials to enter the lake. All these are removed at the end of construction to the best ability of the crew. These can kill of plants and animals in the river and possible make the lake and river uninhabitable. Air admission is negligible as here is none burnt during the use of the dam. Impacts on the surrounding area effect the down river portion the dam. It will change the flow and possibly direction of the stream. Often, lakes form behind the dam can also be used, leisure, tourism, and water sports. There is a wide range of environmental impacts associated with all power generation technologies. Other than the building and upkeep of the dam there is no waste made from this process.

Why is Hydropower better than current energy sources?

Compared to other renewable energy sources Hydropower is among the most efficient. Once the damn has been built it produces no air pollution and has a minimal environmental impact. The few environmental impacts it does have such as disturbing fish migration patterns can be over come with inventions such as the fish ladder. Dams also have a minimal maintenance costs and they are always producing electricity as long as the water is flowing. They are very efficient converters of energy since there are very few conversions of the energy. 85%-90% of the energy in the water is converted into electricity.

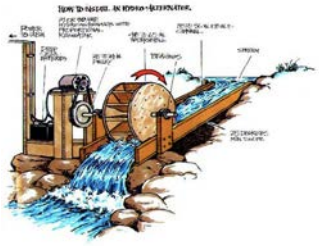
Government Support

Until the past few years the government has not been a major supporter of hydropower. They felt that since after a dam was built it required very little maintenance costs they did not need to support it because it would pay for itself quickly. However in recent years more efficient and equipment that offers less of an environmental impact have been invented the government has been supporting this more and granting more money into funding the development of this technology.

Tuoba Hydro-Power Station. 2015. Tuoba Hydro-Power Station, n.p

History

This power has been used since the days of the Greeks. While it was not the huge dams we see today it was a simpler approach. During this time it was mostly the force of water to turn grinders or water wheels to crush grain of textiles. During the mid 1700s a French hydraulic and military engineer, Bernard Forest de Bélidor, wrote a book about using water to power a turbine called, Architecture Hydraulique. Over the cores to the years the technology got more and more far reaching. In 1881 Niagara Falls was used to power streetlights in the surrounding area. During the time only direct current was used. It was not as far reaching as it is today. Once alternating current came along the power of water could reach miles around. As it got more powerful acts and political groups started to arise to fund and advocate the clean energy. In 1907 Hydropower provided 15% of U.S. electrical generation. Then in 1940 Hydropower provided 40% of electrical generation. Today about 6–8% of U.S. electricity comes from hydropower.



Micro-Hydroelectric Plant. 2015. Inside Energy via The Durango Herald:, n.p. *History of Hydropower*. 2013. Eletrical4u.com, n.p.

Summary/Opinion

In conclusion Hydropower is among the most efficient sources of renewable energy. I think we should invest more resources into this technology because if done properly by only diverting small amounts of water rather then forming large dams and creating reservoirs it is extremely efficient and has a very small environmental impact. Yes, it has its environmental drawback but with evolving technology and a few more years I believe we will be able to lessen the impact and harness the true power or Hydropower.

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Well I'll Be Dam-ed

Published By: Alex Vreeland and Brianna Lemenze

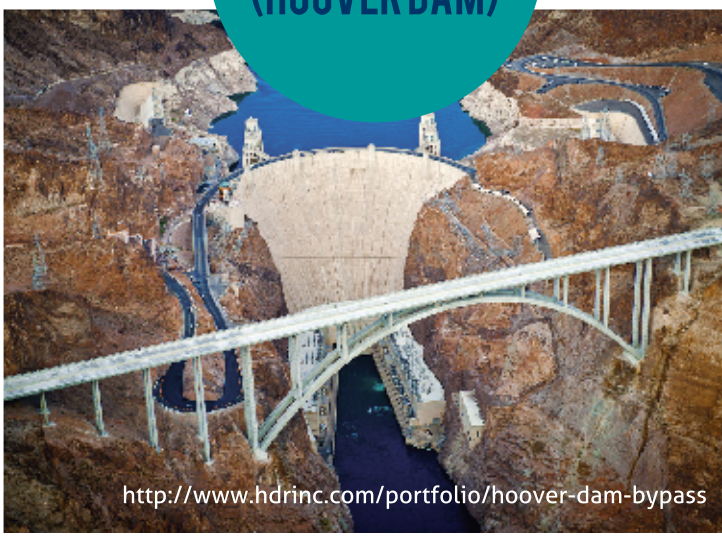
WHAT IS A DAM?

~A Dam harnesses the kinetic energy of moving water and converts it to electrical energy through the use of generators.~

The Dam Raw Materials

Overall, the most necessary raw material needed for hydropower is water. Literally meaning "water" power, hydropower is the second most common form of renewable energy in the world. In order to use the water, the dam must block the water flow of a quick paced river/ water source which can cause environmental harm [1] (see The Dam Waste Products).

HERE'S ANOTHER DAM PICTURE! (HOOVER DAM)



http://www.hdrinc.com/portfolio/hoover-dam-bypass

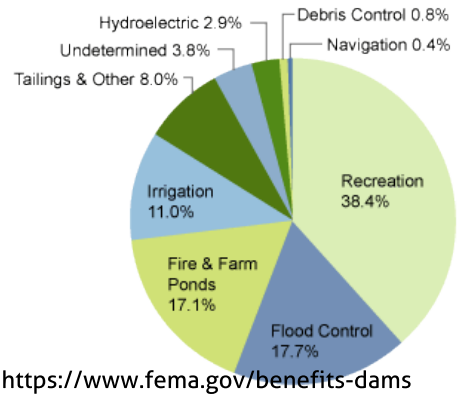
THE DAM HISTORY

Hydro power has been used in the US since the late 1800's. Ancient cultures from the Greeks to Imperial Rome to China used water-powered mills for essential activities like grinding wheat. In 1849, an engineer, James Francis developed the Francis Turbine, the type of turbine that is most widely used today. Wisconsin was home to the world's first hydroelectric power plant, which began operating on September 30, 1882.

http://www.kavehfarrokh.com/iranica/

How Does This Dam Technology Compare to Others?

Compared to other energy sources, such as burning fossil fuels, the use of dams does not emit any air pollutants, waste products or CO_2 emissions into the atmosphere; however, the making of cement is responsible for 5% of global anthropogenic CO_2 emissions. Overall, hydroelectric dams seem to be sustainable. They provide power as well as recreation and flood control. [1] In New Jersey, hydropower may be an interesting alternative to some of the nuclear methods we are currently using. Here, we have many rivers, including the Delaware, and we are near the Atlantic Ocean, where we could harness tidal energy.



https://www.fema.gov/benefits-dams

Government's Dam Support

The government currently encourages the building of dams. Many resources are being put into the research of untapped water-power in order to expand our clean-energy industry in the U.S. Research has included updating the efficiency of current dams as well as building new ones in locations such as tributaries leading into the Atlantic Ocean. [4]

The Dam Waste Products

Hydropower does not generate waste products and does not pollute the water or the air. However, the construction of the dam and the maintenance do produce some pollution. It also changes the environment by affecting natural habitats. In the Columbia River, salmon must swim upstream to their spawning grounds to reproduce, but the series of dams get in their way of traveling upstream. [3] Fish ladders have helped the salmon get around the dam and to the spawning grounds. The vegetation that was once growing along the riverbed decays in the lake that is created by the dam. This causes the buildup and release of methane. [5]

The Dam Summery

We think that hydropower is good in small amounts. It disrupts the ecosystem of the river and it causes more harm than benefits .A lot of countries do not have access to a lot of rivers to put dams in. it We like that it generated little to no pollution but we do not think that hydroelectric power will solve the world's energy crisis .

More Dam Information

http://www.hydro.org/tech-and-policy/history-of-hydro/

http://www.edfenergy.com/energyfuture/hydromarine

http://www.hydro.org/

http://energy.gov/articles/top-10-things-you-didnt-know-about-hydropower

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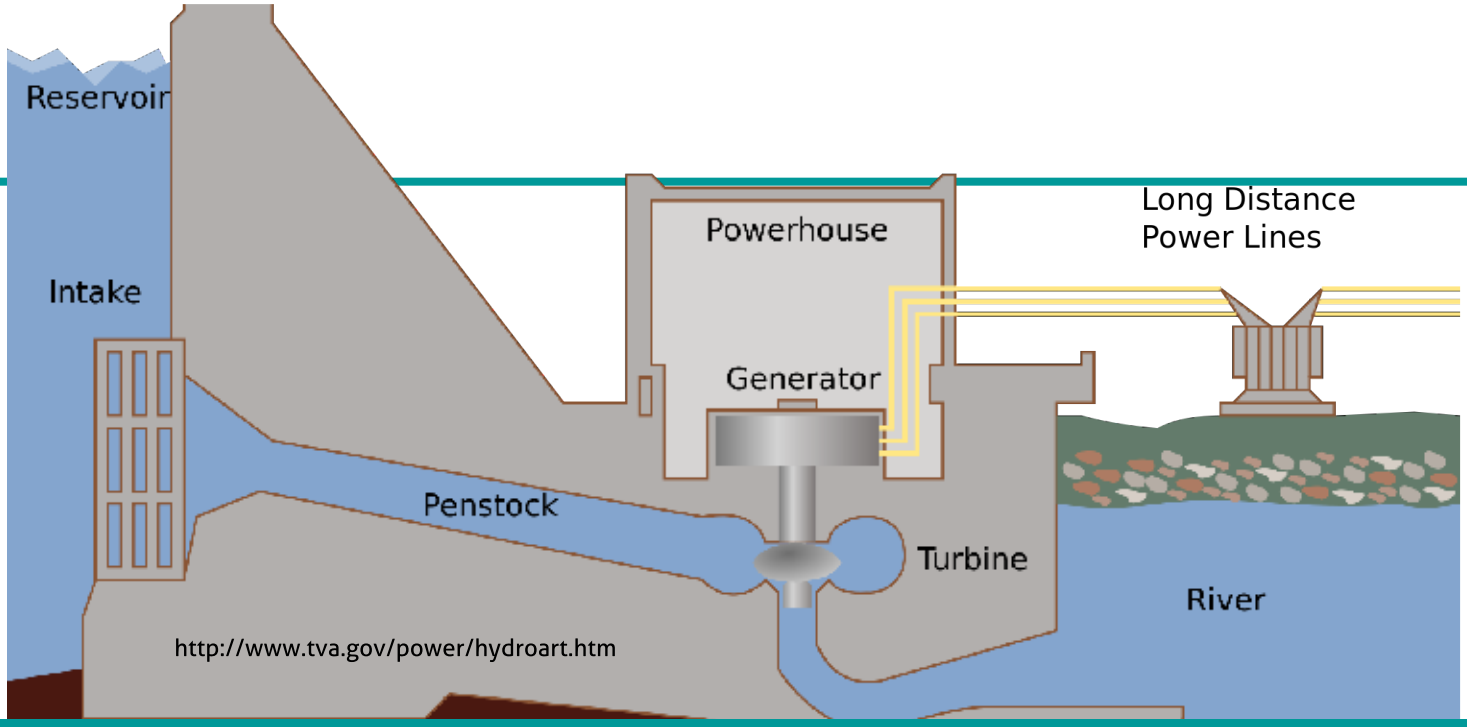

HOW DOES THIS DAM TECHNOLOGY WORK?

STEP 1: Water builds up behind the dam creating a reservoir

STEP 2: The water in the reservoir is funneled through an intake, or opening, within the dam.

STEP 3: The water travels down the penstock, through the dam.

STEP 4: The water rushes past the turbine which is forced to rotate, which generates electricity through a generator. The electricity is then transmitted through power lines.

STEP 5: The water exits on the other side of the dam an continues to travel down the river

We hope you enjoyed all our dam jokes!

Published by: Jack Kolodziej and Noah Cerone 2/12/15
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Nuclear Energy: The Future

How Does a Nuclear Reactor Work?

-Uses atomic isotopes (Usually Uranium-235) as power source

-High-speed photon are launched at these isotopes which break apart and in turn create thermal energy

-This energy is used to boil water which creates a large amount of steam

-The steam will rotate turbines which will create electricity

-Certain isotopes create more energy than others

Raw Materials

-Requires Uranium-235 or U-238

-Uranium ore goes through a complicated multi-step process

-Ore is usually mined through an open shaft or in-situ mining

-In-situ mining uses highly acidic chemicals to break down ore into slurry which is then sucked back to the surface using groundwater

-Collected ore is then broken down by sulfuric acid to eliminate unnecessary materials to extract the valuable mineral

-The ore is radioactive and hazardous to unprotected workers

-Some mines are in less-developed areas which exploit workers for profit

-Shaft mining destroys the landscape and makes it very difficult for the land to recover

Waste Products/ Environmental Impact

Where to go for more information…

Why are nuclear reactors better than current energy sources?

Government Support

History

-Uranium discovered in 1789 by Martin Klaproth and named after Uranus
-Development of nuclear technology began in early 1900's
-Most scientists were focused on how it could be utilized as a weapon
-Atomic bomb created in 1939
-First reactor created in 1951
-Commercial models available by 1959
-Nuclear power usage grew exponentially until the late 1970's
-Reactors declined from early 1980's to late 1990's
-Resurged in production in early 2002

Summary/Opinion

-Nuclear energy is a good choice for renewable energy
-However, new technology will need to be created so reactors can be safer and less hazardous if leaking
-Waste products should be utilized so as to cause less harm to the environment
-Better solution for transportation of waste
-A more sustainable fuel source should be utilized rather than uranium

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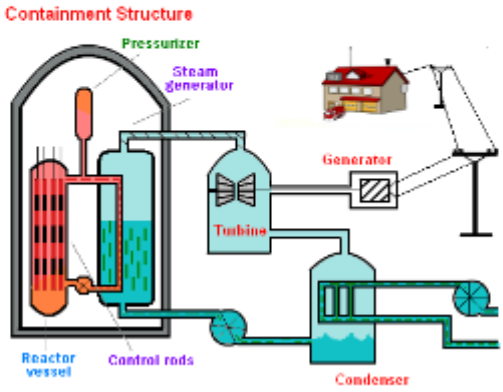
Nuclear Energy Is The Way To Be!

How Does a Nuclear Reactor Work?

Nuclear plants, like plants that burn coal, oil and natural gas, produce electricity by boiling water into steam. This steam then turns turbines to produce electricity. They use uranium fuel, consisting of solid ceramic pellets, to produce electricity through a process called fission.
Components of a Nuclear Reactor include:
Fuel: Uranium is the basic fuel. Usually pellets of uranium oxide are arranged in tubes to form fuel rods. The rods are arranged into fuel assemblies in the reactor core.
Moderator: Material in the core which slows down the neutrons released from fission so that they cause more fission. It is usually water, but may be heavy water or graphite.
Control rods: These are made with neutron-absorbing material such as cadmium, hafnium or boron, and are inserted or withdrawn from the core to control the rate of reaction, or to halt it.
Coolant: A fluid circulating through the core so as to transfer the heat from it.
Pressure vessel or pressure tubes: Usually a robust steel vessel containing the reactor core and moderator/coolant, but it may be a series of tubes holding the fuel and conveying the coolant through the surrounding moderator.
Steam generator: Part of the cooling system of pressurized water reactors where the high-pressure primary coolant bringing heat from the reactor is used to make steam for the turbine, in a secondary circuit. Reactors have up to six 'loops', each with a steam generator.
Containment. The structure around the reactor and associated steam generators which is designed to protect it from outside intrusion and to protect those outside from the effects of radiation in case of any serious malfunction inside.



Raw Materials

The most important raw material used in nuclear energy is uranium-235. It is a radioactive isotope found deep within earth's crust. The only way it can be found is by mining for it. It takes a lot of manpower and fossil fuels to mine for U-235. Miners remove large amounts of host rock, to get very little U-235. Also byproducts of nuclear energy include the leftover radioactive materials (fuel rods) as well as the leftover radioactive water.

Why are nuclear reactors better than current energy sources?

Nuclear energy is cleaner than traditional fossil fuels. There are no air pollutants produced. Nuclear energy accounts for 20% of the energy produced in the USA. Despite its cleanness, there are major concerns around the disposal of the radioactive waste products.

Waste Products/ Environmental Impact

Although nuclear energy does not produce any air pollution like the burning of fossil fuels, it does have a significant environmental impact. The left over radioactive fuel rods as well as the left over radioactive water are two of the major waste products produced by nuclear energy. These radioactive byproducts must be properly disposed of because of how dangerous they are. The major

Where to go for more information…

Nuclear Energy Institute: www.nei.org
Energy Gov: http://www.energy.gov/ne/office-nuclear-energy

Summary/Opinion

Nuclear Energy is possibly the best way to produce energy! The way it works is simple with the use of uranium fuel and converting water into steam. Although it has some issues with removing the waste, it is still cleaner than other traditional fossil fuels. The Department of Energy has been a great supporter of the use of nuclear energy and encourage the new use of the improved technology. Even though it is somewhat new to the United States, it still has been a great component to the production of energy in our country.

History

was discovered in 1789 by Martin Klaproth, a German chemist.
Cockcroft and Walton produced nuclear transformations by
rding atoms with accelerated protons. Hahn and Strassmann
that fission not only released a lot of energy but that it also
additional neutrons which could cause fission in other uranium
and possibly a self-sustaining chain reaction leading to an
ous release of energy. By the early 1930s there were several
centers specializing in nuclear physics. Peierls and Frisch had
redicted in 1940 that almost every collision of a neutron with a
m would result in fission, and that both slow and fast neutrons
e equally effective. It was later discerned that slow neutrons
were very much more effective, which was of enormous significance for
nuclear reactors but fairly academic in the bomb context. The first

support that allows companies to

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Solar Electricity

How Does Solar Electricity Work?

Photons from sunlight strike and ionize semiconductor material on solar panels. This causes outer electrons to break free of their atomic bonds and then they are forced in one direction, which creates a low voltage flow of electrical current. This is usually converted into a higher voltage alternating current to be used in homes and businesses. In a crystalline silicon solar cell, the most common type of PV technology, high-purity silicon is "doped" with impurities and then fused together. This creates a structure that makes a pathway for the electrical current. There is also Thin-film PV and concentrating PV. Solar cells are on 12-20% efficient because some of the sunlight is reflected, some is too weak to create electricity, and some of it creates heat energy.

Solar panels are large arrays of PV solar cells. The energy produced is tied to electrical grids and when there is extra electricity produced it is sent to your electric company. Some off-grid homes rely solely on PV solar cells.

Where to go for more information...

http://www.seia.org/policy/solar-technology/photovoltaic-solar-electric

http://www.madehow.com/Volume-1/Solar-Cell.html

http://www.nrel.gov/learning/re_photovoltaics.html

Raw Materials

A solar cell is made primarily of pure silicon.The raw materials involved in making solar cells include silicon dioxide, which are derived from either quartzite gravel or crushed quartz. In order to release oxygen, these are then inserted into an electric arc furnace and a carbon arc is applied making carbon dioxide and molten silicon. Once this silicon is further purified, it is treated with phosphorus and boron until it is able to produce a semiconductor that can conduct electricity

Waste Products/ Environmental Impact

Photovoltaic cells themselves release no gases and do not contribute to global warming. They are safe, make no noise and create no pollution; it is their production that brings a concern. The energy required to produce the electricity, the questions as to what happens at the end of the cells lifetime and to the toxic and harmful material associated with the production are what catch people's attention. Waste from production can leak into the surrounding soil. Although silane and phosphine used in the production are not flammable gases, phosphine is highly toxic. The impact of these concerns have yet to be calculated but it is on the watch for potential environmental problems. The manufacturing process has multiple hazardous materials. These materials are all variables of danger depending on the amount and usage. Silicon, a main material in the production of photovoltaics does not pose much of a threat but the production of monocrystalline panels create more waste. Thin-film PV cells contain more toxic materials but as long as they are handled properly they give off no direct harm.

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Solar Electricity

Why is Solar Electricity better than current energy sources?

Solar electricity serves to be a better energy source than others because of it's efficiency matched with it's lack of environmental damage. In comparison to wind turbines which have to be in windy places, solar energy is versatile and can be used in most places. Solar panels can also be put on roofs while wind turbines have to take up a lot of space. In comparison to hydropower, solar energy is better suited for individual homeowners, is less expensive, and does not alter water levels nor induce habitat fragmentation. Finally, in comparison to biomass, solar electricity does not produce any kind of emissions, have higher efficiencies, and is more available to homeowners.

Government Support

Over three decades ago, the US led the world in the use of renewable energy. Now, the US government is trying to reestablish the leadership of the solar energy industry with the help of the Recovery Act. The government is focusing on developing today's technologies further, specifically for solar photovoltaics and creating funding for new solar power technologies. The Department of Energy's solar PV incubator program has also helped support competition in the process of reestablishing the industry. Solar companies are doing their best to increase the efficiency of production as well as lower the cost of solar power. Along with decreasing prices, the Department of Energy's Recovery Act pre-incubator and incubator programs are supporting findings in nano material and organic material to bring down the usage price dramatically. If they are successful, solar electricity will be cheaper than electricity from the grid, even without government incentives.

History

The idea of photovoltaic technology has been observed since the 1830's and it continued to be studied all throughout the 20th century. The first PV device was created by Bell Labs in 1954. In 1970 there was an energy crisis and that was when using solar cells became a major interest. Unfortunately, it was very expensive and impractical to use them. Research and industry development have allowed the cost to go down over time. The average cost of a complete photovoltaic system has dropped by 33% since 2011.

Summary/Opinion

In essence, the utilization of solar energy would not only benefit homeowners who rely on electricity, but would also benefit our environment in comparison to other sources of energy because it produces no harmful emissions. In our opinion, the use of this type of solar energy should be encouraged by not only the government but by society as well. It is pivotal that we consider the impact the electricity we are using is having on our earth; and by using solar energy we can be attentive this concept and help power the world more efficiently with less environmental concerns.

Ryan Garcia, Kristen Sipos, Jess Schneider 2/15/15

A Cleaner, Friendlier Nuclear Energy

How Does a Nuclear Reactor Work?

Solar thermal electrical generation is an active system that uses energy from the sun's light. The technology concentrates the sun's light using reflective material and creates heat used to run a heat engine, which could be a steam engine, gas turbine, stirling engine, or another type of engine. The engine used is filled with liquid or gas, usually water, oil, salts, air, nitrogen, or helium, which turns a generator to directly produce electricity. Most are between 30-40% efficient and can produce 10s to 100s of megawatts of power.[1] It takes solar energy converts it to mechanical energy that can be converted to electricity.[2]

3

Where to go for more information…

http://sunwatersolar.com/solar-thermal/what-is-solar-thermal
http://www.solar-thermal.com/solar-thermal.pdf
http://www.seia.org/policy/solar-technology/solar-heating-cooling

Raw Materials

- sun
- mirrors (or other reflective material)
- various types of metal(steel, brass, aluminum, copper, ect.) to make the engine and heat collector
- Need to be installed in areas where there is a lot of sunlight (desserts)[5]

3

Waste Products/ Environmental Impact

Making the photovoltaic cells uses energy and silicon, which can be harmful to the environment. The waste product of that is harmful to the environment. The large area required for this can disrupt the natural balance of an ecosystem. It can take up too much space and damage a supply of resources.[8]

1

Why are nuclear reactors better than current energy sources?

Not the same as photovoltaic or solar panel energy. Concentrates the light from the sun to create heat, and that heat is used to run a heat engine, which turns a generator to make electricity. The working fluid that is heated by the concentrated sunlight can be a liquid or a gas. Different working fluids include water, oil, salts, air, nitrogen, helium, etc. Different engine types include steam engines, gas turbines, Stirling engines, etc. All of these engines can be quite efficient, often between 30% and 40%, and are capable of producing 10's to 100's of megawatts of power. More effective than photovoltaic energy because solar panels are only effective during daylight hours. Heat storage is a far easier and efficient method because it can be stored during the day and converted at night. Most cost-effective energy compared to fossil fuels. Beats cost of natural gas and fossil fuels. Low cost. Low environmental impact. It can be used in our area because we have the space to support it.[1]

Government Support

A 30% credit equal to expenditures with no maximum credit is given by a government subsidy for solar thermal heating. The eligible technology must use solar energy to heat or cool a structure or produce energy.[6] A 30% credit equal to expenditures with no maximum credit is given by a government subsidy for solar thermal heating. The eligible technology must use solar energy to heat or cool a structure or produce energy. Because of the economy, many countries such as spain have focused their spending on other problems such as the tariff deficit and taken away funding for environmental and renewable energy funds . This has restricted the availability of government subsidies and progression of renewable energy.[7]

History

1774: Lavoisier (French chemist) and Joseph Priestley (English scientist) developed the theory of combustion concentrating the rays of the sun on a test tube for gas collection for power production.1878: World's Fair in Paris had an exhibition of a small solar power plant.[2] 1900s: natural gas decreased in price, and, with it, the interest in solar thermal electrics.[3] 1901: A.G. Eneas operated a 10-hp solar steam engine powered by a reflective dish in Pasadena, California.1907-1913: F. Shuman (American engineer) developed solar driven hydraulic pumps.1913: F. Shuman built a 50-hp solar engine for pumping irrigation water in Meadi, Egypt (6000 gallons of water per minute from the Nile to nearby fields.[4] 1973: Interest picked back up and further research took place.[2] 1980: Luz International, an Israeli company founded in 1980, was the first company to implement this technology on a commercial scale.[4] 1984-1991: US built nine solar thermal electrical power plants in California's Mojave Desert. They provide a capacity of 354 megawatts per year that are used in 500,000 Californian homes.[3] 1990: Luz constructed 9 plants with a total capacity of 345MW (90% of all solar electricity in the world at the time).[4] 2008: six days of peak demand abused the power grid, bringing a loss of electricity in California, those solar thermal plants continued to produce at 110 percent capacity.[3]

Summary/Opinion

After doing research on solar thermal electrical generation we have concluded that it is a good choice for producing energy. Large plants could be set up in desserts where they could then transfer energy all over the country. It is by far less expensive than other methods. It is by far more efficient than other methods and it is far less damaging to the environment. The government gives tax refunds if this energy method is used for your home or business. This method has become more popular recently and should only grow in popularity because it is such a good alternative to fossil fuels. The only downside is the amount of space it takes up for it to be effective.

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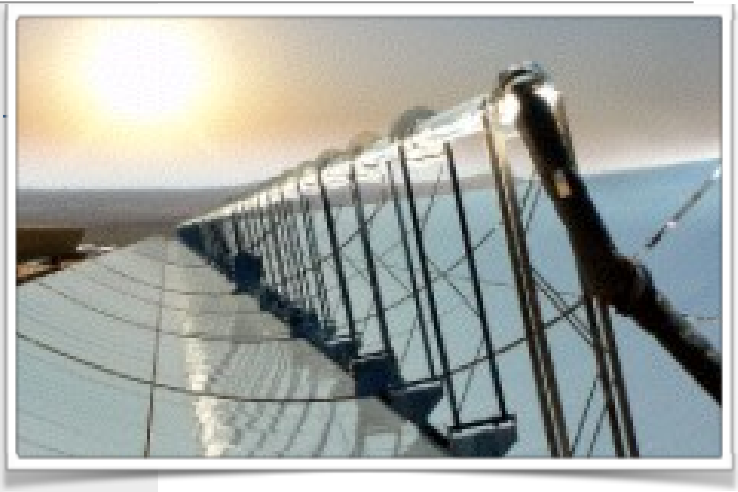
Christine Walsh and Tyler O'Steen February 11, 2015

SUN AND DONE

The Benefits of Solar Thermal Electrical Generation



http://mdvseia.org/concentrated-solar-

Description

The amazing technology of solar thermal electrical generation produces clean energy from the sun The sun's energy is concentrated using an array of mirrors or panels, into a beam that heats a liquid which creates steam. The steam turns a turbine. There are three main types of solar thermal generators: the parabolic trough, the solar power tower and the solar dish. The parabolic trough system is a linear collector that is shaped like a U. The solar powered tower has many heliostats or sun tracking mirrors that collect the suns light. The solar dish system is a dish that concentrates the sun's light, and then a thermal receiver converts the heat into energy. The most effective system is the parabolic trough, but the solar tower design is expected to out produce all of the other systems soon.(Trimarchi, M. (n.d.). How Solar Thermal Power Works? Retrieved February 15, 2015, fromhttp://science.howstuffworks.com/environmental/green-tech/energy-production/solar-thermal-power1.htmHistory)

History

Solar thermal electrical generation can be traced back to the late 1800's, when a basic form of this technology was commonly used in the midwest by pioneer families to heat water for their homes.This technology was first used on a mechanical scale in order to power a printing press in 1878. This system consisted of a twenty square meter parabolic reflector that concentrated light to boil water and generate steam for the steam powered printing press. In the 1900's, people started to use these systems to generate electricity. Over the last twenty years this technology has grown immensely and contributes around 2000 megawatts of electricity per year. One example of this technology being used is in the Mojave Desert where the largest solar thermal power plant is located. The nine power stations generate 360 megawatts of electricity or enough electricity to power 360,000 homes. (Solar Thermal Electricity. (2015, January 1). Retrieved February 15, 2015, from http:// www.consumerenergycenter.org/renewables/solarthermal/)

Materials, Waste, and Government Funding

! Not many materials are required to construct a solar thermal system. The system requires metals for the framework, glass for the reflectors, oil to heat, and generator components. So in order to build a solar station, metal must be mined, glass must be made and oil must be collected. Overall the acquisition of raw materials needed to build a solar thermal station does not greatly impact the environment because all of the materials are needed for other uses anyway so no unnecessary environmental destruction is done in order to build these stations. !

Trimarchi, M. (n.d.). How Solar Thermal Power Works? Retrieved February 15, 2015, from http://science.howstuff works.com/environmental/green-tech/energy-production/solar-

http://mcensustainableenergy.pbworks.com/w/page/32178486/Solar%20Parabolic%20Dish%20CSP

Comparison With Current Technology

Austra Inc. is dedicated to proving that solar thermal electricity could replace coal, gas and oil. In fact, they believe that solar thermal electricity could generate over 90% of the energy needed in the US, while cutting carbon emissions. David Mills , founder of Austra, said,"The U.S. could nearly eliminate our dependence on coal, oil and gas for electricity and transportation, drastically slashing global warming pollution without increasing costs for energy."

The biggest concern with switching to solar thermal electrical energy is how electricity will be generated on cloudy days. The answer to this is a storage system with 93% efficiency on rainy days. Solar thermal generation is an upcoming trend.

http://cleantechnica.com/2008/03/27/solar-thermal-electricity-can-it-replace-coal-gas-and-oil/

thermal-power1.htm!

! There are also very few waste products associated with solar thermal electrical generation. Since the technology is powered by the sun it is very clean energy and the system itself does not produce waste. The potential waste products really only come from repairs in which the glass or metal must be disposed of. Also, the oil may need to be replaced periodically so the used oil would be a waste. This technology does have an impact on the environment though. The systems require a lot of space which can displace wildlife and disturb the natural environmental conditions. Also, the concentration of the sun's light produces temperatures in excess of 800 degrees which has been known to cause bird and insect deaths. However the overall system is relatively clean and does not do much damage to the environment which makes this system of energy production much better than other methods such as fossil fuel systems when it comes to environmental impact and sustainability. (Lewis, M. (2014, July 14). Solar Thermal ElectricGeneration: Still Not Cheap, Not Green?Retrieved

February 15, 2015, from http://www.globalwarming.org/2014/07/14/solar-thermal-electric-generation-still-not-cheap-not)!

! The government has been pumping more money into this initiative recently. One of the nations largest solar projects is taking place in California and is known as Dessert Sunlight. The government pumped $4.6 billion into this initiative, and as solar thermal electrical energy continues to develop, more and more money will put put towards this eco-friendly initiative. !

http://losangeles.cbslocal.com/2015/02/09/large-solar-plant-opens-in-riverside-county/!

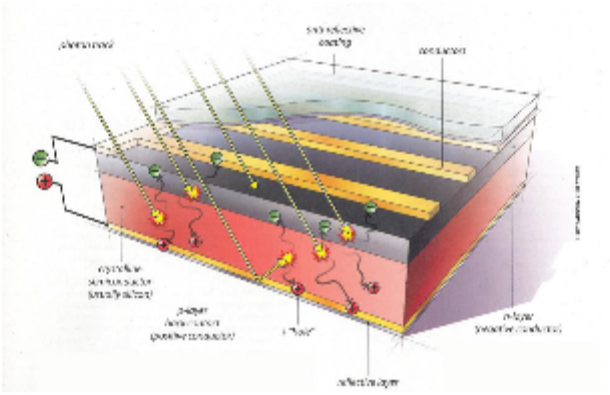
Published by: John Maleski, Sean Szymczak, Kyle Reiter 2/10/15 Volume 1 Issue 1

Solar Photovoltaic- Energy of the Future

How Does Does PV Work?

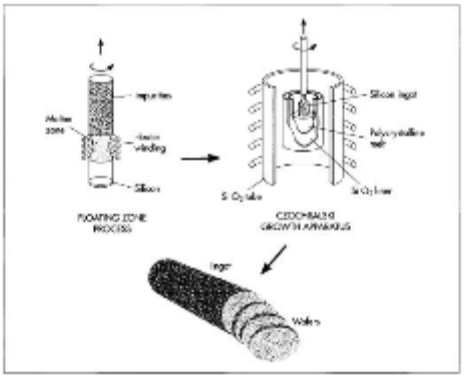
The solar panels are directed towards the sun in order to receive the most light possible in its positioning. Photons from the light strike and ionize the material on top of the solar panels which cause electrons to separate from their bonds. The structure forces the electrical current to flow in one direction. This energy then flows into available energy. It is not completely efficient though because different lights do not work. Some light is reflected immediately. Infrared light is too weak to create electricity. Ultraviolet light is too strong and only creates heat energy.[2]

More specifically, the PV cells are made of semiconductor materials like silicon that are used in microelectronics. These materials are specifically treated in order to create an electric field that have a positive side and a negative side. The light passes through this electric field, electrons are forced to separate from their atoms. The electrons then move through the electrical circuit which is creating the electrical field and creates an electrical current. Then this energy is available for use as electricity. Panels are created with numerous cells inside. The cells make up a module and then multiple modules make up an array. With all of this being said, the more surface area in an array, the more electricity can be converted from the photons from the light rays.[4]



Raw Materials

Silicon is required to create solar cells for panels. Crushed quartz and/or quartzite gravel are put in an arc furnace and the products that come out of the furnace are carbon dioxide and molten silicon. The silicon is then cooled into an ingot and sliced into thin "wafers." Titanium Dioxide and Silicon Oxide are used as an anti-reflective coating. Glass or plastic is then used to cover this.[3]



Waste Products/ Environmental Impact

Overall, PV solar panels are a fantastic alternative and a much cleaner form of energy. There are some problems such as large scale solar facilities using quite a bit of land and they also use a small amount of water in order to help cool down the plant like most other plants. The manufacturing process includes the use of many chemicals such as hydrochloric, sulfuric, and nitric acid in order to help clean which can be hazardous. Also, the silicon that is used in the production can be breathed in and therefore be harmful to workers' lungs.[5]

Why are photovoltaic cells better than current energy sources?

Photovoltaic cells are better than current energy sources because they use a renewable energy source, it does not have harmful waste, and electric companies must buy back any electricity that you produce but do not use due to laws implemented by governments. Unlike fossil fuels, there is no limit to the amount of solar energy that we can use. Also, as we are not burning coal or natural gas, nor using radioactive material, it produces almost no waste (the only detriment is the silicon used to create the PV cells). Also it is economical as it lowers your electric bill and raises property value. Many people who have several panels on their property profit in the long run despite the somewhat large initial price of the panels. This is due to the high amount of energy captured and harnessed reducing bills and turning a profit from the electic companies reimbursing you for your excess energy.[4]

Government Support

The Energy Department's SunShot Initiative has been committed to leveraging America's solar resources and has supported research and manufacturing solutions to support expansion of our world's solar energy output. The US Department of Energy also leads a large group of researchers to deliver more photovoltaic and concentrating solar technology. The amount of solar power installed in the US since 2008 has increased 13x from 2008 to today. The US government also provides the Solar Powering America website which enables communicties and organzitions to learn more about solar energy and use solar energy more easily. All of these steps have helped to make solar energy more affordable for Americans, making it clear that the government backs the use and advancement of solar energy very much. [2]

History

Forms of solar energy date all the way back to 700 AD when Greeks and Romans used magnifying glasses to concentrate the sun's rays to make a small fire. Four hundred years later, the Greeks and Romans used burning mirrors to light torches for religious purposes. Only 100 years later, Archimedes learned how to use bronze shields to reflect the sun's light and burn opposing ships. Amateur use of the sun's energy was used for a long a time, including in the 1200s when the North American Anasazi tribe lived in south-facing dwellings to capture the sun's heat in the winter. It was not until 1767 that we saw the next big step in solar energy when Horace de Saussure created a building with the world's first solar collector. In 1839, French scientist Edmond Becquerel discovered the photovoltaic effect, further advancing the development of solar energy. In 1860s, French mathematician August Mouchet proposed the idea for a solar-powered steam engine and then went on to create the first one in the following two decades. Steady steps over the next century continued to develop the concept of converting the sun's rays into energy, including in 1972 when the French used the photovoltaic system to fully operate an educational TV in Niger. The US Department of Energy launched the Solar Energy Research Institute in 1977 which was dedicated to harnessing power from the sun. This institute helped to produce enough solar panels each year to generate 100 megawatts of power in the year 2000. Solar power has continued to develop over the years to the point where we see it today. [5]

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Summary/Opinion

Solar energy is an excellent alternative to modern methods as it is a cleaner source and it is renewable. With more funding being put into raising the efficiency of PV cells, it is becoming more and more economical. Also, local and state governments assist with payment for solar panels it is feasible for many Americans. With depleting fossil fuel reserves, it is essential to look for alternative renewable and clean sources of energy. Solar energy fits this criteria and can help you economically. It lowers utility bills and increases property value.

Tidal and Wave Energy

APES Mods 1-2

Kelly McDowell, Sierra Yetka, Larisa Prezioso

INSIDE THIS ISSUE:

What is Tidal Energy?

Tidal energy is the energy found in moving ocean tides. The gravitational pull of the moon causes a change in tides twice a day—causing high tide and low tide. Underwater turbines capture this energy to be used to power human activities.

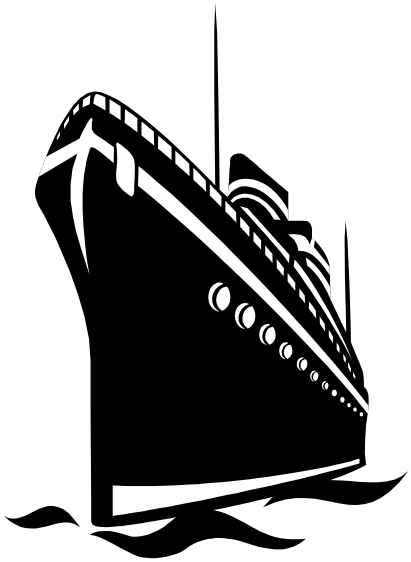
Tidal energy is extremely efficient, more efficient than solar and wind, due to the fact tides and moving water guaranteed twice a day. Underwater turbines also do not produce water or air pollution, fossil fuel emissions, or noise.

Six turbines can produce 65 megawatts a year. While not as much energy as coal or traditional fuels is produced, the environmental impact is significantly less harmful to the ecosystem. These turbines are enclosed in mesh netting to protect fish and other marine wildlife from being harmed by these turbine blades. Since they are hidden underwater, they also do not interfere with coastline aesthetic.

Because these turbines are below the water's surface, they can also be placed near large cities as an alternative energy source, without taking up the above ground space of wind turbines.

As with all energy sources, tidal energy does have some slight disadvantages. While predictable and reliable, overall, these turbines do not produce as much energy as coal, fossil fuel, nuclear, or other energy sources. However, it is clean, and extremely environmentally friendly that utilizes an abundant natural resource—no mining or charcoal production required.

W.H. Freeman (2/15/11). *Environmental Science for AP.* Text.



Tidal Energy is a great, clean alternative to traditional energy.

BENEFITS OF TIDAL ENERGY:

- *Renewable, non depletable resource*
- *No harmful emissions*
- *Reliable and durable (upwards of 100 years or more)*
- *Predictable and highly efficient*

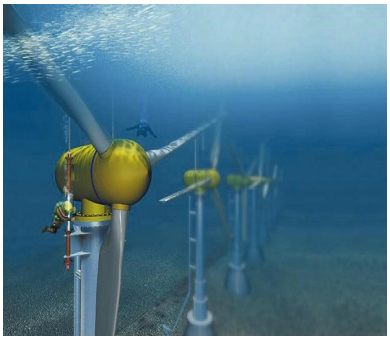
The Background of Tidal Energy (and government support)

In late July of 2012, the United States' first tidal power project was first recognized. The plant was to be constructed in Eastport, Maine, with the support of $10 million from the Energy Department in Washington. President Barack Obama was a heavy supporter of this innovative energy plan, as it coincided with his plan to create jobs for Americans and strengthen America's global competitiveness. The government overall saw this as an opportunity to create new manufacturing, construction, and operational jobs. Maine was, and still is expected to lead America's installation of tidal energy—about 100 billion tons of water flow in and out of its coastline each day. This plan was to initially power between 75 and 100 homes. With future development, this project is aimed toward powering upwards of 1000 homes. This project is ensured for 20 years; the first long term tidal energy project to be approved. This project has been moved from the laboratory and into commercial use, and is projected to continue to grow in the upcoming years. Tidal Electric. (Feb. 2105). *History of Tidal Power* Retrieved from http://www.tidalelectric.com

Want to Know More?

- http://www.tidalelectric.com
- http://www.alternative-**energy**-news.info/technology/hydro/**tidal**-power/
- www.ocean**energy**council.com/ocean-

Tidal energy has no global environmental impacts.



http://thetimes.co.uk

Tidal energy cycles typically last 12 and a half hours.

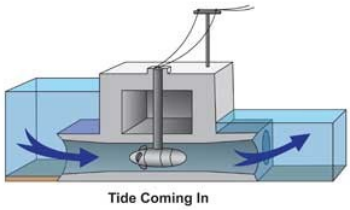
Some History of the Powerful Waves

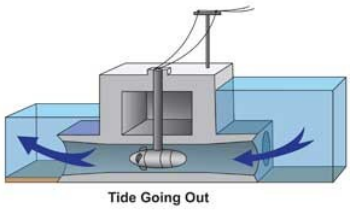
Water has been used for energy since about 900 A.D., some historians say, but one of the biggest water innovations was that of the water mill. Arising in America and Europe around the late 1700s into the 1800s, water rushed over a giant paddle laden wheel, which turned a mechanism inside the mill which turned a stone that ground grains into flour. However, this energy was only available for about three hours a day. When electricity became widespread, water power lost its appeal. However, now in modern day, water power is making a comeback, and since 2012, water turbines to capture tidal and wave energy are becoming increasingly popular as a cleaner alternative energy source in America.

In other countries…

In 1960, France was the first to construct a commercial tidal wave power plant. 24 10-megawatt bulb turbine generators capture moving wave energy, and has reliably done so for 37 years. In 1982, the second tidal energy plant was constructed in Nova Scotia, Canada. There are a handful more plants across the world, namely in China, but most are not used for commercial energy. Science still works toward improving this form of capturing energy in hopes to make it more accessible for all.

Tidal Electric. (Feb. 2105). *History of Tidal Power* Retrieved from http://www.tidalelectric.com





http://climatekids.nasa.gov

http://wyretidalenergy.com

We believe that tidal energy is a great and reliable source of alternative energy. It is natural, clean, free of emissions, and provides predictable energy. Besides the downside of the initial building cost, tidal energy has the potential to provide a major environmental benefit to the ecosystem and be a reliable energy source for the coastal homes of America.

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You know what blows? Wind Energy

How Does Does Wind Energy Work?

Wind Energy is primariliy accumulated by wind turbines. Wind turbines are large structures standing 300 feet tall and have blades that are 100 feet long. As the blades spin they accumulate kinetic energy and that kinetic energy is than transfered into a battery to be stored as electiricity. Once the battery is fully charged, a techinician swaps the fully charged battery for an empty one, so that the cycle can continue. Wind energy is a good source of energy ,but its conversion of kinetic energy is only 25%.

Where to go for more information…

http://energy.gov/eere/office-energy-efficiency-renewable-energy

http://www.windenergyfoundation.org/wind-at-work/wind-consumers/wind-power-your-home

Waste Products/ Raw Materials/ Environmental Impact

The wind turbine consists of three major parts, the tower, the nacelle, and the rotor blades. The tower is majority stainless steel, the nacelle made of fiberglass and the blades use a variety of different materials, sometimes fiberglass, sometimes lightweight woods, all hollowed of course. While there are no waste products, the environmental impact consists of the "unaesthetic" nature of the turbines, as well as the many birds that die due to the birds colliding with the blades.

Comparisons

When comparing wind energy to many others, it is important to note that wind is a non-depletable resource. That being said, it is also a clean energy source, however placing these turbines requires much open land. Though much land is used though, the land can still be used for other purposes, such as grazing. The turbines themselves may cause the deaths of many birds, but overall, it seems much more sustainable than coal or nuclear plants.

Government Support

Government support for wind started after the Oil Crisis in 1973. It started by funding subcontractors to create designs for wind turbines. They pushed for the creation of large megawatt creating turbines for wind to be considered as a serious power source. Once these large vertical axis turbines (VAWT) were created the industry took off.

Today the Obama administration has pushed for wind energy projects on federal lands and future offshore projects. They are also helping small scale turbine companies become successful with incentives for the buyer.

History

Wind energy was first used by the Persians through 900-500 B.C. As time passed, wind energy made its way to Europe in 1000 A.D. Wind energy had several different purposes before its more prevalent use in the modern days as a source of energy. It used to serve as a way to propel ships forward amongst rivers, and even used to be used as wind mills to drain lakes. In the 1850's, Daniel Halladay and John Burnham created the first wind energy company and built the Halladay wind mill, which would be the most commonly seen design in the mid-west. Wind energy was then used as ways to pump water for irrigation. In 1890, the first wind turbine was produced in Denmark. This device was made to capture and harvest the kinetic energy from wind. Although this technology seemed to be the way into the future, most wind turbines were shut down in the 1950's due to disuse. Through time, technology has evolved into better shapes and forms. Wind turbines are now more frequently used than in any other point in time. In 2012, wind energy was the number one most used renewable energy resource and was able to produce energy for 15 million households.

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