

**MYP Science AB One World Essay: Solar Energy**

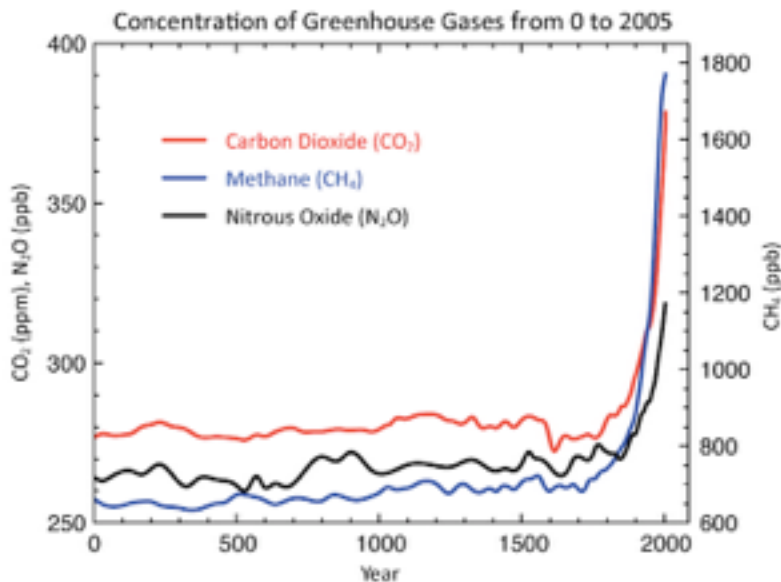
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Due Date: Tuesday 1st April 2014

**Introduction**

Fossil fuels is the most commonly used and dependent source of energy humans since the late 1700s. (Britannica) This has caused an issue as it is a nonrenewable source of energy, hence will eventually run out. 93% of the world's energy consumption is supplied by non-renewable energy sources, whilst fossil fuels such as coal, oil and natural gases provides nearly 88% of the world's energy. (McLamb, 2011) The most important issue with using fossil fuels is the harmful gases it releases, polluting the environment with acid rain and also acts as a large factor of greenhouse effect. According to graph released by IPCC, there is a sudden increase of over 1000ppb of Methane and 100ppb of carbon dioxide present in the atmosphere from the 1700's to 1900's. (IPPC, 2007) In attempts to solve this issue, scientists have discovered a way to use the unlimited source of sunlight in order to generate energy. It is a renewable source, and is always available as long as it contacts with sunlight. Hence, this renewable source solves the issue of running out of fossil fuel energy. Also, the generation of solar energy from panels does not have an effect on the environment, showing sustainability for long term use. Although it does not damage the environment, the process of setting up the solar panels still uses minimal amounts of fossil fuels.

(Edgar, K., &amp; Lerner, B. ,2012)



This graph shows that there is a sudden rise of greenhouse gases present in the atmosphere from 1700s to 1900s due to the industrial revolution.

(IPPC, 2007)

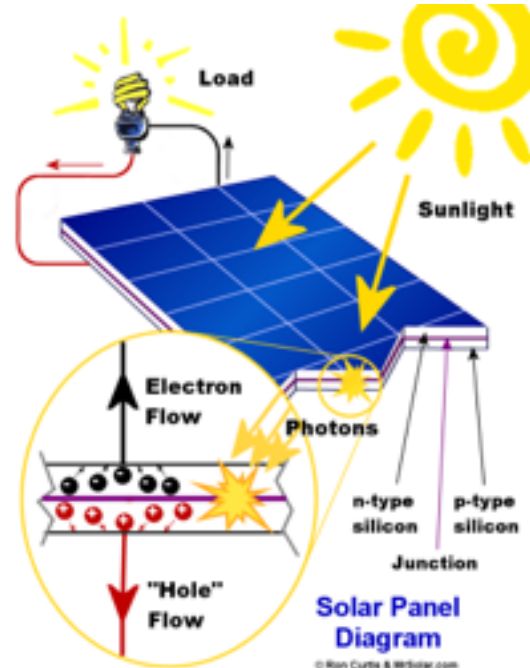
**How do solar energy work?**

Solar cells are used to directly convert light energy to electrical energy that can be used. This process is called photovoltaic. Each photovoltaic cell is usually arranged into large groups called arrays, to provide more energy for industrial, commercial or residential uses. The size of these solar panels depend on the amount of energy it is required to generate. Solar panels are made up of two separate layers of semi-conducting

materials. The material commonly used material is silicon, as it is efficient, and have a low cost. When particles of photons from the sun hits a silicon electron in the first layer of the cell, it transfers it's energy to knock the electron free from it's atom. In order to create an electric current with these electrons, an electric field is created between the two silicon layers when two opposite poles are separated. This electrical imbalance by phosphorous into the top layer of the silicon to increase the number of negatively charged electrons, and boron to the bottom layer to reduce the amount of electrons, reaching a negative charge. Hence, when photon particles knock the electrons free from the first layer, it would move into the second layer, supping energy for another to electron move. This process continues to create and electric current. (Dhar, 2013)

This diagram shows the basic setup of a solar panels, where there are two layers of silicon with a junction between, and the direction of electron flow.

(3D Printing, 2011)



### How effective is solar energy at solving human problems?

Solar power is not suitable for all environments, and cannot be guaranteed to provide a steady source of energy. It requires sunlight in order to generate energy, and on days that are cloudy, have poor weather or in countries that are constantly in winter (where nights are longer than the day) where there is minimal access to sunlight, solar panels would not be very effective. This can cause inconvenience to users as electricity has become an important part of our lives. Another limitation that reduces it's effectiveness is the large space the panels occupy and the cost to install it. The large sizes of solar panels make it difficult to install and smaller residential areas such as apartments due to the lack of space and also cannot reach the sunlight. According to the NMHC, in New York itself, there were 50% of the citizens living in apartments. (NMHC) Hence, this suggests that solar power is not a feasible solution to replace their use of fossil fuels. Also, although installing solar panels can save much money on electricity bills in the long term, they are very expensive, and many families cannot afford to install the panels. According to statistics collected from Germany, Japan and US, the average price to install a 2KW solar panel ranges from \$9,400 - \$21,000, whilst the average monthly wage of citizens were \$3,769 USD in 2011. (Whitburn)

### Positive Impacts of Solar energy

Solar panels has become a benefit for the economy of the United States greatly by reducing the use of foreign imported oil and other energy sources through trading, and opening many job opportunities in the solar panel industry, as well as installation and transportation. This is because the production requires many procedures and due to the large size of the solar panels, specific transportation means have to be made. Just in America, solar industries have provided over 100,000 job opportunities, in 5,000 businesses in every state. (Ipeck, 2011) The invention of solar power has also reduced the amount of crude oil and petroleum products import from 21,790 Mbbl of oil in June 2002, to 4,350 Mbbl in January 2014. (EIA) Furthermore, solar power has also largely contributed to reducing the amount of pollution as it done not emit any greenhouse gas when producing electricity, and does not have any consumption of raw materials. This has become evident when the total CO2 emission from the consumption of energy in UK has reduced from 560.339 Million Metric Tons in 2000 to 496.799 in 2011.(EIA)

### Negative Impacts of solar energy

Although solar power has improved our lives, it also comes with a negative impact on our environment and economy. The use of solar energy does not produce and greenhouse gas emission, but production of these solar panels are bound to lead to a certain amount of greenhouse gas emission, as fossil fuels are most commonly used to supply electricity for such large scaled industries. Larger use of solar power, such as utility scale solar farms can also lead habitat loss and land degradation as solar panels that can efficiently supply energy for large scaled use is very large. A report issues from the U.S. Census Bureau stated that it would take a minimum of 3.68 million acres to power to power 115 million homes in the US. (Levitan, 2013) Another environmental impact the use of solar panels has on the environment is the massive use of water for cleaning and cooling down systems. According to elements power, 10 acres of PV panels will require 10,000-15,000 gallons of water per year for panel cleaning. (Power) Also the cleaning of panels require hazardous materials such as hydrochloric acid, sulfuric acid, nitric acid, hydrogen fluoride, 1,1,1-trichloroethane, and acetone. The USA EPA estimates that 256 million tons of officially classified hazardous waste was produced in US yearly. (Science) Lastly, products that establish themselves to be solar powered generally have a much higher price. For example, the cost of an average car in the US is \$31,252, (Healey, 2013) yet Ford's C-Max Energi cost approximately \$1,000 more due to it's solar cells design. (Randall, 2014)



This image shows the large amount of land solar panels occupy. (Levitan, 2013)

## Conclusion

In conclusion, it is clear that the use of solar energy is a possible future solution for of a renewable energy source that does not produce and greenhouse gas emission or harm the environment when in use and also improves the economy of a country by producing job opportunities. Although the production of these solar panels can lead to damage in the environment, it is evident that it leads to much less damage than the use of fossil fuels. Also, solar panels are long-lasting and only needs to be manufactured once, hence, such impacts is not very significant.

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