

**Hwa Chong Institution**  
**Project Work**  
**Category 3 Inventions Log Book**

Title of Project:	Multiple Electric Generators powered by magnetism
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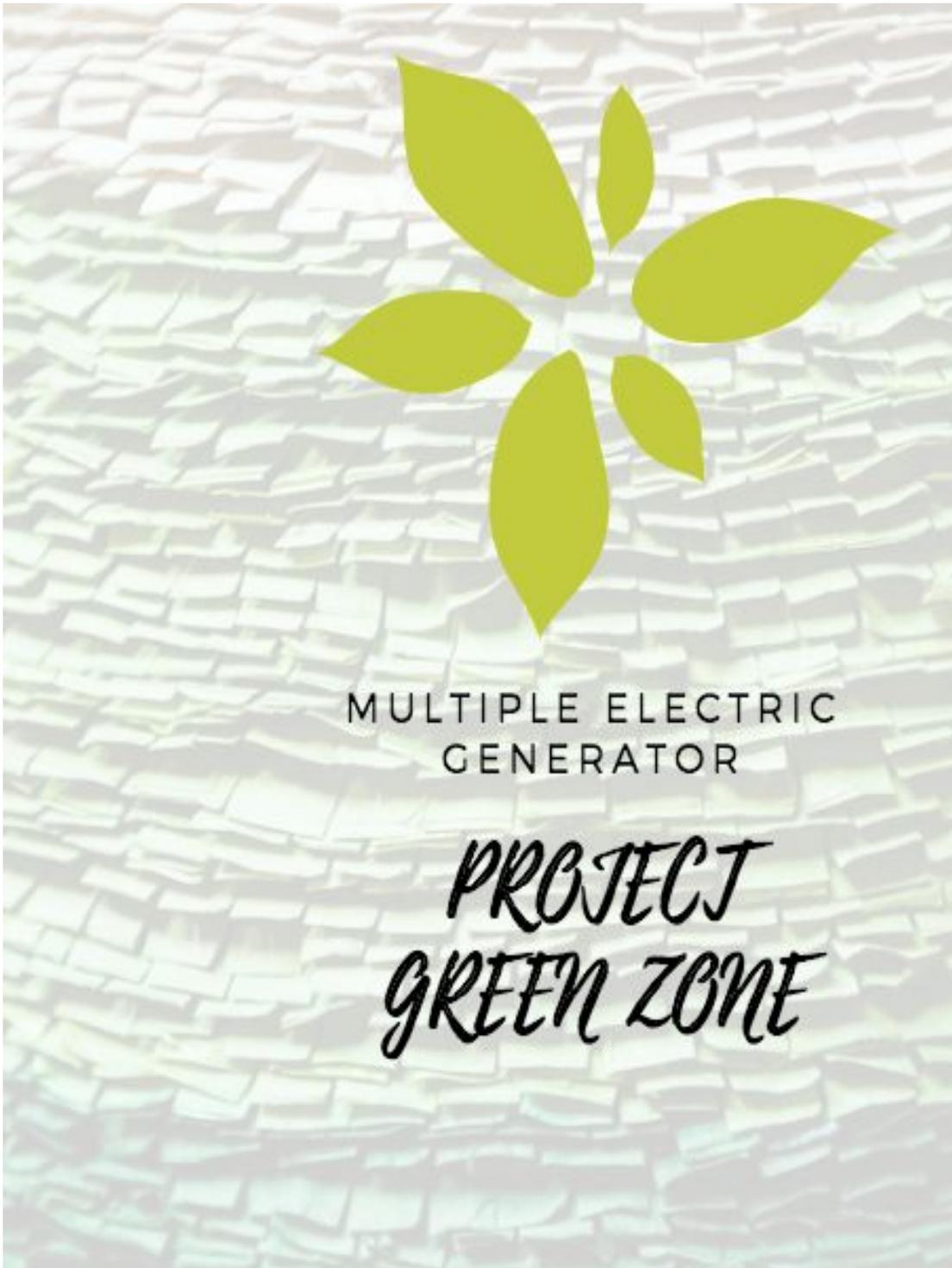
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## Problem Finding

### Appendix: 1A

Our group has chosen this method for ideation. A Day in the Life Study is a type of ethnographic research in which a user is followed and observed by the researcher throughout a typical day. The researcher is able to observe moments that are so routine to the user as to be unremarkable, or even entirely unnoticed by the user. This removes the bias towards more interesting (but possibly less relevant or impactful) events.

The purpose of a Day in the Life is to demonstrate the various product touchpoints with a user within the context of their life. This will give the user experience designer insight to user behaviors, needs, goals and the amount of focus they can give the product at any point in time. Hence, we would like to magnify potential, or existing problems the students have in their daily life. We are going to state these problems students have in a table below, a timetable would illustrate the problems.

0645	Problems waking up
0700	Carrying Heavy Bag & Using of mobile devices.

0730	Battery of mobile devices running out
0800	Lessons in a stuffy classroom
1030	Long queues in canteen
1330	Long queues in canteen
1530	Large crowds in public transport
1730	Reach Home

Problems That are identified:

1. Heavy Bags
2. Charging Mobile phones with green energy
3. Lessons in a Stuffy room

**1B and 2A, Content as follows...**

**Contents:**

1. Introduction
2. Climate changes
3. Long-term effects of climate change
4. Ozone layer
5. Resource depletion
6. Disadvantages of renewable resources
7. Disadvantages of nuclear plants
8. Solution

**Introduction:**

Electricity or Electrical Energy, is what we use in our daily lives to power our homes. Without Electricity, our lives would not be as comfortable and efficient. We could automate actions and provide health care faster than ever before, and the possibilities are infinite. However, this luxury and

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development comes with a cost. As we keep using electricity, we could drive ourselves to a serious problem known as climate changes.

### **Climate Change:**

Climate Change is mainly caused by greenhouse gases such as Carbon dioxide. They are produced from power plants that use fossil fuels. These gases, such as carbon dioxide(CO<sub>2</sub>), methane(CH<sub>4</sub>), and nitrous oxides(N<sub>2</sub>O) are harmful to our atmosphere. The greenhouse gases are easily trapped in our atmosphere and this results in a drastic increase of our surface temperature. The rising temperature will also cause the ice caps in the arctic regions to melt. ([Nasa, GITT, 2016](#)) This leads to a loss in natural habitats to animals such as polar bears and sea lions. Coastal cities like Singapore and New York will soon be underwater due to the increasing rate of **Global Warming**. Besides that, the cold atmosphere will move closer to the equator, leading to strange and unexpected weather. This was evident as snow was observed in the Sahara desert in January 7th, 2018. The snow was reported to be 15 inches(37.5cm) deep. As time pass, there would be more greenhouse gases being emitted to our atmosphere. At this rate, the average temperature would rise and will melt the polar ice caps faster than before. As a result, polar bears would lose their habitats which leads to extinction of the polar bears. Moreover, the ice melts, turning into water and contributing to the height of the Global Mean Sea Level(GMSL). After our constant use of Fossil Fuels, our oceans have already risen by 4 inches.

**In-text: ("BBC - GCSE Bitesize: Nuclear power", 2018)**

### **Ozone layer:**

The ozone layer is a region that absorbs the sun's ultraviolet rays. The ultraviolet rays in long exposure could penetrate our skins and cause mutations in our DNA which results in cancer, particularly skin cancer. Certain greenhouse gases like chlorofluorocarbon(CFC), will destroy the ozone layer through a process called ozone depletion. With the excessive use of electricity, the ozone layer will deplete. Overexposure to these ultra violet rays will lead to the weakening of our immune system.

**In-text: ("BBC - GCSE Bitesize: Nuclear power", 2018)**

### **Resource depletion:**

Electrical generators that uses fossil fuel are a non-renewable source of electricity. This means that the fuel we use cannot be renewed and recycled. This could cause resource depletion in the long run. This results in the loss of energy in the future if we insist of using fossil fuel. Researchers have found out that all of our Fossil Fuels sources will get depleted by 2088 and this is a bad sign, if we insist on using fossil fuels.

### **Disadvantages of renewable source of electricity:**

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Renewable electrical generators would have replaced the non-renewable ones if it wasn't for their inconsistencies. For a Wind energy, we use turbines which produces electrical energy by turning its huge blades via the wind and kinetic energy. However, wind is not constant. For a solar energy, we use energy from the sun and use panels to harness its energy. However, problems such as clouds will block out energy from the sun and which decreases the energy production. Rain will results in the clouds blocking the sun rays and decreasing the efficiency and increasing of the photons which in turn, will damage the solar panels. Another form of renewable energy is harnessing the kinetic energy of water. We build huge Dams that utilise the power of the River flow. However, they also come with other problems such as the blocking of the river for fishes. The Dam prevents fishes to swim upstream to spawn and it will reduce the amount of water. A generator that uses Biomass combust trees as a fuel. Trees take a long time to regrow, and they aid in gaseous exchange which is the process of taking in carbon dioxide(CO<sub>2</sub>) and emitting oxygen(O<sub>2</sub>). By cutting down trees, we have less trees to absorb the sheer amount of carbon dioxide we produce in our atmosphere, which will result in more carbon dioxide. This solution makes the problem worse! A geothermal generator uses heat energy from the mantle to generate electrical energy. However the only plausible way to create such power plants are to build it on a volcano, limiting the amount of energy produces. These plants also have to situated near an active volcano which is highly dangerous. These disadvantages are the reason why people are insistent to use fossil fuel.

**In-text: ("BBC - GCSE Bitesize: Nuclear power", 2018)**

### **Disadvantage of nuclear plants:**

Although nuclear plants do not emit greenhouse gases, there are some huge disadvantages. Nuclear plants uses isotopes which has a higher amount of protons than neutrons inside its atoms making it unstable and dangerous. **In-text: ("BBC - GCSE Bitesize: Nuclear power", 2018)** An example is uranium. Their instability makes them easier to split apart and to produce huge amounts of energy. These isotopes are non-renewable and not as abundant as fossil fuels, but they last longer. Furthermore, nuclear plants are dangerous as they need huge concrete walls to be erected to keep the radiation levels low. Events like **Chernobyl** has shown how dangerous nuclear plants can be. Nuclear plants use isotopes which is a highly active substance that cannot be easily disposed. Despite its benefits which could solve the problem as there are zero emissions, there are over 47000 tons of highly radioactive waste which causes radioactive decay because they take millenniums to deteriorate. Overall, we should not compromise safety for efficiency.

**In-text: ("Chernobyl | Chernobyl Accident | Chernobyl Disaster - World Nuclear Association", 2018)**

1 C

Considerations for Selection	Problems		
	#1 Devices running out of battery	#2 Weight of the bag	#3 Increase in temperature
Consideration 1 Current amount of solutions	3	2	1
Consideration 2 Impact	2	1	3
Consideration 3 Group's ability to solve this problem	3	1	1
Total Score	8	4	5

Hence, in this study, we would be pinpointing the problem, on the over usage of phones as our main problem to solve.

**Solution:**

**Appendix: [ Q3A,B,C&D]**

The solution is simple but not easy.

The criteria for a plausible solution:

- 1) It must not emit greenhouse gases
- 2) It must not be dangerous
- 3) It must be able to be built anywhere
- 4) It needs to be consistent, efficient and not terribly expensive
- 5) It must not consume a large amount of non-renewable resources if it is not renewable

Our idea is to use the energy from magnets to generate energy. Our magnetically powered electric generator uses energy from magnets. Magnets are not significantly affected by weather. Furthermore, it emits no greenhouse gases and it is cheap.

Although magnets are not permanent, they still last for a long time. A neodymium magnet loses 5% of its magnetism every 100 years. That would mean that a neodymium magnet would only lose its magnetism after 20000 years. A magnet is made of alnico or neodymium which is a compound of aluminium, nickel, and cobalt. Our product is more efficient as it does not rely on the inconsistency of the weather, and does not disrupt water flow and fishes or require an active volcano to generate electricity. Ours is self reliant and consistent.

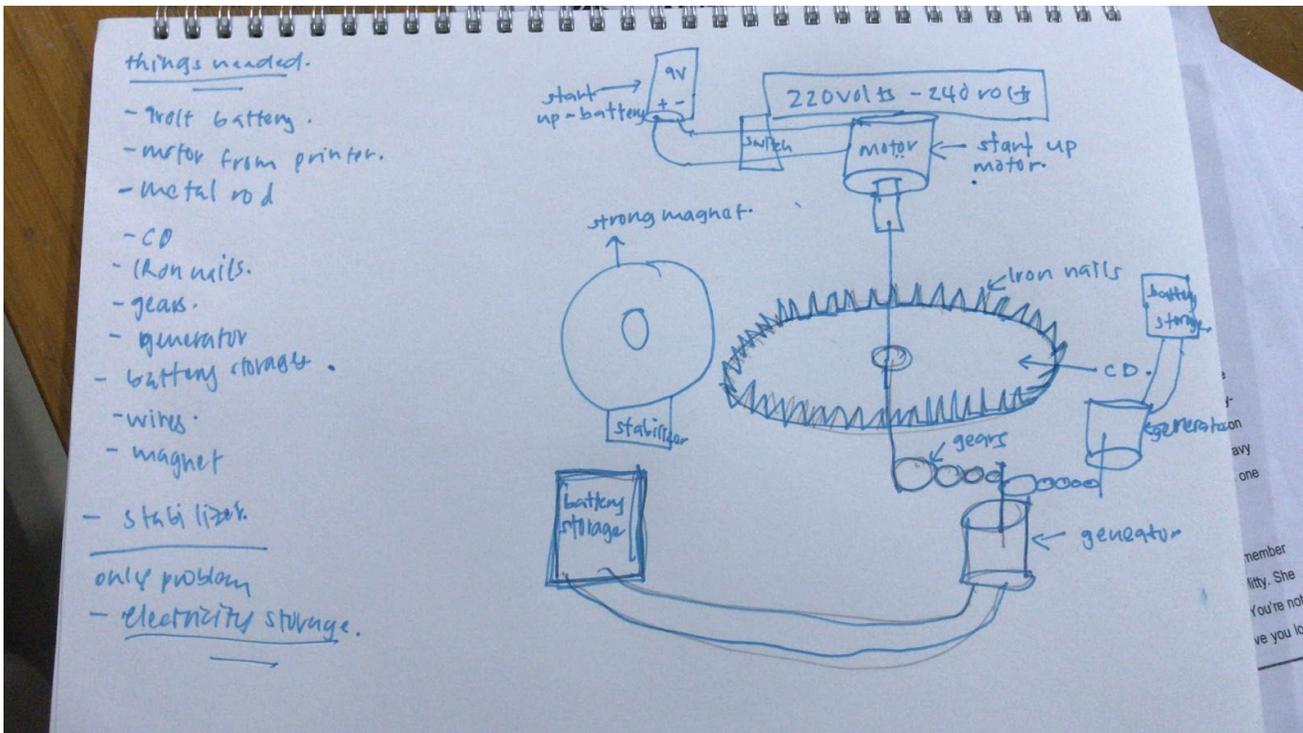
Overall, the magnetically powered generator is a logical solution to various problems. It is not significantly affected by weather changes and it is not costly. It does not damage the environment and does not pose any health risk or environmental risk. I believe that the magnetically powered generator is a possible and plausible solution.

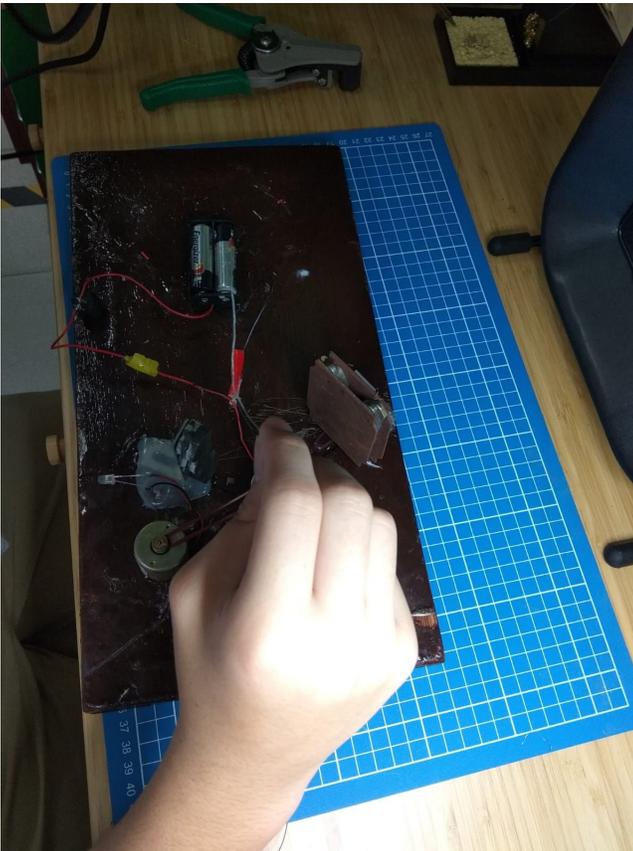
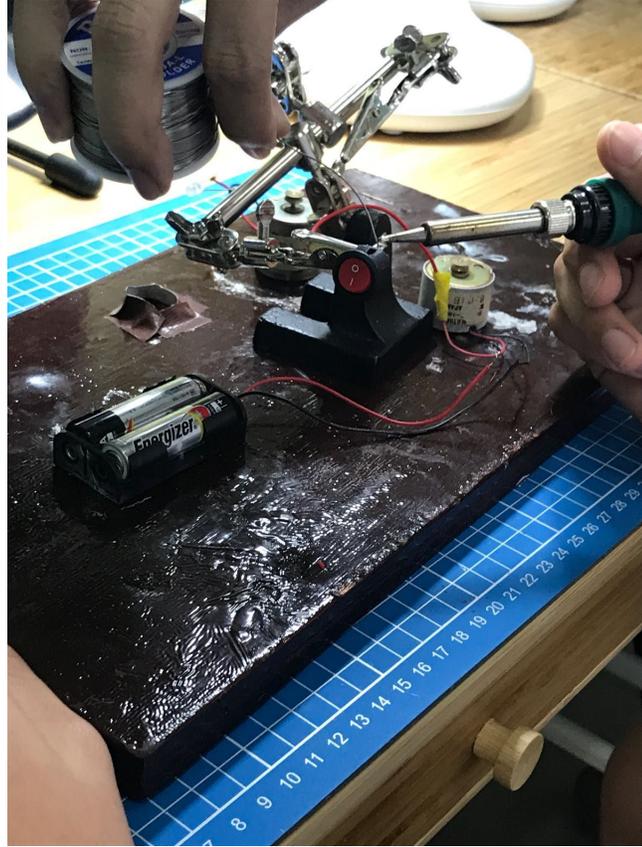
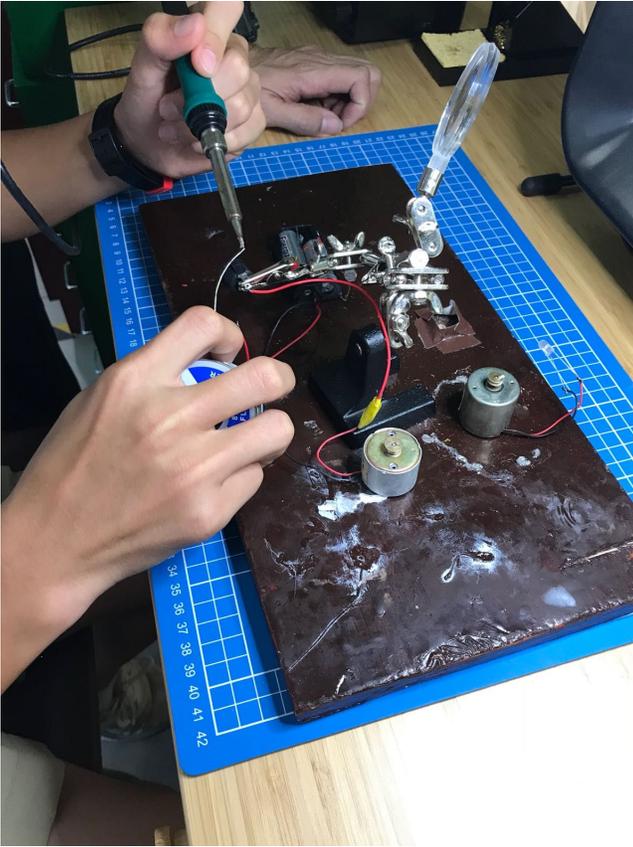
The materials are chosen based on these criteria:

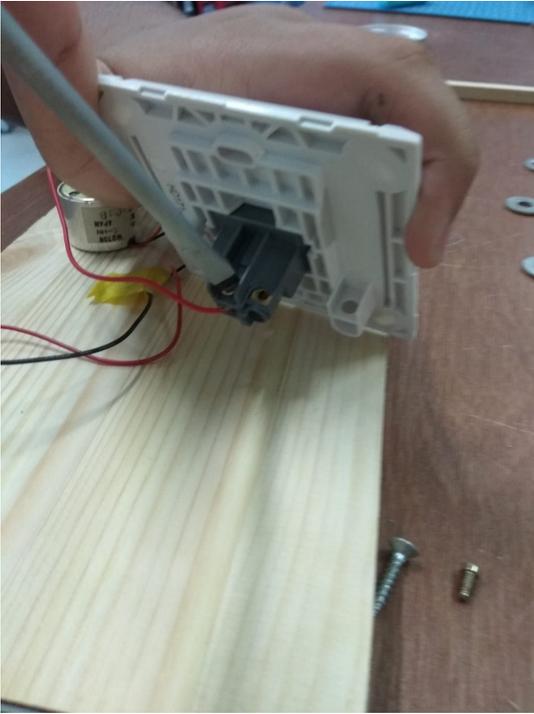
1. The affordability of the material
2. The Weight of the material
3. Durability of the material
4. The performance it has in its respective roles.

Our materials has to the best among the other materials which have the same properties, as our product includes electricity, and sometimes, large voltages or currents flowing pass throughout the electric currents. And , hence we are pretty careful of the materials we choose and the decisions we make. And along this way the materials we choose could also give us a gauge on what is an appropriate measurement or amount we need for a specific role.

4 C







**5 A**

Test Iteration:	Tick			Remarks
Test Date:	Pass	Fail	Potential Failure	
Voltage	✓			3.33 volts according voltmeter
charge phone	✓			
able to work	✓			

\*\* Repeat table for next test iteration

## **Citations:**

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