***Physics 3.7*: Use physics knowledge to develop an informed response to a socio-scientific issue**

Nuclear power: NO

Processes involved in producing nuclear power and production of nuclear power:

Nuclear power is produced through the nuclear reactor. Nuclear plants just like any other plants that burn oil, natural gases and coal to produce electricity which is done through boiling water into steam. The steam then is produced into electricity. The difference is that the nuclear plants do not burn any substances in order to produce electricity but instead it uses uranium fuel that consist of solid ceramic pellets to produce electricity. This is done through the process called fission reaction. There are initially two type, fusion reaction and fission reaction, but the uranium reacts in a fission reactions which produces more energy therefore more amount of electricity will be produce. The nucleus of the uranium atom is held together with great force "strongest force in nature". When continuously attacked with neutrons which results in the atom splitting apart, the name for this reaction is fission. When neutron is collided with the uranium atom it splits and the atom is discarded, this creates a chain reaction as it then collides again with another atom repeating the process. Releasing large amount of energy is used for heating water at 520 degrees Fahrenheit in the core of the nuclear reactor. The water heated then is released into the spinning turbines to that are connected to the generators to produce electricity.

Hazards associated with the production of nuclear power, malfunction of the nuclear power station and likelihood of the hazards occurring:

Uranium mining is a process of where uranium is extracted from the ground. "The worldwide production of uranium in 2012 amounted to 58,394 tonnes." Uranium mining is used as fuel in the processes of producing nuclear power. The price of uranium has dropped to almost 50% since 2011 due to the Fukushima nuclear disaster. There are two ways of mining uranium, open pit where overburden is removed by bombing exposing the ore body which then the workers work in the enclosed cabins reducing the effect of radiation. The other way is undergrounding uranium mining. This particular way includes the workers directly exposed to the radon gas which affects their body. There are many ways but these are the most influential. There are many health risks of uranium mining which is a hazard during the process of producing nuclear power. First one is lung cancer, there has been many deaths during uranium mining. Radon gas is the product of radioactive decay of uranium and therefore undergrounding mining has very high concentration of the radon which obviously affects the workers badly. There is increase in frequency of workers contracted to lung cancer. In many states for example, Utah, Colorado, New Mexico, and Arizona in Unites States there are many abandoned mines have not been cleaned up which affecting the environment and also increasing health risk for the people in the community. New Zealand being considerably small country unlike the United States cannot overcome the risks of public health. The environment can also cause many problem for the communities and also affects the people in the communities. Being a well-known country for its beauty and a sustainable country where many people around the world wishes to live, New Zealand cannot risk its citizens, costs and the sustainability. Global warming is affecting the whole world and the temperature on Earth is getting warmer which means that the ice in Antarctica and many other cold places is melting and the sea level is rising this is not good news for our future generation and also for a small country like New Zealand where some parts of the country can drown. Therefore, it is our responsibility to minimise the casualties of citizens in New Zealand by providing a safe environment for them.

The other important hazard is when large amount of heat is released in the process of fission reaction and it is very important that the reaction is controlled. "Meltdown" is a term used when the reactor core is not covered fully with water for cooling down when the neutrons have collided with uranium. Not fully covered with water can lead to nuclear fuel to overheat and eventually melt. In the Fukushima Daiichi plant disaster caused by earthquake and tsunami which lead the plant to shut down. Power outcomes followed. During the reaction, the control rods were inserted into the core to absorb neutrons where its function was to slow down the fission reaction but not stopping it immediately. The control rod will slow down the fission reaction and eventually stop it but the other major problem was with cooling down of the fuel system. During the disasters, the water that should have cooled down the fuel system had leaked which increased the temperature and that led to four of six reactors exploding. The likelihood of this hazard occurring in New Zealand is more as the tectonic plates beneath us is very close to it edges and there is high chance of getting earthquakes and large sea sounding a small country like New Zealand also have chances of tsunami and many other disaster, knowing that fact it is not a very acceptable decision to have nuclear power in New Zealand as a clear reason is stated. Also, the hazard of mining; New Zealand does not have the mines but transporting uranium is a risky and very solid job, which also have many risks for example radioactive decay and radiation through where it is getting transported. These risks stated is very likely to happen when producing electricity through nuclear power.

Explanation from Environmentalist to say no to nuclear power:

Some environmentalist in New Zealand from the University of Auckland, John Francis Hamilton who does not prefer nuclear power generation as a "clean" energy source. While more and more of the nuclear waste is produced then the small quantity of the nuclear power, half the century went past by and still we have not come across a solution to safely dispose the nuclear waste. The medium- level waste is considered very dangerous and requires disposal as it is creating many difference in climate change and health of the people in the community. Uranium mining also creates many hazards that has taken many people's lives and it is still doing that. The studies show that uranium mining in Australia had around eight thousand clean-up workers died within the five years' period. Nuclear power is not for New Zealand as the nuclear plant creates large, single and bundle of energies. They cannot be subdivided like Huntly power station in New Zealand currently, if one stops working the others are still operating. Nuclear shutdowns which happen frequently removes 1200 megawatts without any warning while one of the four Huntly power stations removes 400megawatts or 250 megawatts. John also says that nuclear plant risks security of supply because the New Zealand system cannot provide instant back up.

Nuclear power could affect New Zealand economically as New Zealand not being economically stable can be defeated by the uprising of the costs. Armed transport for fuel and waste and all the checks on the workers, constant monitoring of radiation can have very high costs. Having a nuclear plant can offer many jobs but also at the same time can risk many people's lives.

The constant climate change is also a big issue environmentally. "While the halting of the Gulf Stream and the resulting cooling of Europe and the eastern US is a horrific possibility." Says John, which is true and terrifying because knowing that currently climate change is occurring as we continue to harm the environment and the sea level rising and there is a high chance of many cities in many countries including New Zealand drowning, it is not sustainable for the future generation.

Saying no to the nuclear power can save New Zealand in many ways including its citizen's life. Being a country well known for its sustainable efforts and not affecting the climate changes as many other countries are doing really can be said that New Zealand has put in effort to protect the environment. Say no to nuclear power in New Zealand.