Advantages and disadvantages of nuclear power

ASSIGN BUSTER

Do the advantages of using nuclear power outweigh the disadvantages and thus making it a safe and economical method of generating electricity?

At this time it is believed that there are far more disadvantages than advantages when it comes to the use of nuclear power. This report will list the advantages and disadvantages and prove that nuclear power is the next stepping stone in technological advancements and a cleaner future.

HYPOTHESIS

The advantages of utilizing nuclear power will by far demean the disadvantages and therefore prove that it will be beneficial to make use of nuclear power as an energy source.

DISCUSSION

ADVANTAGES

One of the main advantages of nuclear power is that it does not emit a large quantity of green house gases such as CO2 [1] [2] and thus does not contribute to global warming. In turn this allows for a cleaner global environment. As seen in the below diagram, Coal-fired power stations release 5912000 tons of CO2 per year. Nuclear power stations use less than a twenty-fifth of that because they only release 230000 tons of CO2 per year. Therefore in the environmental aspect, nuclear power is safe and beneficial for the world s future.

Figure 1: A graph of the CO2 Emission by Each Power Source

Another advantage of nuclear power is that it has relatively low costs involved in its production [5]. It yields much more electrical energy for each unit of nuclear fuel (uranium rods) used than the conventional fossil fuel power stations (coal) [1] [2]. Due to this it will also cost less to ascertain the resources needed to produce the same amount of energy as fossil fuels as is made evident in the below graph. This results in nuclear fuel costing much less per kilowatt hour for a consumer than any other method of producing electricity [fig. 2]. Therefore nuclear power will be economically beneficial for the world s electricity consuming population.

Figure 2: A graph showing the US Electricity Production Costs for 1995 – 2008

An organization known as the International Atomic Energy Agency (IAEA) is in place to ensure that all nuclear power stations and nuclear activity which occur anywhere in the world is done without error which ultimately makes the use of nuclear power a safer option [7]. They implement standards and regulations which must be adhered to by all nuclear facilities [7]. One of their main tasks is to oversee the installation of the nuclear systems and transportation of nuclear materials to insure safety and security [7]. These monitoring protocols allow the usage of nuclear energy to be safe and secure.

Over time improved designs have come about for nuclear reactors such as the advanced reactor in Japan which has been operating since 1996 [6]. The major safety feature in this reactor is its passive safety system. In the event of a malfunction, no intervention from an operator is required thus

eliminating the chance of a human error [6]. If this type safety feature was to be implemented in all the current and future nuclear reactors, it would significantly enhance the safety of the nuclear plants.

There is a variety of safety features for nuclear reactors one of which is the three barriers between the fuel rods and the environment [6]. The fuel rods are in a solid ceramic pellet which forms the first barrier [6]. These pellets are inside a closed zirconium tube, which forms the second barrier [6]. The final barrier is the containment of the fuel rods. They are stored in a steel pressure vessel and this vessel has walls up to 30cm thick therefore preventing all radioactive radiation from escaping. Other than those safety barriers the whole containment structure has one meter thick reinforced concrete walls [6]. Thus in the event of a human error there are provisions in place to minimize the severity of the error. These measures will increase the safety of using nuclear power plants even more.

DISADVANTAGES

The technology and resources used for producing nuclear power can also be used in malicious activities such as illegal nuclear weapons manufacturing [1]. The IAEA has a security area specifically implemented to eliminate such events. It protects the transport and installations of nuclear substances so that they cannot be used for the above mentioned malicious activities [7]. Therefore this is no longer a major disadvantage of using nuclear power.

There is a possibility of a nuclear reactor melting down due to human error or bad maintenance. This will result in environmental destruction and/or human casualties [2]. If a human is exposed to a radioactive substance then

it is likely that that person and their future generations could suffer from genetic deformities. In the last 50 years there have only been two serious nuclear catastrophes: The Three Mile Island (1979) and Chernobyl (1986). In the Three Mile Island incident the radiation was contained and there were no subsequent environmental or health problems. There have been ten other meltdowns but they were mostly a part of a military or an experimental reactor and they did not result in any hazards on the reactor s surroundings. The first nuclear power station ever created was at Calder Hall in England [10]. It was created in 1956 and has had no operational problems since [10]. This indicates that nuclear reactors can be very safe and therefore beneficial. One of the requirements of a nuclear reactor is to ensure that a core meltdown must be restricted to the nuclear plant therefore ensuring the safety of nearby residents and the environment. It can thus be deducted that in the event of a reactor meltdown, our safety will not be compromised therefore human or accidental error are not a devastating issue.

Terrorism is a huge concern in relation to nuclear reactors especially since the 9/11 terrorist attack in New York [3]. The concern is that a terrorist will crash an airplane in to a nuclear reactor or radioactive waste plant but such nuclear facilities are some of the most terrorist attack resistant infrastructures built [6]. This is because of their robust design (one meter thick walls). Analysts have conducted experiments that have proved that nuclear facilities are terrorist proof. One of the experiments includes using a Boeing 767 and a penetrating missile when testing the strength of facility. Therefore nuclear reactors and radioactive waste facilities are not prone to terrorist attacks.

The earth s supply of nuclear fuel (uranium) is very limited and is only expected to last for another 30 to 60 years [2]. Because of the rate of technological developments, it is likely that a new source of electricity will be discovered within 30 to 60 years. With this in mind there is no reason to not use nuclear power in the meantime.

A large disadvantage of nuclear power is that it takes about 20 to 30 years to create a nuclear power station (in western democracies) [2]. The planning and building is very time consuming [2]. This is not necessarily a bad thing because it decreases the chances of an error occurring which could have potentially lead to a meltdown accident or any other accidents occurring. This could also increase the quality of the power station s construction which therefore making the nuclear power station safe to use.

CONCLUSION

As can be seen from the above mentioned points, the use of nuclear power has numerous benefits, both in terms of economics and safety. One cannot deny the disadvantages to using nuclear power but there are solutions available, as showed above, that either negates the disadvantage or minimizes its severity. Therefore the advantages of using nuclear power outweigh the disadvantages by far, which makes nuclear power a safe, secure and economical option for generating of electricity.

GLOSSARY

Meltdown: When a nuclear reactor core overheats causing the encasement to melt thus allowing radiation to escape.

Greenhouse gases: Gases that are produced by most traditional fuel sources which affect the ozone layer and the containment of heat within the Earth s atmosphere.

Kilowatt: Is a unit used to measure power and is equal to 1000 watts.

Fuel rods: A specialized container used to store nuclear fuel.

Human error: An error which has occurred due to the incorrect intervention of human(s).