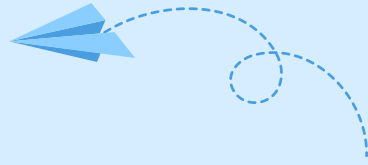




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Nuclear Energy and Climate Change

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ABSTRACT

In this paper, the explanation of why nuclear power should be considered as a response action to the climate change issue is discussed. A clear view of nuclear power as a clean, affordable, and secure form of energy is elaborated. The potentiality of nuclear power in the mitigation of climate change is explained. The development of nuclear power in most parts of the world and its efficiency is outlined. The paper also stresses on the nuclear disasters that happened in Three Mile Island, Chernobyl, and the Fukushima-Daiichi plant and how they contributed to the changes in nuclear development. The cleanliness of nuclear energy in relation to fossil fuels and the safety concerns is also addressed. The efficiency and stability of nuclear power in comparison to other sources of energy is also regarded. As such, this paper explains the importance of nuclear power adoption as a solution to climate change.

Keywords: nuclear power, climate change, Chernobyl, Three Mile Island, Fukushima-Daiichi.



Nuclear Energy and Climate Change



INTRODUCTION

The effect of climate change on the world today cannot be ignored. This global issue has resulted in the rise of sea level, extreme hot and cold temperatures, pest invasion, erratic rain patterns, resilience to pests and diseases, cyclone and hurricanes among others. The biggest culprit linked with the intensification of climate change is the soaring levels of greenhouse gases in the atmosphere. Greenhouse gases (GHGs) are gases such as carbon dioxide, chlorofluorocarbons (CFCs), nitrous oxides, and methane (Hoffert et al., 2002). They are released into the atmosphere through various anthropogenic activities such as mining and burning of fossil fuels, coolants and refrigerants, ruminants and garbage decomposition (Poortinga, Pidgeon, & Lorenzoni, 2006). However, a huge amount of carbon dioxide, which remains to be the biggest source of emitted greenhouse gas, is generated from the use of fossil fuels (Hoffert et al., 2002). Fossil fuels, specifically, coal and petroleum, release greenhouse gases, sulphur dioxide, and other pollutants into the atmosphere when burnt but are used to power machines and engines. In addition, electricity used in most parts of the world is generated from fossil fuels, which remain to be unclean sources of energy. With the rise of energy needs in the world, cleaner, efficient, affordable and reliable sources of energy are required to protect future generations from the

disaster that is in the offing. Studies have proved nuclear power to be a clean source of energy (Bickerstaff, Lorenzoni, Pidgeon, Poortinga, & Simmons, 2008). This paper explains why nuclear power is a potential response to the climate change disaster. It outlines the effects nuclear power offers towards climate change and the challenges in its development.

THE SOLUTIONS NUCLEAR ENERGY OFFERS FOR CLIMATE CHANGE

The demand for energy in the world is always on the rise. Therefore, the continuous burning of fossil fuels in order to meet this need is to deteriorate the climate change disaster. On the contrary, nuclear power is an environmentally friendly. Nuclear power plants do not emit a considerable amount of greenhouse gases to the atmosphere in their entire cycle (Socolow & Glaser, 2009). It is also a reliable and proficient source of energy in comparison to fossil fuels (Bickerstaff et al., 2008). Nuclear power is outlined by many researchers to be a low-carbon energy supply, what is specifically important since greenhouse gases remain to be the main culprits of climate change. Moreover, nuclear power plants are not disrupted by changes in weather conditions as compared to solar and wind energy while the power itself has bigger energy density (Sailor, Bodansky, Braun, Fetter, & van der Zwaan, 2000). In addition, the efficiency of nuclear power plants is higher than that of thermal energy generation plants. As such, nuclear power remains a potential source to meet all the world's needs in energy without polluting the planet and



intensifying the effects of climate change. The development of nuclear power as a source of energy can be a lasting solution to the polluting effects of greenhouse gases (Poortinga et al., 2006).

Nuclear power not only offers a solution to climate change but also provides energy security meaning that it can be produced in huge amounts (International Atomic Energy Agency (IAEA), 2012). Uranium is the main raw material used as a source of nuclear power. This element is largely available and can be obtained from diverse sources. Seawater and rocks as primary sources harbor large quantities of uranium. In a report published in 2010, the IAEA says that the available uranium resources are capable of meeting the current nuclear energy needs for the next hundred years considering the current consumption rates. The report also states that with faster and more efficient reactors, this period could be increased up to 2,500 years (OECD Nuclear Energy Agency & IAEA, 2010, p. 48). Geologically, the access to uranium makes it a secure and lasting resource in energy provision. With time, due to the intensified exploration of uranium, the resources have increased almost threefold since 1975 (OECD Nuclear Energy Agency & IAEA, 2010, p. 145). Studies also show that the burning of uranium generates two to three million times the energy an equivalent amount of coal would produce (OECD Nuclear Energy Agency & IAEA, 2010, p. 11). These conditions make uranium an available, affordable, reliable, and efficient raw material for nuclear power production. Therefore, unlike fossil fuels that are fast depleting, uranium is available in large quantities, which offers an assurance of the availability of energy.

Nuclear power also reduces the impact of the fossil fuels. Nuclear power is secure and affordable. The prices for fossil fuels, however, are unpredictably volatile (Turton & Barreto, 2006). Nuclear power provides a low-cost substitute for fossil fuels. Therefore, the funds saved as a result of switching from fossil fuels to nuclear power might be put to use in addressing the effects of climate change. The funds can be utilized for the research and development of prevention, mitigation, and adaptation measures of climate change (International Panel on Climate Change (IPCC), 2011). Mitigation measures like afforestation, recycling and reuse, and the growth of clean sources of energy require large investments. The funds saved could be directed to such programs, thus helping in the management of climate change.

CHALLENGES OF DEVELOPING NUCLEAR POWER

A few problems are associated with nuclear energy. They curtailed and barred the development of nuclear power as a source of energy in many parts of the world. The problems include a small but real possibility of catastrophic accidents caused, for example, meltdown of reactors, by disposal of the generated radioactive waste, transportation of nuclear materials, and proliferation and terrorism (IAEA, 2012). The period from the 1970s to 1980s experienced rapid growth in the development of nuclear power (IAEA, 2012). However, this progress was drastically reduced with the occurrence of nuclear reactors accidents.

Surely, nuclear accidents are not frequent, but they make a great impact. However, when take place, they lead to substantial damages to the environment with long-lasting implications (Zaleski & Sophie, 2009). The impacts of such instances can be felt up to ten thousand years after their occurrences. The first nuclear accident happened in 1979 at the Three Mile Island generating plant. It was a low-magnitude accident that occurred as a result of a reactor meltdown. In 1986, another high-level accident took place at the Chernobyl plant in Ukraine. The disaster caused the death of 31 people, and to date, the effects of the accident are still felt (IAEA, 2012, p. 22). This catastrophe caused an evident effect on the development of nuclear energy in many countries. Another such accident, caused by an earthquake, occurred in Fukushima Daiichi in Japan in 2011. It led to the explosion of the reactor and the release of radioactive substances into the environment (Pacala & Socolow, 2004). This accident raised safety concerns regarding nuclear power plants and led the IAEA to conduct tests and checks (IAEA, 2012). The occurrence of such accidents has derailed the development of nuclear power due to safety concerns. A high level of safety is required when operating nuclear plants, and for this reason, nuclear power has not been widely adopted for use in the developing world.

Another challenge that is involved is the disposal of the radioactive waste that is generated from nuclear reactors. The waste is radioactive and also emits toxic radon gas. The waste can, therefore, result in the damage to the environment and human beings for a long time. Nuclear waste requires proper and careful disposal in deep geological repositories

(Leiserowitz, 2006). Consequently, the expenses associated with this process make many countries refuse from the development of nuclear power. The transportation of nuclear materials from the mine to the plant is another challenge. Radioactive material used in a nuclear reactor requires safe and careful handling during transportation. Unsafe transportation may result in a catastrophic disaster.

Proliferation and terrorism of nuclear power are other problems connected with the growth of nuclear power. The use of nuclear power as a weapon of mass destruction is possible. Nuclear technology has been used by some nations to develop their army weapons for war in the past. This tendency led to the introduction of international safeguards in the non-proliferation of nuclear weapons and nuclear security (IAEA, 2012). In addition, nuclear plants are hot targets for terrorism activities. Therefore, to deal with these challenges, the strengthening of capacities is required. This will also facilitate the growth of nuclear power as a source of energy in the world.

In conclusion, nuclear power provides a possible solution to climate change mitigation. Despite the challenges, the positive effects of nuclear power by far outweigh the negatives. Nuclear power offers a method that will result in the subsequent reduction of the level of carbon dioxide and other greenhouse gases in the atmosphere. Nuclear power is a clean source of energy with low if any emissions. As such, to move from the dependence on the dirty and polluting fossil fuels, nuclear power must be embraced. Furthermore, nuclear power offers efficiency and energy

security to the world. Nations should, hence, develop the nuclear power technology as a commitment to sustainable development. Nuclear power should be considered as a response to climate change. However, while developing and propagating it, safety should be highly considered to avoid the occurrence of accidents. When issues of safety concerning nuclear plants are regarded, people should have the confidence of using nuclear energy.

