

The Road to Our Cleaner, Brighter Future  
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Nuclear power is the key to unlocking the door to a cleaner and brighter future. With the demand for energy growing every day, and energy deficits in major areas of the world, we are in desperate need of a pathway to more energy. However, we have reached a crossroads in our path to energy surplus. One trail is punctuated with the consumption of oil and fossil fuels, the other, planted with an ambivalent source of power, nuclear energy. Exploring each of these sources of power, we find drastic differences in the processes they use to generate energy and their effects on the environment. Each of these factors is crucial in determining what is best for the future of our society, and the flourishing of our posterity on earth.

Producing energy through a means of nuclear power is a simple concept to understand. As atoms of an unstable element seek to become stable, the atom is split into two different atoms while heat is generated. We will return to the original element and its predecessors later; now, we are concerned with the fact that heat is generated. This heat is used to create steam, which will turn a turbine. Kinetic motion by the turbine is used to generate our end product and goal -- power, the power that is used in homes, in streetlights, and across the entire world. Now let us return to the elements that give us this heat. The prime element, mainly Uranium, is unstable and as it returns to a more grounded state, two new elements are created. These after products are the "nuclear waste" that is propagated as dangerous to our environment, and it is, however, only if it is mishandled.

Similarly, fossil fuels are used to generate energy to power our world. The source of this energy originated millions of years ago during the Carboniferous Period when swamp biomes covered the earth. After millions of years of heat and pressure on the carbon rich-organic matter, the three types of fossil fuels were born: natural gas, oil, and coal. The process used to make energy is constant with every type of fossil fuel, and similarly, nuclear power. Burning fossil

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fuels will generate heat and side products, like earlier we will worry about the side products later. The heat will in turn boil water, in which the steam will turn a turbine and generate electricity. However, unlike nuclear processes, these combustible products are used to power 64% of the energy used around our world. According to the World Nuclear Association "in 2017, fossil fuels generated 64.5% of worldwide electricity, compared with 61.9% in 1990" and this increase is devastating our world. Unlike waste generated by nuclear processes, fossil fuel emission is released directly into our atmosphere. The side products mentioned earlier are CO<sub>2</sub> and other greenhouse gasses which have negative effects on the planet and accelerate global warming.

Global warming is a crisis that is devastating our planet that we call home. This crisis is defined by the Natural Resources Defense Council as the "occurrence when carbon dioxide (CO<sub>2</sub>) and other air pollutants and greenhouse gases collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface." These potent gases released into our atmosphere cause a fluctuation in global temperatures, massive geological and environmental changes, along with climate change. Each energy-producing process has a drastically different effect on the crisis of global warming. Strikingly, the main source of energy that powers our world, fossil fuels, does the most to damage and accelerate the process of global warming. This gradient change is caused by the emission of fossil fuels. Returning to the side products of both energy-producing processes, only the burning of fossil fuels results in these chemicals which contribute to global warming. However, the after products produced by nuclear power is significantly less toxic, to our atmosphere. While nuclear waste is still toxic, it is stored in safe facilities while the byproducts of fossil fuels are pumped directly into the air we breathe.

This doesn't mean to say that nuclear energy doesn't have its downsides. As a result of fission processes, the reaction that drives nuclear power plants, we are left with toxic waste.

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Spent nuclear fuel is not only radioactive, but also contains many potent chemicals. To add, it only loses its harmfulness slowly, over thousands of years. The United States National Regulatory Commission stipulates that "Transuranic wastes, sometimes called TRU, account for most of the radioactive hazard remaining in high-level waste after 1,000 years. ... Some isotopes decay in hours or even minutes, but others decay very slowly. Strontium-90 and Cesium-137 have half-lives of about 30 years. Plutonium-239 has a half-life of 24,000 years." However, this problem can easily be circumvented by building safe storage facilities. Yet, out of the 30 countries that operate nuclear power stations, only one country is currently serious about opening a permanent civilian waste facility, Finland. Even so, these toxicities have little effect on global warming, but this difficult problem should be handled if we are to convert to nuclear power as our main source of energy and prevent the further exacerbation of global warming.

However, using the knowledge of how each energy production cycle works, we can compare how each rank according to safety. In a nuclear plant, the amount of safety and precaution set in place has resulted in the prevention of deaths per energy unit produced. NASA along with the Goddard Institute for Space Studies found that by "Using historical electricity production data and mortality and emission factors from the peer-reviewed scientific literature, we found that despite the three major nuclear accidents the world has experienced, nuclear power prevented an average of over 1.8 million net deaths worldwide between 1971-2009." When compared to nuclear energy, fossil fuels have an increase in harm to both humans and the environment. According to the DARA International Research group, "Our present carbon-intensive energy system and related activities cause an estimated 4.5 million deaths each year linked to air pollution, hazardous occupations, and cancer." These fossil fuel emissions also

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cause harm to the environment, by releasing CO<sub>2</sub> and other greenhouse gasses, which accelerates the process of global warming.

Another benefit that nuclear energy adds to the environment is its efficiency in producing energy. Nuclear power plants have greater productivity at producing energy per hour while fossil fuel plants struggle to keep up with this efficiency. According to the U.S. Department of energy, "A typical nuclear reactor produces 1 gigawatt (GW) of electricity. That doesn't mean you can simply replace it with 1-gigawatt coal or renewable plant. ... You would need almost two coal or three to four renewable plants (each of 1 GW size) to generate the same amount of electricity onto the grid." Since each nuclear power plant produces energy more efficiently, it would take at-least 2 coal-burning plants to produce the same amount of energy per hour. By using nuclear power, we decrease the demand for fossil fuels which decreases the amount of harmful CO<sub>2</sub> and other greenhouse emissions. This, in turn, slows the process of global warming while also ensuring more energy per unit of time.

As the global climate begins to change and mankind seeks a new avenue to energy surplus, which path will we go down? Nuclear power provides benefits in the fields of the safety of humans, the safety of the environment, and the efficiency that this energy is produced. However, problems of containment must be solved before safely adventuring down this path. On the other hand, fossil fuels provide a cheap and easy way to produce energy at the cost of our environment. Theodore Roosevelt once said, "Nothing in the world is worth having or worth doing unless it means effort, pain, difficulty... I have never in my life envied a human being who led an easy life. I have envied a great many people who led difficult lives and led them well." With this in mind, nuclear power, even though a harder path to follow and challenges still left to

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overcome, will lead to a cleaner and brighter future that will sustain our world and the future of tomorrow.

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