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The use of nuclear power as a primary energy source is a controversial discussion. However, if reversing or stopping the effects of climate change is our main goal, then this is a top contender. Fossil fuels account for 34 billion tons of emissions annually according to Ritchie, Hannah, et al. (2020). Instead, we can create energy through nuclear fission. I believe nuclear energy should become a much larger player in the energy game.

The first practical use of nuclear power became apparent on December 2, 1942 when a physicist, Enrico Fermi, developed a self-sustaining nuclear fission reaction at the University of Chicago; Brook, Barry W., et al. (2014). This was the first action taken towards nuclear energy. Now, roughly 11.7% of electricity globally is generated from nuclear energy, behind hydroelectric dams supplying 15.8% shown in a 2011 study. Countries such as France obtain up to 75% of their energy from nuclear power; Brook, Barry W., and Corey J. A. Bradshaw (2015).

With new innovations such as the fast neutron reactor, which have not been implemented yet, even more benefits will come from nuclear power. With these fast neutron reactors, over a hundred times more energy can be produced using relatively the same uranium supply creating an energy source that is potentially limitless; Brook, Barry W., et al. (2014), International Atomic Energy Agency. Even at a high point, the price of energy would be around $0.003 per kWh. These fast reactors would essentially power the global population for tens of thousands of years with its capacity and cost; Lightfoot, H. Douglas, et al. 2006.

There are many examples of the economic benefit of nuclear energy, such as in France, which has one of the lowest unit prices for electricity on the planet. The cost effectiveness of building these plants can be simplified by creating identical blueprints for plants which reduces possible delays in production. France also has some of the lowest emissions in the world compared to other countries such as Germany, Australia, and Denmark that rely more on nonrenewable energy sources. Over time, this reduces the overall effects of climate change by using energy sources with minimal emissions. Turkey is also implementing nuclear power because of its benefits. Just using 26 power plants Turkey can power their entire electrical grid. This is more practical than other forms of renewable energy because it takes up less space and produces more energy; Adar, Elanur (2020).

Along with its benefits, nuclear power has downsides. There is concern that technological advancements of nuclear energy will result in destructive weapons, similar to the atomic bomb. Along with weaponry, toxic waste is among major concerns when dealing with nuclear power plants. Storage of waste depends on the level of radiation given off ranging from low, medium and high, which all need to be disposed of separately. Liquid, solid, or gas also determine the length at which the waste needs to be disposed of; Efremenkov, V. M. (1989).

Another article shared that the waste produced equates to roughly one ton annually and 7 million tons of carbon dioxide and hydrogen sulfide emitted. Compared to fossil fuels it produces 1.5 million times more energy; Adar, Elanur (2020). Events like Chernobyl cause many to disapprove, however only about 200 tons of radioactive waste was released, which is about seven and a half years of a coal mine's waste; *Coal Combustion: Nuclear Resource or Danger?* (2020).

Newer models of power plants such as BN-800 and the project BN-1200 are in place to improve safety among workers and prevent natural occurring events from compromising the integrity of the plants; Tashlykov, O., et al (2014). The creation of nuclear power has the lowest death rate per billion kWh at only 0.04. Even less than solar; Brook, Barry W., et al. (2014). Even with its downsides, nuclear energy is cost effective, safe for the environment when built and controlled properly and safe around human populations.

In conclusion, nuclear energy is a viable energy source that has the capabilities to completely transform the way the human population across the globe utilizes energy and electricity. As we progress away from fossil fuels and slowly build fast neutron reactors from current thermal neutron reactors, the amount of energy available will be beyond the needs of daily life.

Work Cited

Adar, Elanur. “The State of the Art of Nuclear Energy: Pros and Cons.” *EurAsia Waste Management Symposium*, 2020, pp. 26–28.

Brook, Barry W., et al. “Why Nuclear Energy Is Sustainable and Has to Be Part of the Energy Mix.” *Sustainable Materials and Technologies*, vol. 1–2, Dec. 2014, pp. 8–16. *ScienceDirect*, https://doi.org/10.1016/j.susmat.2014.11.001.

Brook, Barry W., and Corey J. A. Bradshaw. “Key Role for Nuclear Energy in Global Biodiversity Conservation: Biodiversity and Sustainable Energy.” *Conservation Biology*, vol. 29, no. 3, June 2015, pp. 702–12. *DOI.org (Crossref)*, https://doi.org/10.1111/cobi.12433.

Efremenkov, V. M. “Radioactive Waste Management at Nuclear Power Plants.” *Iaea Bulletin*, vol. 31, no. 4, 1989, pp. 37–42.

International Atomic Energy Agency. *International Conference on Innovative Technologies for Nuclear Fuel Cycles and Nuclear Power Unedited Proceedings*. 1563–0153, 2004, p. 784.

Lightfoot, H. Douglas, et al. “Nuclear Fission Fuel Is Inexhaustible.” *2006 IEEE EIC Climate Change Conference*, 2006, pp. 1–8. *IEEE Xplore*, https://doi.org/10.1109/EICCCC.2006.277268.

Ritchie, Hannah, et al. “CO2 and Greenhouse Gas Emissions.” *Our World in Data*, May 2020. *ourworldindata.org*, https://ourworldindata.org/co2-emissions.

Tashlykov, O., et al. *Ecological Features of Fast Reactor Nuclear Power Plants (NPPs) at All Stages of Their Life Cycle*. 2014, pp. 907–18. *DOI.org (Crossref)*, https://doi.org/10.2495/EQ140852.