In Order to Combat Climate Change, The United States Must Look to Expand its Global Nuclear Infrastructure

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Climate change poses an unprecedented threat to our planet as we know it, and the threat is only escalating. A recent Intergovernmental Panel on Climate Change (IPCC) report emphasized that climate change is "widespread, rapid, and intensifying," so much so that most mitigation measures would not prevent the 2℃ temperature rise that would devastate agricultural and biological life, including humanity (IPCC 2021). While leaders in the international political arena have begun to take this inevitable catastrophe more seriously, simply taking it more seriously is not enough to reverse the damage we have done.

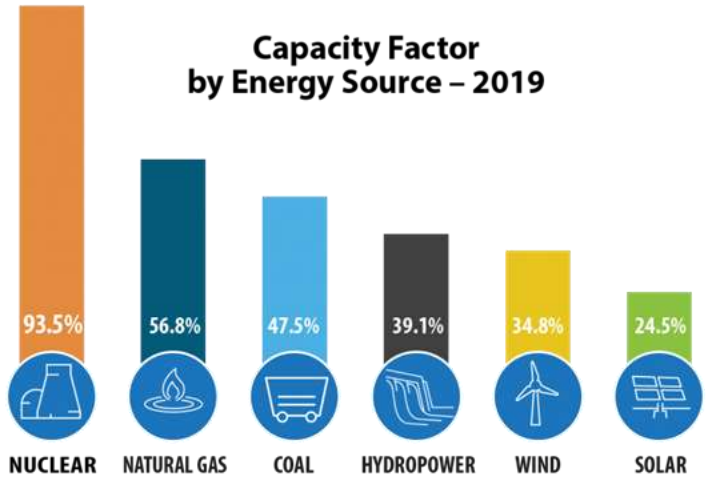
Climate scientists have come to a clear consensus that we have no time to waste in order to tackle climate change (NASA 2022). While it is almost never the first source of clean energy that comes to mind, nuclear energy may hold the key to replacing the highest amount of carbon emissions in the quickest time possible with the least disturbance to our current energy infrastructure. Nuclear energy is absolutely not a panacea; no one source is. But continuing to take steps back on our nuclear infrastructure and ignoring the immense potential it has for decarbonization would prove detrimental to life on Earth.

Nuclear energy has an incredible number of upsides over traditional renewables like wind and solar, which have been prioritized by state and local governments in climate change mitigation efforts. For one, nuclear power is by far the most efficient source of clean energy that exists on our planet, producing near its highest capacity of energy production at all times; nuclear power plants generate immense amounts of carbon-free energy 24 hours a day, every day of the year, while wind and solar production relies entirely upon the weather each day (US Department of Energy 2021). The 2,553 terawatt hours (TWh) of electricity produced globally by nuclear plants in 2020 far surpassed what all sources of wind and solar energy produced, combined (World Nuclear Association 2022). Contrary to the myths perpetuated for decades about nuclear's safety, it is actually the safest source of energy used today and has caused the least number of deaths yearly (Jaganmohan 2021). Not to mention, there are also invaluable community and economic benefits: power plants are guaranteed sources of well-paying jobs at all levels of expertise, from advanced nuclear physicists to safety personnel to janitorial staff. Closing power plants also poses a threat to certain communities' identity as a whole (Conca 2020). Nuclear power plants are often the pillar of towns nearby, providing work, entertainment, and camaraderie as well as significant economic

benefits and growth, including lower electricity costs for residents (Duke Energy 2012). Plus, the tax dollars raised on these power plants locally can be repurposed to infrastructure improvements, indirectly improving the everyday lives of those living in its backyard.

Furthermore, scientific advancements in the field of nuclear energy are perhaps the most promising in the history of energy production. The possibility of a nuclear fusion reactor, capable of creating essentially limitless energy, seems to be on the horizon (Gibney 2021). Small Modular Reactors (SMRs), already approved by the U.S. Nuclear Energy Commission, can significantly cut down on the size of nuclear power plants without sacrificing production (Levitan 2020). The United Kingdom is preparing to construct these energy marvels across the country, with each providing enough energy to power over 1.3 million homes (Davies 2021).

Figure 1: Capacity Factor by Energy Source (2019)



Nuclear power plants are capable of producing at nearly maximum strength 93.5% of the time. (US Department of Energy)

Source: Department of Energy

With such astounding clean energy potential, it would be a mistake not to carefully consider investing in the nuclear energy effort. Despite clear scientific evidence pointing towards the necessity of nuclear in a carbon-neutral future, decision makers throughout the world continue phase-outs of crucial reactors. Counterintuitively, the huge amounts of energy lost by nuclear reactor shutdowns are almost always replaced by increased fossil fuel consumption, directly contributing to worsening climate change (Ahn 2021). Perhaps the most infamous example of nuclear phase-out is Germany's, which should be completed by 2022. While this policy decision was meant to increase the proliferation of renewables around the country, it instead did the opposite; in 2019 over three-quarters of Germany's energy consumed was from fossil fuels, significantly more than any other European nation (Ritchie and Roser 2021; Sonnichsen 2021).

When thinking ahead to a net-zero emissions future, a world without nuclear energy looks even more dire (Levin et. al 2019). The US Energy Information Agency predicts energy consumption throughout the world will increase by fifty percent, a crucial aspect of climate change consideration that we cannot ignore (US Energy Information Agency 2021). While we are trying to compensate for the emissions we are creating now, we are not taking the proactive steps necessary to offset the tremendous increase in global consumption. The United States risks falling behind as leaders on the international stage in climate change mitigation, energy production, and technological innovation. China, the biggest polluter in the world, already produces the most clean energy globally, and has 17 more nuclear reactors under construction compared to the United States' two. This lack of investment in nuclear infrastructure could potentially jeopardize the United States' legitimacy as a climate change leader (US Embassy in Georgia 2020; International Renewable Energy Agency, n.d.; Conca 2021).

Renewables have largely taken the mantle in the international fight against climate change. They are easy ways for the ordinary person to get involved in reducing their carbon footprint, such as installing solar panels on a home or buying an electric vehicle, which are important micro-level decisions for cutting carbon that all should consider. They're also typically the most accessible and easiest to build for private companies without needing government subsidy or large influxes of capital. However, on the macro-scale, where we need to build out our energy producing potential, these options are not practical. Solar Star, one of the world's largest solar farms with an approximate area equal to four Central Parks, produced around 265,000 MWh of electricity in Q3 2020 (SunPower 2020; US Energy Information Agency 2021). In that same timespan, California's nuclear power plant Diablo Canyon produced nearly 17 times more clean energy than Solar Star. Furthermore, building gigantic solar farms often requires cutting down trees, which are actively combating emissions in their own ecological fashion. As a planet, embracing the least productive options is not going to get us where we need to be by 2050, 2070, or any year. In order to prevent the destruction of our planet as we know it, policymakers will need to take radical measures to combat emissions. The research shows that nuclear energy can provide the abundance of power and reduction of emissions that are needed to meet these goals.

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