FEAR AND MISCONCEPTIONS: PROBLEMS WITH MODERN NUCLEAR ENERGY POLICY AND HOW TO OVERCOME THEM

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I. Introduction

Nuclear Energy has long been considered the boogeyman of energy policy. Now, to illustrate the stark disparity in public and governmental response to different energy industries, imagine if one of the many catastrophic oil spills of recent decades—such as the Deepwater Horizon disaster—had instead involved a nuclear reactor or waste storage facility. The outcry would likely have been so overwhelming that the nuclear energy sector might have faced paralyzing restrictions, if not outright dismantlement. In contrast, the ongoing environmental devastation caused by fossil fuel emissions—spanning decades of oil spills, air pollution, and carbon saturation—is met with little more than passive concern.

This discrepancy reveals a dangerous inconsistency: societies across the world remain inversely wary of nuclear energy, even when safely and minimally produced, while displaying apathy toward the proven, ongoing harm caused by fossil fuels. This disconnect is not only social and political—it is deeply embedded in legal systems, regulatory frameworks, and public policy. Misinformation and fear surrounding nuclear energy persist despite overwhelming scientific evidence of its safety, carbon efficiency, and potential for scalable implementation.

This paper is an interdisciplinary study. It aims to advance three key objectives. The first part will demonstrate the safety, reliability, and low-carbon profile of nuclear power, grounded in empirical data and comparative energy outcomes. The second part will confront and contextualize the disproportionate public fear of nuclear energy, particularly in light of fossil fuel's documented legal and environmental harms; and the third part will educate the public and policymakers by analyzing the legal structures that both hinder and could enable a just, science-informed energy transition.

and gas pollution slowly and consistently poisoning our water and air. Or compare the major disaster events caused by these industries, and the difference is stark. The BP Deepwater Horizon Disaster had immediate and devastating effects on both wildlife and people, with some of them still being felt today.[2] While the leak was active and immediately following it, there was wall to wall news coverage and concerns over the cause and effects. But the ongoing conversations regarding how to better regulate the oil industry and to ensure safety in the face of future disasters are muted in comparison to the same ones being had over nuclear energy. The National Oceanic and Atmospheric Administration (NOAA) responds to more than one hundred and fifty oil spills each year.[3] How often is something like that covered in depth on the nightly news?

Now, to showcase the differing response to these two industries, picture if any one of those spills were nuclear reactor or storage facility leaks. The public outcry would likely have been so great that the entire energy sector would be irreversibly changed or regulated to oblivion. Comparatively, the transnational public response to the ongoing poisoning of the world from oil spills and other emissions from fossil fuel use is a muted shoulder shrug. People and governments around the world are seemingly apathetic to the consequences of continued mass fossil fuel use while being inversely wary of even low-level production of nuclear power. Fear and false information regarding nuclear energy production have permeated within societies across the globe. Even as the planet warms to unsustainable levels, various politicians regardless of country still refuse to adopt the low carbon emission alternative of nuclear power, and their citizens refuse to demand change due to these fears. While the current visions for the future of

[2] National Oceanic and Atmospheric Administration, *Deepwater Horizon Oil Spill Longterm Effects on Marine Mammals, Sea Turtles,* (April 2017), https://oceanservice.noaa.gov/news/apr17/dwh-protected-species.html
[3] Jocelyn Timperley, *What we've learned about cleaning up major oil spills since Deepwater Horizon*, BBC (March 10, 2025), https://www.bbc.com/future/article/20240905-have-we-improved-oil-spill-clean-ups-since-bp-deepwater-horizon

energy production may be bleak and emission filled, there is a way forward. While nuclear power is currently the red-headed stepchild of energy production, it does not have to be so.

Since 2000, carbon dioxide emissions have increased worldwide by more than 40%.[4] And in 2024, the earth experienced its warmest year ever recorded.[5] It is also the majority consensus among scientists that the earth will reach the 1.5 degree Celsius threshold before 2030.[6] If we are to confront the problems from the continued emission dispersion through the atmosphere caused by fossil fuel consumption, all avenues and possibilities must be explored. Nuclear energy has the potential to be a major source of clean and efficient power for the world. During operation and over the course of its entire life cycle, a nuclear plant produces the same amount of carbon dioxide equivalent emissions per kilowatt hour as wind power, about one third the emissions of solar, and sixty-eight times less emissions than coal.[7]

From 1974-1990, nuclear power in France went from a minor player in generation to being responsible for nearly 70% electricity production.[8] The average French household's electricity bill is lower that to that of their German neighbors,[9] ardently opposed to nuclear power and reliant on coal and natural gas.[10][11] What the French have done is effectively prove that

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[4] World Nuclear Association, *How Can Nuclear Combat Climate Change*, https://world-nuclear.org/nuclear-essentials/how-can-nuclear-combat-climate-change

[5] Roxana Barden, *Temperatures Rising: NASA Confirms 2024 Warmest Year on* Record, NASA, (Jan 10, 2025), https://www.nasa.gov/news-release/temperatures-rising-nasa-confirms-2024-warmest-year-on-record/#:~:text=Earth's%20average%20surface%20temperature%20in,the%20record%20set%20in%202023.

[6] Lamboll, R.D., Nicholls, Z.R.J., Smith, C.J. et al. *Assessing the size and uncertainty of remaining carbon budgets*. Natural Climate Change 13, 1360–1367 (2023). https://doi.org/10.1038/s41558-023-01848-5

[7] World Nuclear Association, *How Can Nuclear Combat Climate Change*, https://world-nuclear.org/nuclear-essentials/how-can-nuclear-combat-climate-change

[8] *Id.*

[9] Carbon Credits, *Liftoff: Nuclear Energy Will Accelerate the World*; Module 2 | Chapter 3, https://carboncredits.com/nuclear-education-how-germany-lost-another-world-war-to-france/

[10] World Nuclear Association, *Germany's Energiewende*, (last updated May 27, 2021), https://world-nuclear.org/information-library/energy-and-the-environment/energiewende

[11] *Id.*

with dedication, carbon emissions from power generation can be reduced all the while not imposing excessive costs on their citizens after scaling has occurred. Like the US, the Swedes also held strong reservation regarding nuclear energy but have recently reversed course and are now embracing it after undertaking practical decision making. While other nations continue to dawdle and allow continued pollution from oil, coal, and natural gas emissions, the environment continues to suffer. If the course is to be reversed before ecological disaster, there must be a change in energy production. Nuclear power can be that change. Through this paper, I will showcase that nuclear energy is a reliably safe and low carbon alternative to fossil fuels, confront the misconceptions which have dogged the industry for decades, and provide a roadmap for how the narrative regarding nuclear energy can be changed to benefit countless people around the globe.

I. Nuclear Power Is Both Safe and Clean

To first garner support for the higher implementation of nuclear power as an energy source, it must be fully understood in the context of generation and output. Some of the opposition nuclear power can be attributed to fundamental misunderstanding of the process, and one cannot make a decision on something so important before all facts are known and understood. There is likely a substantial portion of the population that believes nuclear waste is a glowing green substance which is produced in such massive quantities that the world is already struggling to contain it. In fact, the total volume of spent fuel used across the United States for the last fifty years only covers the area the size of a football field at a depth of less than ten yards.[12] Compare that to national coal ash outputs, which along with the emissions from the physical burning of coal, is an

[12] Duke Energy, *Debunking 9 Myths About Nuclear Energy*, (January 23, 2019), https://nuclear.duke-energy.com/2019/01/23/debunking-9-myths-about-nuclear-energy

ash waste product containing harmful materials such as arsenic, lead, mercury and chromium.[13] In 2014, one hundred and thirty million tons of this potentially deadly material was produced and needed to be disposed of in that year alone.[14] By weight, the US only produces two thousand tons of spent nuclear fuel every year. This volume is enough is enough to power seventy million homes for the year– while also avoiding four hundred million metric tons of carbon dioxide emissions which would be required from other traditional power sources.[15]

The actual process of turning uranium into clean energy can be a confusing one for the non-scientifically aligned, which is the majority people. But knowledge of what was previously unknown can dispel fear. Simply put, the heart of any nuclear power plant is the nuclear reactor. The reactor controls a process called nuclear fission, where atoms of the uranium fuel are split apart to release energy in the form of heat and steam, which in turn spins a turbine to produce electricity.[16] The processed and enriched uranium is used as fuel and comes in the form of pellets, stacked on top of each other to make rods. These rods are then bundled together to create fuel assemblies which only need to be replaced every twelve to twenty-four months.[17] The assemblies are then lowered into water, which acts as a moderator to slow down the fission and to sustain the chain reaction.[18] This is the process for light-water reactors, which all nuclear plants in the US use. After the process has occurred, the fuel assemblies are removed from the

[13] Environmental Protection Agency, *Coal Ash Basics*, (last updated March 28, 2025), https://www.epa.gov/coalash/coal-ash-basics
[14] *Id.*
[15] Office of Nuclear Energy, *5 Fast Facts About Spent Nuclear Fuel*, U.S. Department of Energy (October 3, 2022), https://www.energy.gov/ne/articles/5-fast-facts-about-spent-nuclear-fuel
[16] Office of Nuclear Energy, *Nuclear 101: How Does a Nuclear Reactor Work?,* U.S. Department of Energy, (August 2, 2023), https://www.energy.gov/ne/articles/nuclear-101-how-does-nuclear-reactor-work
[17] U.S. Energy Information Administration, *Nuclear Explained | The Nuclear Fuel Cycle,* (last updated October 26, 2023),*https*://www.eia.gov/energyexplained/nuclear/the-nuclear-fuel-cycle.php#:~:text=Typically%2C%20reactor%20operators%20change%20out,every%2012%20to%2024%20month s.
[18] Office of Nuclear Energy, *Nuclear 101: How Does a Nuclear Reactor Work?,* U.S. Department of Energy, (August 2, 2023), https://www.energy.gov/ne/articles/nuclear-101-how-does-nuclear-reactor-work

reactor and stored in submerged water for several years at the site itself as the assemblies remain hot, in both temperature and radioactive terms.[19] Once the radioactivity has subsided to lower levels, the spent assemblies are then ideally stored in permanent underground repositories.[20] However, the US has no site due to outsized fears and typical American political gridlock.

The biggest point of contention in US nuclear policy, and of policies around the world, is the issue of what to do with nuclear waste. There are three types of nuclear waste: low-level at 90% of total waste volume, intermediate-level at 7%, and high-level at 3% of volume.[21] Low-level waste is lightly contaminated items like tools and work clothing. While the volume is high, the total amount of radioactivity from these items is only 1% of the total and can be disposed of in a safe manner easily.[22] Intermediate-level waste are the used filters and other components within the reactor which isn't spent fuel. This type encompasses 4% of the total radioactivity of nuclear waste. The real problem child of nuclear waste is high-level, which contains 95% of the radioactivity of total waste while only being 3% of the volume.[23] Health risks associated with radioactive exposure only occur if someone were to be exposed to an extremely high dose of radiation, or prolonged exposure to low levels of radiation.[24] Through effective storage mechanisms, the risks of exposure can be effectively minimized. While it is true that the stored waste will remain radioactive for hundreds of years, within that time, the material itself will breakdown into a lower-level, and less dangerous form of radioactivity.[25] Within 50 years, the

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[19] *Id.*
[20] *Id.*
[21] World Nuclear Association, *What is Nuclear Waste, And What Do We Do With It?*, https://world-nuclear.org/nuclear-essentials/what-is-nuclear-waste-and-what-do-we-do-with-it
[22] *Id.*
[23] *Id.*
[24] World Health Organization, *Ionizing Radiation and Health Effects*, (July 27, 2023), *https*://www.who.int/news-room/fact-sheets/detail/ionizing-radiation-and-health-effects
[25] *Id.*

more dangerous radioactive waste will decay into intermediate and lower-level classified material that can be safely stored in a wider variety of facilities.[26]

Initially, deep geological disposal is widely considered the best solution.[27] Often termed a 'multi-barrier' safety concept due to the layers of protection being offered. First, the waste is packaged as securely as possible within items not likely to corrode and break down, like in copper and clay. Next, the engineered repository is built deep underground far away from any potential contact points with humans or groundwater, effectively minimizing potential leaks into the environment. Finally, these deep facilities have generally limited amounts of both oxygen and moisture, preventing the waste containers from being exposed to any corrosive agents.[28] In the very unlikely chance of a leak happening, any dose from a repository leak would be 50 times less than the average background radiation which is ever-present in all environments on the planet.[29] Through proper planning and execution, these risks can be minimized.

However, due to poor planning and political infighting within the United States Government, there is no large-scale nuclear waste storage within the borders of the nation. In 1982, Congress put forth the Nuclear Waste Fund and the Nuclear Waste Policy Act (NWPA).[30] The purpose of the act was to evaluate and select natural geologic repositories for the storage and disposal of spent nuclear fuel and other high-level radioactive waste.[31] Furthermore, the Act sets forth the mechanisms and procedures by which federal agencies and the various levels of

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[26] World Nuclear Association, *Storage and Disposal of Radioactive Waste*, (last updated April 30, 2024), https://world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-waste/storage-and-disposal-of-radioactive-waste#:~:text=Radioactive%20wastes%20are%20stored%20so,about%2050%20years%20before%20disposal.
[27] *Id.*
[28] *Id.*
[29] World Nuclear Association, *What is Nuclear Waste, And What Do We Do With It?*, https://world-nuclear.org/nuclear-essentials/what-is-nuclear-waste-and-what-do-we-do-with-it
[30] Nuclear Waste Policy Act of 1982, Public Law 97-425 (1982)
[31] *Id.*

government were to interact and work together. The NWPA assigned the Department of Energy (DOE) the task of handling the minutia of building and operating sites for disposal and storage. While the Environmental Protection Agency (EPA) was tasked to develop the standards and guidelines of off-site operation the facilities so that risk of contamination would be minimized.[32] Finally, the Act directed the Nuclear Regulatory Commission (NRC), the independent regulatory body managing nuclear energy matters, to license the DOE to fully operate a selected repository site only when the EPA's standards have been complied with.[33]

Next, the DOE evaluated nine potential sites as a permanent repository.[34] The final three candidates were located in Nevada, Washington State, and Texas. But concerned with the cost of fully evaluating the three options and dealing with bureaucratic holdups, Congress shortsightedly and irresponsibly amended NWPA to focus solely on the Nevada site, Yucca Mountain.[35] While publicly congressional members explained that the decision was made on the basis of costs alone, privately on capital hill, the amendment became to be known as the 'Screw Nevada Bill' as representatives from the state had the smallest amount of political influence.[36] Rather than fully evaluate the options on the table for a major decision, Congress forced through a half-cocked one. Now the country was forced into a singular choice. On its face, Yucca Mountain seemed a good location to settle upon. However, the cursory decision by Congress did not consider the full fact outlay. While seismic activity in the area is relatively minor, it is continuous.[37] Nor did they reconcile with the facts that the rock in the area was

[32] *Id.*
[33] *Id.*
[34] Catherine Clifford, *The Feds Have Collected More Than $44 Billion For a Permanent Nuclear Waste Dump – Here's Why We Still Don't Have One*, (last updated December 19, 2021), https://www.cnbc.com/2021/12/18/nuclear-waste-why-theres-no-permanent-nuclear-waste-dump-in-us.html
[35] *Id.*
[36] *Id.*
[37] Alan Ramelli, *Earthquake Hazard Research at Yucca Mountain*, Nevada Bureau of Mines and Geology (Winter 1989).

porous, allowing for underground water from nearby aquifers to potentially pass through which could corrode the housing canisters and seep into other local water.[38]

An ideal waste disposal site is arid, in an area with impermeable surrounding geological formations and little to no seismic activity. The Yucca Mountain site was nearly everything you wouldn't want from a repository. In the name of efficiency, the government blundered into a no-win scenario. After billions of dollars were spent in preparation for and construction of a project doomed for failure from the start, President Obama signed an order halting licensing procedures in 2010, putting the project on hold indefinitely. Currently, the situation remains the same as it did fifteen years ago, with the empty husk of Yucca Mountain standing as a monument to the ineptitude of US lawmakers. No other second repository has been selected and the $15 billion dollars directly spent on the project have been wasted.[39] Since, nuclear power reactors have had to rely on smaller storage vessels located at the plants themselves.[40] Further storage options may be further hampered depending on the outcome of the Supreme Court case, *Nuclear Regulatory Commission v. Texas*. At issue in the case is whether the Nuclear Regulatory Commission has the power to license private entities to temporarily store spent nuclear fuel away from reactor sites.[41] The history of spent fuel storage in the United States is littered with examples like Yucca Mountain. Continuously, efforts to move the country towards a sustainable future have been

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https://nbmg.unr.edu/_docs/Newsletters/nl5.htm#:~:text=In%20the%20Yucca%20Mountain%20area,recent%20occurrence%20of%20basaltic%20volcanism.

[38] Trina Kleist, *Yucca Mountain: Faster Water Flow Undermines Project Safety, UNR Geologist Says,* NPR, (July 12, 2020), https://www.kunr.org/energy-and-environment/2020-07-12/yucca-mountain-faster-water-flow-undermines-project-safety-unr-geologist-says

[39] Darius Dixon, *The $38 Billion Nuclear Waste Fiasco*, Politico, (November 20, 2013), *https*://www.politico.com/story/2013/11/nuclear-waste-fiasco-100450#:~:text=The%20first%20$15%20billion%20is,up%20a%20string%20of%20wins.

[40] *Id.*

[41] Oyez, *Nuclear Regulatory Commission v. Texas*, (March 5, 2025), https://www.oyez.org/cases/2024/23-1300

hamstrung, delayed, and shut down. However, if key decision makers were to look outward, lessons can be learned from others.

As mentioned earlier, France and Sweden have led the way in both development and operation of nuclear reactors and their byproducts. Both countries have taken the issue of waste increasingly seriously. Unlike the US, they also practice a closed-fuel cycle. Meaning there is recycling of nuclear waste from unusable fission byproducts into usable re-enriched uranium and new plutonium. These materials are then formed into new fuel rods and reused again. In fact, more than 90% of potential energy in spent rods remains in the fuel, even after a period of five years in the reactor.[42] Additionally, France and Sweden have also taken their time in selecting repository sites for more permanent storage. The former is expected to store their unusable waste in a site called Cigéo, 500 meters deep in the ground and surrounded by impermeable clay.[43] Pending expected permits and approval, construction will begin in 2027 and is estimated to cost 25 billion euros.[44] Sweden will also construct a repository called Forsmark, 500 meters deep in bedrock. Upon completion, there will be 60 kilometers of tunnels, where spent fuel rods will be encased in copper capsules, surrounded by clay. Estimating a cost of just over 1 billion US dollars and the site will hold 12,000 tons of waste.[45] Through careful planning and evaluation, the two sites will likely end up costing less than the failed Yucca Mountain project.[46]

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[42] Office of Nuclear Energy, *5 Fast Facts About Spent Nuclear Fuel*, U.S. Department of Energy (October 3, 2022), https://www.energy.gov/ne/articles/5-fast-facts-about-spent-nuclear-fuel

[43] CIGEO project, *CIGEO – Overview of a Planned Repository*, Radioactvity.EU.COM, https://radioactivity.eu.com/articles/radioactive_waste/project_cigeo

[44] Électricité de France, *Ministerial Order related to the cost of the Cigéo storage project and impacts on the Group's consolidated financial statements*, (last updated January 15, 2016)

[45] Simon Johnson, *Sweden Starts Building 100,000 Year Storage Site For Spent Nuclear* Fuel, Reuters, (last updated January 15, 2025), https://www.reuters.com/business/energy/sweden-starts-building-100000-year-storage-site-spent-nuclear-fuel-2025-01-15/#:~:text=The%20Forsmark%20repository%20will%20cost,10%20more%20reactors%20by%202045.

[46] Darius Dixon, *The $38 Billion Nuclear Waste Fiasco*, Politico, (November 20, 2013), *https*://www.politico.com/story/2013/11/nuclear-waste-fiasco-100450#:~:text=The%20first%20$15%20billion%20is,up%20a%20string%20of%20wins.

II. Confronting Public Fear and Misconceptions

Chernobyl. The name alone is enough to strike fear into the hearts of people across the globe, regardless of country of origin. Especially for those who lived through that time, and were in relatively close proximity to it, the event became another piece of evidence that nuclear reactors were not safe. It is normally the first thing an individual opposed to nuclear energy will bring forth in an argument against it. The explosion and subsequent release of radioactive material was a multi-layered failure which has plagued policy and decision making in the decades that have followed. In the book, *The Conservative Futurist*, author James Pethokoukis explains that fear driven responses to this accident and from others at Three Mile Island and Fukushima have driven decision making which costs more lives on a monthly basis than the total number of fatalities of all these events put together.[47] The decision to stop or shutter nuclear energy and turn to the ever reliable fossil fuels harms the very populations politicians are trying to protect. "Deaths from radiation exposure after a nuclear meltdown are more visible and dramatic than those resulting from higher energy prices. In the former case, specific deaths can easily be attributed, while in the latter case fatalities are a big-picture."[48]

The September 2021 issue of the *Journal of Health Economics* published a report from researchers who studied the unintended health effects as result of policy decisions made by the Japanese government in the wake of the Fukushima Daiichi nuclear accident. As a result of the accident, nuclear power stations stopped operations and traditional fossil fuel sources were used to supply the country's electricity needs. Because Japan didn't have an immediate supply of

[47] James Pethokoukis, *The Conservative Futurist: How to Create the Sci-Fi World We Were Promised* (2023)
[48] *Id.*

these resources, they had to look elsewhere, with those options costing more money. Due to the fear-based decisions made by policymakers, energy prices rose by around forty percent in some areas. Higher prices often lead to lower consumption. In the three winters which followed the accident, almost 5,000 deaths have been attributed to reduced wintertime energy consumption.[49] The site itself and people who were proximate to it are still being studied for long term effects, but so far, there has been no evidence of increased harms from radioactive exposure.[50]

The point of these discussions is not to point fingers, nor to prove the superiority of a single ideology or point of view. Nearly every policy decision made by lawmakers is one which will have a large effect on the lives of their constituents. Each of those decisions needs to be approached with the sober reality of the world in which we live. Every choice has positives and negatives which will be attributed to it. Often times, when major events occur that leave a lasting physical or mental scar on a country's population, there is a knee jerk reaction by the decision-makers to stop whatever the cause of that event was and to never again be confronted with it. In the preliminary working paper titled "The Political Economic Determinants of Nuclear Power: Evidence from Chernobyl", economists from MIT, University of Chicago, and Northwestern University have studied the effects of shuttering operations in nuclear plants in the wake of Chernobyl. They estimate that since the accident, the harm to people's health as a result of air pollution from continued fossil fuel use has been astronomical. In the US, there has likely been a loss of 141 million expected life years, and 318 million lost years from the global population who have lived in the world since.[51]

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[49] Matthew Neidell, et al., *The Unintended Effects From Halting Nuclear Power Production: Evidence From Fukushima Daiichi Accident*, Journal of Health Economics Volume 79, (2021)

[50] World Nuclear Association, *Fukushima Daiici Accident*, (last updated April 29, 2024), https://world- nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-daiichi-accident

[51] James Pethokoukis, *The Chernobyl Syndrome: Another Example of Just How Deadly Nuclear Fear Can Be*, American Enterprise Institute, (July 26, 2024), https://www.aei.org/articles/the-chernobyl-syndrome-another- example-of-just-how-deadly-nuclear-fear-can-be/

By policy makers turning the cold shoulder to nuclear power, the consequences of that decision have not been fully considered. Construction of new plants across the world has slowed, causing the average age of them to increase. Since the late 1980's, commercial reactor construction has slowed considerably, capping output rates all the while increasing reliance on older reactors.[52] The newest built reactor in the US is the Unit 4 at the Alvin W. Vogtle Electric Generating Plant in Georgia.[53] While all reactors are still regularly maintained and kept to the highest of safety standards, there remains the ever-present law of machinery: older things are more likely to break down or have other issues. The average age of reactors in the US is 42 years old.[54] All US reactors are originally licensed for a 40 year period, and there is an option to have two twenty-year renewals, provided the reactors can meet relevant safety standards.[55] While the expected life of them is around 80 years, the failure to continually build new ones presents a twofold failure of long-term planning. New creation will nearly always lead to innovation.

Throughout a continuous process of building, more efficient methods are found, lessening costs and increasing opportunities.[56] Furthermore, because of the age of current reactors, there will need to be an increase of new sites that must be built in order to keep up with energy demands. The choices for the decision makers of energy policy will come down to making a massive dollar investment for multiple new reactors, or use cheaper non-renewable sources against the world's ever-expanding carbon tab.

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[52] U.S. Energy Information Administration, *Nuclear Explained | U.S. Nuclear Industry*, (Last Updated August 24, 2023), https://www.eia.gov/energyexplained/nuclear/us-nuclear-industry.php

[53] *Id.*

[54] *Id.*

[55] United States Nuclear Regulatory Commission, *Backgrounder on Reactor License Renewal*, (last updated January 3, 2022), https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-reactor-license-renewal.html

[56] Robert Lea, *French WEST Reactor Breaks Record in Nuclear Fusion*, Advanced Science News, (last updated February 21, 2025), https://www.advancedsciencenews.com/french-west-reactor-breaks-record-in-nuclear-fusion/

As the use of artificial intelligence rises, energy needs are increasing as well. The current administration's plan to confront this need is to go back to "beautiful clean coal", rolling back decades of progress towards newer and cleaner energy production methods.[57] Along with the emissions from the burning of the material, the output of coal ash can have devastating effects for those unfortunate enough to be located near the plants.[58] Unlike nuclear energy generation, there is definitive proof on how the burning of coal has caused ill-health effects to entire communities.[59] One only needs to look at a place like Iredell County in North Carolina for evidence. There are numerous coal plants and coal ash deposits in the area and the childhood Papillary Thyroid Cancer rate is more than double the average national rate.[60] In researching cancer clusters, researchers have found a general causal relationship between the prevalence of cancer and the presence of environmental harm as a result of contamination from coal ash deposits.[61] Meanwhile there is no evidence of increased cancers from close proximity to nuclear reactor plants, even in the face of decades of intensive research.[62]

The industry standard for disposing of cancerous coal ash is merely to dump it into unlined ponds and landfills, allowing for the free flow of contaminants into groundwater.[63] In fact, 94% of all coal ash ponds are unlined in the US.[64] The direct contamination of drinking

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[57] Martina Igini, *Trump Signs Executive Orders to Revive 'Beautiful Clean Coal' in Blow to US Emissions Reduction Efforts,* Earth.Org, (April 9, 2025), https://earth.org/trumps-signs-executive-orders-to-revive-beautiful- clean-coal-in-blow-to-us-emissions-reduction-efforts/

[58] Xue Han et al., Journal of Korean Medical Science, *Cancer Incidence Among Residents Near Coal-Fired Power Plants Based on the Korean National Health Insurance System Data*, (2024)

[59] Sruthi Gopalakrishnan, *Coal Ash 101: Everything You Need to Know About This Toxic Waste*, Great Lakes Now, (September 13, 2022), https://www.greatlakesnow.org/2022/09/coal-ash-101/#:~:text=What%20is%20Coal%20Ash?,contaminate%20groundwater%2C%20lakes%20and%20rivers.

[60] *Id.*

[61] Erik Ortiz, *Teen's Cancer Uncovers a Mystery In One North Carolina Town: Why Here?,* NBC News, (last updated January 4, 2020), https://www.nbcnews.com/health/cancer/teen-s-cancer-uncovers-mystery-one-north- carolina-town-why-n1062011

[62] United States Nuclear Regulatory Commission, *Backgrounder on Reactor License Renewal*, (last updated January 3, 2022), https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-reactor-license-renewal.html

[63] https://earthjustice.org/feature/coal-ash-contaminated-sites-map

[64] *Id.*

water had gone unabated until 2015, when the first ever large scale regulations directly targeting coal ash.[65] The 2015 Coal Combustion Residuals Rule (CCR) was established by the EPA to require companies to test for ground water, take corrective actions where contamination has occurred, and make plans to close deposit sites.[66] Even with the regulations, hundreds of "legacy ash ponds" have been excluded under the rule as they closed before the EPA released their new rules.[67] Also excluded under the rules are examinations of previous unlined coal ash deposits used to build berms or fill in land.[68] The CCR in its entirety was short lived, as the first Trump administration relaxed rules in 2018[69], and the second administration's EPA recently announced their intention to "update" regulations.[70] Which in effect means there is an intention to kill the regulations and poison more Americans.

III. Educating the Public and Correcting Falsely Believed Information is Critical to Advancing Science Based Energy Policy

In order to build towards a cleaner future of energy production, all options must be considered and approached with a rational mindset that only considers the facts and not misinformation. Our collective future depends on it. While more pollutants are being pumped into the atmosphere every day, we continue on a march towards irreparable harm and a world which will be forever changed by human-induced climate change.[71] The world's natural filters

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[65] *Id.*
[66] Sruthi Gopalakrishnan, *Coal Ash 101: Everything You Need to Know About This Toxic Waste*, Great Lakes Now, (September 13, 2022), https://www.greatlakesnow.org/2022/09/coal-ash-101/#:~:text=What%20is%20Coal%20Ash?,contaminate%20groundwater%2C%20lakes%20and%20rivers.
[67] *Id.*
[68] *Id.*
[69] *Id.*
[70] Environmental Protection Agency, *EPA Announces Swift Actions on Coal Ash Program (Coal Combustion Residuals),* (March 12, 2025), https://www.epa.gov/newsreleases/epa-announces-swift-actions-coal-ash-program-coal-combustion-residuals
[71] Roxana Barden, *Temperatures Rising: NASA Confirms 2024 Warmest Year on* Record, NASA, (Jan 10, 2025), https://www.nasa.gov/news-release/temperatures-rising-nasa-confirms-2024-warmest-year-on-record/#:~:text=Earth's%20average%20surface%20temperature%20in,the%20record%20set%20in%202023.

for carbon are being destroyed, both directly and indirectly as a result of human activity. The coral reefs, crucial to the ocean's ecosystems, are being bleached out of existence.[72] The Amazon rainforest serves as the world's largest carbon filter, and it is being deforested at record levels.[73] Soon, large swaths of the land will be barren scrubland, adversely affecting not only the people living there, but everyone on the planet.[74] As a species, humans are at a critical tipping point. In order to counteract the damage that has already been done and to possibly change the outlook of the future, rational policy is needed. But in the US and abroad, science-based decision-making is being outweighed by ideological force.[75]

It's not too late to change course and correct the ship, but that initiative can only be started from average everyday people. It is exceptionally rare for political change to be made without there being a desire from constituents. Currently across the world, there is little understanding of the full potential of nuclear energy. Any time there is a discussion of them, the Chernobyl Effect kicks in, and fear gives way to reason. In no way should the possible negatives of nuclear harm be understated. But rather than treating the industry sector as a boogeyman only to be blindly dismissed, the full scope of possibilities should be evaluated. Take Sweden for example, in a national referendum in 1980, the people voted that no new nuclear reactors were to be built, and all existing ones were to be phased out by 2010.[76] But since, a desire for energy independence and to be carbon neutral has shifted mindsets and there has been a full turnaround

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[72] National Oceanic and Atmospheric Administration, *NOAA Confirms 4th Global Coral Bleaching Event*, (last updated April 15, 2024), https://www.noaa.gov/news-release/noaa-confirms-4th-global-coral-bleaching-event

[73] Matt Sandy, *The Amazon Rain Forest is Nearly Gone*, TIME, https://time.com/amazon-rainforest-disappearing/

[74] *Id.*

[75] Martina Igini, *Trump Signs Executive Orders to Revive 'Beautiful Clean Coal' in Blow to US Emissions Reduction Efforts,* Earth.Org, (April 9, 2025), https://earth.org/trumps-signs-executive-orders-to-revive-beautiful- clean-coal-in-blow-to-us-emissions-reduction-efforts/

[76] World Nuclear Association, *Nuclear Power in Sweden*, (last updated February 25, 2025), https://world- nuclear.org/information-library/country-profiles/countries-o-s/sweden#:~:text=In%20June%202023%20Sweden's%20parliament,the%20conditions%20for%20nuclear%20powe r.

on public opinion.[77] While start up costs are high, the effect will be that if the policy goals are realized, the Scandinavian nation will be able to independently produce carbon free energy.[78]

France meanwhile already has a large percentage of their energy generation from nuclear power. They are not only providing for their own citizen's needs, but they are exporting the power to other nations, generating income.[79] Conversely, Germany's Energiewende plan which has the stated goal of bringing emissions down while raising their share of renewable source production, completely eliminated the possibility of using nuclear power.[80] To meet their current domestic power needs, they have destroyed towns for the mining of coal[81]. The average German household's power bill is 40% higher than their French counterparts.[82] What France has done, and what Sweden is beginning to do, is show that through rational policy making, nuclear power can be embraced safely. Lessons can be learned and applied elsewhere.

First, there needs to be a general education of what the entire process of nuclear energy production is and how it can be effectively managed. The misconceptions about the sector come from fear and misunderstanding, both of which can be dispelled through knowledge. If people understand the risks of radioactivity and how to counter them, they will be more open to the use of nuclear power. Furthermore, they may begin to demand change from their elected officials, who to date have no motivation to pursue a changed course. The public also needs to be made more aware of the devastating effect that coal, oil, and natural gas burning has on them and their

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[77] *Id.*
[78] *Id.*
[79] Carbon Credits, *Liftoff: Nuclear Energy Will Accelerate the World*; Module 2 | Chapter 3, https://carboncredits.com/nuclear-education-how-germany-lost-another-world-war-to-france/
[80] *Id.*
[81] Laura Paddison, *Germany Plans to Destroy This Village For a Coal Mine. Thousands are Gathering to Stop it*, CNN, (last updated January 14, 2023), https://edition.cnn.com/2023/01/14/europe/lutzerath-germany-coal-protests-climate-intl/index.html
[82] Carbon Credits, *Liftoff: Nuclear Energy Will Accelerate the World*; Module 2 | Chapter 3, https://carboncredits.com/nuclear-education-how-germany-lost-another-world-war-to-france/

environment. There is a slow drip of poison which has caught up and the effects are being felt locally and on a global scale. Communities in North Carolina proximately located near coal plants and ash dumping sites are getting sicker at unnatural levels and that can spread if the current administration's energy goals are met.[83] This past decade has seen average temperatures rise to the highest they have ever been in human recorded history.[84] This is the reality of the world we now live in, if action isn't taken to change our ways, the effects could devastate humanity.

IV. Conclusion

The future outlook of energy production may look bleak and emission filled, but it does not have to be so. The fear of nuclear energy is warranted to an extent, but that can be used to exercise cautious optimism and careful planning, which in turn can improve the system. Knowledge of the entire nuclear power process allows for more effective oversight, which will improve safety. Rather than delegate regulatory powers to niche sections of federal agencies, more lawmakers will have the necessary fundamental understanding to oversee the industry more effectively. Nearly all nuclear incidents have resulted from either regulatory oversight, or an 'act of god' affecting the entire surrounding area. The former can be effectively minimized through smart regulatory processes and constant safety evaluations. Furthermore, if there is an embrace of nuclear power, there will be inevitable increases to both efficiency and safety. Just as a carpenter increases their efficiency and quality of their craft with each rocking chair they make, the same can happen with nuclear reactors at a national level.

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[83] Erik Ortiz, *Teen's Cancer Uncovers a Mystery In One North Carolina Town: Why Here?,* NBC News, (last updated January 4, 2020), https://www.nbcnews.com/health/cancer/teen-s-cancer-uncovers-mystery-one-north-carolina-town-why-n1062011

[84] NASA, *Global Temperature*, https://climate.nasa.gov/vital-signs/global-temperature/?intent=121

New developments are already being made. In France, a new record of a sustained Nuclear Fusion rection was recently achieved.[85] While twenty-two minutes may seem like a small amount, it is the first 'small step for mankind' in the field. The development is a major leap towards a sustainable energy future. If further leaps are made, many of the fears of current nuclear fission energy creation will be negated. First, fusion uses Tritium as a fuel source.[86] It is still radioactive, but only small amounts are needed to power a fusion reaction, and the half-life is substantially shorter than Uranium and Plutonium.[87] The combination of low volume fuel and limited byproduct radioactivity makes fusion a compelling new technology which can be used in the future to alleviate a stressed energy market. With less material needing to be stored at a lower radioactivity, it dramatically reduces the costs of storage and minimizes the radioactive risks from it.

While commercial use of nuclear fusion is still years away from large scale implementation, it provides hope for the future. Current progress could not have been made if science-based and rational policy making wasn't being practiced. If nations can learn about the benefits of nuclear power while also understanding that the risks can be minimized through effective regulation and proper oversight, the fear and misconceptions that currently grips most of the world can loosen. That can then give way to a clear-eyed decision on the matter. One which could save our planet from the poison of greenhouse gas emissions. By engaging with nuclear power now, more knowledge and innovations will spread dramatically. Change of

[85] Robert Lea, *French WEST Reactor Breaks Record in Nuclear Fusion*, Advanced Science News, (last updated February 21, 2025), https://www.advancedsciencenews.com/french-west-reactor-breaks-record-in-nuclear-fusion/
[86] International Atomic Energy Agency, *Fusion – Frequently Asked* Questions, https://www.iaea.org/topics/energy/fusion/faqs
[87] *Id.*

nuclear energy policy is desperately needed. But only through knowledge can that change be effectively implemented to save the future.