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FOREWORD

Dana Neacşu[1]

This year, *Joule*, Duquesne Kline Law School's Energy & Environmental Law Journal, contains four student-written articles and one case note, covering a variety of timely environmental and energy topics. Incidentally, these topics are also climate change-related, both current and imperative in their need to be addressed.

The first article by Duquesne Kline student Gabriella Godlewski is titled **Private Jet Use by Celebrities Causes Climate Crisis to Soar to New Heights**. It seeks to introduce a variety of potential solutions, as well as their flaws, to combat the devastating effect on the environment caused by celebrity private jet usage. She proposes a variety of tax- and fee-based solutions to offset the environmental damage produced by what the elder George Bush defiantly defined in 1992 as "The American way of life," which he described as "not up for negotiation." As the very well-off Americans are still struggling with the environmental impact of their way of life, Godlewski helpfully suggests ways to help them address that. Specifically, the Article aims to expose a sector of the aviation industry whose lack of regulation has caused a disproportionate negative impact on the environment. Given the regulatory trend with new agency regulations governing aircrafts, and the solutions laid out, Godlewski's article offers glimmers of hope. Godlewski's proposed solutions would

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help avoid the climate crisis from soaring to new heights, so we can continue talking about a way of life for all.

Mackenzie Pensyl is a 3L from the University of Akron's School of Law. Her article, **A Blast From the PFAST: Forever Chemicals Coming Back to Haunt US and How International Regulatory Schemes Can Supplement United States Law**, focuses on the legal regime governing per- and poly-fluoroalkyl substances, known as PFAS. She argues for a more stringent regulatory approach. Major companies like DuPont, 3M, and GORE-TEX have utilized PFAS for decades in manufacturing their widely used non-stick and water-resistant products. **A Blast From the PFAST** summarizes the various legislative and regulatory attempts to regulate the use of PFAS. On March 14, 2023, for instance, the Biden-Harris Administration announced it was proposing the first-ever national drinking water standard for six per- and polyfluoroalkyl substances (PFAS), building on pre-existing regulatory framework. Nevertheless, this standard too, as **A Blast From the PFAST** points out, is insufficient. Only PFAS banning would stop industries from using and discharging these environmentally dangerous materials. **A Blast From the PFAST** brings together impressive international and comparative legal research while presenting a clear view of the road ahead.

Next, Patrick Scully's **The Road to Recycling: The Foggy Future of Electric Vehicle Batteries**, brings up the lesser known aspects of the fight against climate change, such as the creation of new industries, i.e., electric vehicles. Advances in transportation technology have engendered greater trade and profits, but also

carbon dioxide emissions released from gas-based engines. These emissions subsist as one of the greatest forms of pollution. As a result of these technical advances, a leading campaign in climate change mitigation focuses on minimalizing the reliance on gas-fueled vehicles. This campaign gave rise to a new industry: electric vehicles. **The Road to Recycling** clearly presents the international and national regulatory aspects surrounding this new industry. Kudos go to the principal champion of such regulations, California and Governor Gavin Newsom. His recent Executive Order N-79-20 bans the outright sale of fossil-fueled cars by 2035.

John Silvester, another Duquesne Kline law student, thoroughly examines the recent Supreme Court decision in **West Virginia v. Environmental Protection Agency, 142 S.Ct. 2587 (2022)** in a case note. Silvester finds relief in the Supreme Court's decision:

> An act of Congress is more durable than Executive Action. Executive actions can be terminated via the stroke of the President's pen in an Executive Order, but valid Congressional actions can only be amended or repealed by a subsequent act of Congress. In a quick thought experiment, imagine the Clean Power Plan, created under the Obama Administration, had not been blocked by the Court. The Trump Administration, which had differing views on the role of the EPA in regulating greenhouse gas emissions, likely would have discontinued the program after it took charge of the government. Four years later, the Biden Administration, which supports the EPA's role in greenhouse gas emissions, could have reinstated the plan after it took charge, but future administrations could similarly terminate the program by Executive directive. This thought experiment illustrates another reason why unilateral Executive action is not the proper solution for greenhouse gas regulation: Greenhouse gas emissions regulations need to be consistently applied for a number of years to affect the global climate, and Executive actions lack the durability to be consistently enforced over such a long timespan.

Finally, Kate Sullivan's **The Zaporizhzhia Nuclear Power Plant and Jus in Bello** has the Ukrainian war as its background. More precisely, it focuses on the takeover of the Ukrainian Zaporizhzhia Nuclear Power Plant ("ZNPP") by military forces of the Russian Federation. Sullivan persuasively explains that energy is too important to societal infrastructure to let it be unprotected during wartime, "because it would cause unnecessary suffering to civilians and non-combatants." Given the Russian takeover of ZNPP, Sullivan advocates for the adoption of an international treaty prohibiting the use of nuclear facilities as battlegrounds. Such a treaty would best prevent unnecessary suffering of civilians as well as environmental disasters.

The variety of articles contained in this year's volume of *Joule* show the changing landscape of environmental and energy issues. The energy and environmental space continues to evolve, influenced by celebrities' overconsumption, corporate disregard for carcinogenic products, to challenging issues such as international wars. *Joule*'s articles showcase that one thing in the energy and environmental space, however, remains constant: a continued concern for how the world can adapt and respond to the urgent climate crisis. ***Joule*'s Volume 11** presents a snapshot of these pressing issues; and the tension behind how best to solve climate change to ensure a safe planet for all.

Private Jet Use by Celebrities Causes Climate Crisis to Soar to New Heights

Gabriella Godlewski[1]

I. INTRODUCTION

Nearly fifty percent of the global population uses airlines.[2] However, one percent of the global population is responsible for half of the total emissions associated with flying.[3] This incredibly small population is primarily made up of wealthy celebrities.[4] In November of 2019, Kylie Jenner, at the age of twenty-one, became the youngest self-made billionaire ever.[5] Shortly thereafter, Jenner purchased a custom-designed private jet, which features a pink interior and exterior, plush leather seats with her initials embroidered on the headrest, and a TV area, for more than seventy-million dollars.[6] One of her many trips on this jet occurred in July of 2022, when Jenner boarded a flight that lasted only seventeen minutes.[7] It is estimated that this short flight resulted in one ton of carbon dioxide emissions, which is about a quarter of the total annual carbon footprint of the average person globally.[8]

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[2] FEDERAL AVIATION ADMINISTRATION, *Aviation Emissions, Impacts & Mitigation: A Primer*, at p. 1, (Jan 2015), https://www.faa.gov/regulations_policies/policy_guidance/envir_policy/media/primer_jan2015.pdf.
[3] Oliver Milman, *A 17-minute flight? The super-rich who have 'absolute disregard for the planet'*, THE GUARDIAN (July 21, 2022, 5:00 PM), https://www.theguardian.com/environment/2022/jul/21/kylie-jenner-short-private-jet-flights-super-rich-climate-crisis.
[4] *Id.*
[5] Natalie Robehmed, *At 21, Kylie Jenner Becomes The Youngest Self-Made Billionaire Ever*, FORBES (Mar. 5, 2019, 5:00 AM), https://www.forbes.com/sites/natalierobehmed/2019/03/05/at-21-kylie-jenner-becomes-the-youngest-self-made-billionaire-ever/?sh=71351c802794.
[6] Jennifer Hassan, *Kylie Jenner Gets Roasted for Flauting Private Jet in Climate Crisis*, THE WASHINGTON POST (July 21, 2022, 10:30 AM), https://www.washingtonpost.com/lifestyle/2022/07/21/kylie-jenner-private-jet-climate-crisis/.
[7] Milman, *supra* note 3.
[8] *Id.*

Jenner's trips on her aircraft, however, could largely be accomplished using other methods of transportation and significantly less emissions. The seventeen-minute flight taken by Jenner in July of 2022 would have taken just forty minutes in a car and significantly reduced the total emissions released into the environment.[9] Despite growing concerns over the climate crisis, Jenner continues to frivolously travel on her private jet. She has even taken to Instagram to make light of her private-jet trips in a post captioned "you wanna take mine or yours?" with a photo of herself and her partner, Travis Scott, standing between their private jets.[10] While this post seems to innocently highlight the status, luxury, and wealth Jenner has, it actually emphasizes the lack of regard she has towards the environment and the devastating effect her actions have on it. Jenner is just one of many celebrities who routinely engage in this environmentally harmful method of transportation. Although Jenner's use of private jets may be expected given her very public and lavish lifestyle, some of the other biggest celebrity perpetrators may come as a surprise.

Halfway through 2022, The Tab released a top-ten list.[11] Normally, celebrities thrive to make their way to the top of such a list; but not this one. This top ten list ranks the celebrities who have racked up the most carbon dioxide emissions during the year using their private jets.[12] Despite the enormous carbon footprint Kylie

[9] *Id.*
[10] *Id.*
[11] Phoebe Kowhai, *The celebs who have racked up the most CO2 emissions this year using their private jets*, THE TAB (July 25, 2022), https://thetab.com/uk/2022/07/25/celebrity-private-jets-carbon-emissions-climate-change-263281.
[12] *Id.*

Jenner has left on the planet by taking flights, as discussed above, she is not even on this list.[13]

The list does include, however, Oprah Winfrey, Kim Kardashian, Blake Shelton, Aaron Rodriguez, and Floyd Mayweather, to name a few.[14] The celebrity at the top of this list is familiar with being number one on many charts, especially with the recent release of an album and sell-out stadium tour. It is Taylor Swift.[15] Between January 2022 and August 2022, Swift's private jet has taken flight one hundred and seventy times, with an average distanced traveled of one hundred and thirty-nine miles in eighty minutes.[16] At a speed of sixty miles per hour, it would take roughly two hours and twenty minutes to travel this same distance.[17] The carbon dioxide emissions for these flights totaled 8,293 tons.[18] The emissions from Swift's private jet are about the same as what 2,073 people globally would emit in one year, on average.[19] As Jenner did, Swift saw backlash from this irresponsible detriment to the planet. A spokesperson for Swift responded to this negative press by explaining that Swift's jet is routinely loaned to other individuals and "to attribute most or all of these

[13] *Id.*
[14] *Id.*
[15] *Id.*
[16] *Id.*
[17] *Miles and Mph to Time Calculator*, RESEARCH MANIACS, https://researchmaniacs.com/Calculator/miles-mph-to-time/60/how-long-does-it-take-to-drive-139-miles-at-60-mph.html.
[18] Kowhai, *supra* note 11.
[19] *Calculate Your Carbon Footprint*, THE NATURE CONSERVANCY, https://www.nature.org/en-us/get-involved/how-to-help/carbon-footprint-calculator/#:~:text=Globally%2C%20the%20average%20carbon%20footprint%20is%20closer%20to%204%20tons.

trips to her is blatantly incorrect."[20] This response is just one excuse private jet owners may offer to defer responsibility for the negative impacts their jets cause.

Private jet use by celebrities has caused the climate crisis to soar to new heights. At this moment, the private aviation industry faces very little regulation regarding its environmental impact on the planet. This is where change is needed. This Article outlines the development of the aviation industry, the negative environmental impact it has caused, the historic, current, and forward-looking legislation governing the industry, as well as the environmental impact this legislation has on the planet. Specifically, this Article aims to expose a sector of the aviation industry whose regulation is currently lacking but should be prioritized moving forward because of its disproportionate negative environmental impact. This Article lastly examines several potential solutions, as well as their flaws, to combat celebrity private jet usage and its devastating effect on the environment.

II. BACKGROUND

A. The Rise of Aviation

The earliest aircrafts and flights more closely resembled a modern-day private flight, rather than a commercial flight, given the size of the aircraft and number of passengers.[21] The first ever successful flight in history took off on December 17, 1903.[22] The duration of the flight was twelve seconds, and the aircraft carried only

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[20] Kowhai, *supra* note 11.
[21] *History of Private Aviation*, SOLAIRUS AVIATION (July 13, 2016), https://www.solairus.aero/history-private-aviation/.
[22] *First Airplane Flies*, HISTORY (Dec. 15, 2021), https://www.history.com/this-day-in-history/first-airplane-flies#:~:text=Near%20Kitty%20Hawk%2C%20North%20Carolina,feet%20on%20its%20inaugural%20flight.

two passengers.[23] During the 1920s, the aviation industry saw growth in function and style, as more passengers were able to board the planes and passengers were served drinks and entertained with in-flight movies.[24] In 1945, passengers boarded the Pan Am Boeing 307 aircraft for the first time.[25] This aircraft model propelled commercial aviation forwards, as it was the first to implement a pressurized cabin and fly above 20,000 feet.[26] These features allowed passengers to fly much more comfortably, as turbulence, excessive noise, and air pressure were significantly reduced.[27] In the 1950s, "for the first time in history, more US passengers were travelling by air than train."[28] This is largely due to the Boeing 707 airliner, which was larger and more economical than its predecessor.[29] This aircraft model began regular service in 1958 and remained in operation until the end of 2018.[30] "The 1950s also ushered in the 'jet age'."[31] In the 1950s, the first business jet in the industry was released, which accommodated ten passengers and two crewmembers.[32] It was not until 1966 that private jets with large cabins began to be manufactured.[33] Since then, commercial and private aircrafts have seen rapid growth and development to achieve the modern-

[23] *Id.*
[24] *How Air Travel has Changed in Every Decade from the 1920s to Today*, LOVE EXPLORING (Sept. 02, 2021) https://www.loveexploring.com/gallerylist/86315/how-air-travel-has-changed-in-every-decade-from-the-1920s-to-today.
[25] *Id.*
[26] *Id.*
[27] *Id.*
[28] *Id.*
[29] *Id.*
[30] LOVE EXPLORING, *supra* note 24.
[31] *Id.*
[32] *History of Private Aviation*, *supra* note 21.
[33] *Id.*

day models. These models, which are more attractive to flyers than ever before, have not only increased demand, but also the carbon footprint left on the planet.

B. The Sky-High Price of Traveling on a Private Jet

There are steep costs associated with flying via private jet, including the cost of the plane itself, fuel, staff, and routine maintenance.[34] There are a variety of ways for a person to finance travel on a private jet. The first and most expensive way to travel on a private jet is the outright purchase of one.[35] The cost of a new jet will generally range between two and one-hundred million dollars.[36] Some companies that sell private jets explain that if a person spends at least two-hundred hours per year flying, the purchase of a jet would be justified.[37] Others, however, put this estimate closer to the four-hundred to six-hundred hour range.[38]

If a person does not fly this much or have the financial means to outright purchase a plane, an alternative method of private traveling may be better suited for their travel needs. Alternatives include partial ownership, private charter services, or membership in a private jet club.[39] Partial, or fractional, jet ownership is functionally similar to a timeshare in real estate.[40] Partial owners usually pay for a fixed number of hours a year upfront.[41] The most popular cost option for partial

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[34] Flying Staff, *How Much Does a Private Jet Cost?,* FLYING (June 8, 2022), https://www.flyingmag.com/guides/how-much-is-a-private-jet/.
[35] *Flying Private: The Cost and Benefit of Luxury Travel*, FINANCIAL SAMURAI (April 22, 2022), https://www.financialsamurai.com/flying-private-the-cost-and-benefits-of-luxury-travel/.
[36] Samantha Silberstein & Kimberly Overcast, *How Much is a Private Jet?,* INVESTOPEDIA (Mar. 06, 2022), https://www.investopedia.com/articles/investing/081015/can-i-afford-private-jet.asp.
[37] *Id.*
[38] *Id.*
[39] *Id.*
[40] *Id.*
[41] Flying Private: The Cost and Benefit of Luxury Travel, *supra* note 35.

ownership is fifty hours a year in flight time.[42] As such, partial ownership starts at roughly three-hundred thousand dollars and can easily span up to one million dollars per year.[43] Another alternative method of flying private is through charter services, which allows a passenger to rent a private jet and only pay for the time it is used, similar to a car rental service.[44] Chartering a private plane can cost anywhere between four-thousand and twenty-thousand dollars per hour, depending on the size of the jet.[45] Lastly, by becoming a member of a private jet club, travelers can purchase annual membership from a charter company that, in turn, makes jets available for use.[46] An annual membership costs, at a minimum, about three-thousand dollars, or over three-hundred dollars a month.[47]

In addition to the cost of the plane, charges for jet fuel are also passed onto the flyer.[48] The cost of fuel depends largely on factors such as the size of the jet, weight, weather conditions, altitude, and speed.[49] Private jets will burn anywhere from fifty to over six-hundred gallons of fuel per hour.[50] At an average price of $5.29 per gallon, jet fuel costs can vary anywhere between five hundred to two-thousand dollars per hour.[51] Given the sky-high costs associated with flying private, it is an activity largely

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[42] *Id.*
[43] *Id.*
[44] Tim Parker & Margaret James, *The Economics of Private Jet Charters*, INVESTOPEDIA, (Mar. 4, 2021), https://www.investopedia.com/articles/personal-finance/063015/economics-private-jet-charters.asp.
[45] *Id.*
[46] Silberstein & Overcast, *supra* note 36.
[47] Parker & James, *supra* note 44.
[48] *Id.*
[49] *How Much Fuel Do Private Jets Burn Per Hour?*, COMPARE PRIVATE PLANES, (last viewed Apr. 10, 2023) https://compareprivateplanes.com/articles/private-jet-fuel-burn-per-hour.
[50] *Id.*
[51] *How Much Does Jet Fuel Cost? (Per Gallon, Liter, Mile),* EXECUTIVE FLYERS, (Oct. 5, 2022), https://executiveflyers.com/how-much-does-jet-fuel-cost/.

reserved for the wealthiest people. Due to their wealth and disproportionate impact on the environment, this demographic is a target to impose additional taxes and fees upon.

C. The Environmental Impact of the Aviation Industry

The development of aviation has largely increased society's quality of life and its continued development is necessary to meet the needs of a growing economy and expanding population.[52] However, environmental stability and public health are jeopardized as a result of the continuing development of the aviation industry.[53] When describing the potential health concerns of U.S. citizens and the degradation of the global climate as a result of aviation, the Federal Aviation Agency explains that "Aviation affects the environment in many ways: people living near airports are exposed to noise from aircraft; streams, rivers, and wetlands may be impacted by to pollutants discharged in storm water runoff from airports; and aircraft engines emit pollutants into the atmosphere.[54] Thus, the environmental impacts of emissions associated with commercial aviation impact the general health and welfare of the public, air quality degradation, and broader climate change.[55]

Aircraft engines, like cars, trucks, and other methods of transportation, produce greenhouse gases, including carbon dioxide (CO2).[56] As explained by the Federal Aviation Agency, "carbon dioxide is the product of complete combustion of

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[52] FEDERAL AVIATION ADMINISTRATION, AVIATION EMISSIONS, IMPACTS & MITIGATION: A PRIMER, at p. 1, (Jan 2015), https://www.faa.gov/regulations_policies/policy_guidance/envir_policy/media/primer_jan2015.pdf.
[53] *Id.*
[54] *Id.*
[55] *Id.*
[56] *Id.* at 2.

hydrocarbon fuels like gasoline, jet fuel, and diesel. Carbon in fuel combines with oxygen in the air to produce CO2, which negatively impacts climate change."[57] CO2 emissions are expected to warm the lower atmosphere and Earth's surface.[58] Additionally, CO2 emissions can change sea levels, ice and snow coverage, and precipitation.[59] These potential climate changes impact agriculture and forestry, the ecosystem, energy production and consumption, human health, and social welfare.[60]

CO2 emissions by different modes of transportation are best measured on a per passenger per mile basis across the various transportation types.[61] When compared to other methods of transportation, aviation is approaching the most energy efficient transportation mode because of the large number of passengers carried at once.[62] However, private jets generally carry few passengers for shorter distances, making them five to fourteen times more polluting than commercial planes, per passenger.[63] A celebrity using a private plane emits roughly 480 times more CO2 than an average person's annual emissions.[64] A large majority of fuel burned, and thus emissions released, occur from taxiing the plane, warming the engine, and takeoff, compared to

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[57] *Id.* at 3.
[58] UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, AIRCRAFT CONTRAILS FACTSHEET, at p. 3 (Sept. 2000).
[59] Guy P. Brasseur, *A Report on the Way Forward Based on the Review of Research Gaps and Priorities*, AVIATION CLIMATE CHANGE RESEARCH INITIATIVE, at p. 36 (Aug. 12, 2008), https://www.faa.gov/sites/faa.gov/files/about/office_org/headquarters_offices/apl/ACCRI_Report_final.pdf.
[60] AVIATION EMISSIONS, IMPACTS & MITIGATION: A PRIMER, *supra* note 52, at p. 16.
[61] *Id.* at 5.
[62] *Id.* at 5.
[63] Milman, *supra* note 3.
[64] Allyson Chiu, *Celebrities Use Private Jets Excessively. It's a Climate Nightmare.*, THE WASHINGTON POST (Aug. 2, 2022, 8:22 PM), https://www.washingtonpost.com/climate-environment/2022/08/02/taylor-swift-kylie-jenner-private-jet-emissions/.

when the plane is covering distance while cruising.[65] Accordingly, a short distance private jet trip emphasizes "the least efficient parts of the plane's duty cycle."[66] This exemplifies a significant opportunity for the government and industry to take action to prevent the substantial and disproportionate detrimental emissions that result from private flights. Doing so can be an effective step towards lessening the carbon footprint celebrities leave on the environment.[67]

III. GOVERNMENTAL ACTION

A. History of Regulation on the Aviation Industry and its Impact on the Climate Crisis

Climate change has been a heavily debated topic throughout history.[68] The primary source of legislation regulating climate change comes from Congress, federal agencies, and the President.[69] Historically, however, legislation has either been arguably lacking or ineffective. In 1969, President Nixon's advisor warned the public of "the carbon dioxide problem" that would "dangerously heat the planet, melt the glaciers, and cause the seas to rise."[70] Over fifty years later, drastic steps are finally being taken to respond to and resolve the climate crisis.[71] The following sections will introduce the agencies and legislation that are responsible for the historic and current efforts towards combating the climate crisis, including the Clean Air Act (the "CAA")

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[65] *Id.*
[66] *Id.*
[67] *Id.*
[68] *Congress Climate History*, CENTER FOR CLIMATE AND ENERGY SOLUTIONS (last visited Mar. 20, 2023), https://www.c2es.org/content/congress-climate-history/.
[69] *Id.*
[70] Coral Davenport & Lisa Friedman, *Five Decades in the Making: Why It Took Congress So Long to Act on Climate*, THE NEW YORK TIMES (Aug. 7, 2022) https://www.nytimes.com/2022/08/07/climate/senate-climate-law.html.
[71] *Id.*

and the Environmental Protection Agency ("EPA"), which forged the first ever aviation emission rules and the 2021 United States Aviation Climate Action Plan that seeks to eliminate aviation emissions by 2050.[72]

i. The Clean Air Act and the Environmental Protection Agency

In its introduction to "The Plain English Guide to the Clean Air Act," the EPA recalls a particularly alarming instance of sudden and deadly air pollution: "In October 1948, a thick cloud of air pollution formed above the industrial town of Donora, Pennsylvania. The cloud which lingered for five days, killed 20 people and caused sickness in 6,000 of the town's 14,000 people."[73] Events like this prompted a move towards public health legislation, in the form of air pollution control.[74] One of the first pieces of proposed legislation to combat air pollution was the Clean Air Act of 1963 ("CAA").[75] After more than twenty years of revisions to the breadth and scope of the Act, Congress finally enacted the CAA in 1990.[76] The CAA aimed to protect public health and welfare from any actual or potential adverse effects from air pollution or from exposures to pollutants which originate as emissions to the ambient air.[77] The CAA sought to achieve this mission by reducing air pollutants, including emissions of toxic pollutants, that are produced from stationary sources and mobile sources, including cars, trucks, and planes.[78] The CAA further encouraged the

[72] *Id.*
[73] *Id.*
[74] *Id.*
[75] Congress Climate history, *supra* note 68.; UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, CLEAN AIR ACT OVERVIEW, at pg 4. (May 4, 2022).
[76] UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, CLEAN AIR ACT OVERVIEW, at p. 4 (May 4, 2022).
[77] Congressional Declaration of Purpose. 42 U.S.C. § 7470 (1955).
[78] CLEAN AIR ACT OVERVIEW, *supra* note 75, at p. 4.

production and use of cleaner transportation methods and alternative fuels to reduce carbon dioxide emissions.[79] To achieve these goals, the CAA granted authority to the EPA to set limits on certain air pollutants, including limitations on the maximum amount of carbon dioxide emissions that can be in the air at a given time throughout the United States.[80]

Although the CAA provided the first authority to control emissions, it has been challenged regarding its ability to regulate greenhouse gas emissions.[81] In 2003, the EPA received petitions from several states, local governments, and environmental organizations to regulate the greenhouse gases from cars and trucks.[82] Initially, the EPA claimed that it did not have the authority under the CAA to do so.[83] The issue was brought to the attention of the U.S. Supreme Court, which held that greenhouse gases were air pollutants within the Clean Air Act's definition, requiring the EPA to regulate them if it found that they caused, or contributed to, air pollution which "may reasonably be anticipated to endanger public health or welfare."[84] Since this finding, the EPA has received various petitions from several states, local governments, and environmental organizations to regulate greenhouse gas emissions from aircraft

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[79] *Id.* at 9.
[80] UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, THE PLAIN ENGLISH GUIDE TO THE CLEAN AIR ACT, at p. 3 (April 2007).
[81] James E. MCarthy, *Aviation and Climate Change*, CONGRESSIONAL RESEARCH SERVICE, at p. 4 (January 27, 2010), https://sgp.fas.org/crs/misc/R40090.pdf.
[82] *Id.*
[83] *Id.*
[84] Massachusetts v. Env't Prot. Agency, 549 U.S. 497, 529–30 (2007) (quoting the 2007 version of 42 U.S.C. § 7521 (West 2022)). Similar, but not identical, language regarding is from Section 202(a) of the Clean Air Act, which requires emission standards for motor vehicles. Similar, but not identical, language regarding endangerment appears as the prerequisite to the setting of emission standards for other categories of sources elsewhere in the Clean Air Act. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, *supra* note 58.

engines.[85] However, the EPA made clear that it would prefer Congress to enact legislation explicitly targeted at greenhouse gas emissions in the aviation industry, as opposed to the EPA acting using its current authority under the CAA, because the legislation would likely be more effective and avoid legal challenges in the courts.[86] Accordingly, the EPA did not make significant moves to regulate greenhouse gas emissions from aviation under the CAA for years.[87]

ii. The First-Ever Airplane Emission Rules

It was not until 2016 that the EPA, using its authority under the CAA, legally declared that greenhouse gases, including CO2, emitted from certain classes of engines used in aircrafts "endanger the public health and welfare of the current and future generations."[88] At that point, aircrafts remained the single largest greenhouse gas emitting transportation source not yet subject to greenhouse gas standards in the United States.[89] For the next few years, the EPA promulgated standards addressing greenhouse gas emissions from engines on covered aircrafts.[90] In 2020, the EPA finalized and introduced the first-ever airplane emissions rules regulating green-

[85] *Aviation and Climate Change*, CONGRESSIONAL RESEARCH SERVICE, at p. 5 (Aug. 4, 2009), https://www.everycrsreport.com/files/20090804_R40090_cdf18713d784bceecd73e4fd917d13fd37372353.pdf.
[86] *Id.*
[87] Nathan Richardson, *Aviation, Carbon, and the Clean Air Act,* at p. 9 (July 2012) https://media.rff.org/documents/RFF-DP-12-22.pdf.
[88] *EPA Finalizes Airplane Greenhouse Gas Emission Standards*, UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, at p. 2 (Dec. 2020), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1010TFZ.pdf.
[89] *Id.*
[90] *Control of Air Pollution from Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures - Final Rulemaking*, ENVIRONMENTAL PROTECTION AGENCY (Jan. 13, 2022) https://www.epa.gov/regulations-emissions-vehicles-and-engines/control-air-pollution-airplanes-and-airplane-engines-ghg.

house gas emissions from select commercial aircraft.[91] The rules require that aircraft manufacturers use fuel-efficient engines that release less carbon dioxide for aircrafts produced on or after January 1, 2028.[92] This includes large business jets and commercial aircrafts.[93] When speaking about this rule, a spokesperson for Boeing, one of the world's largest commercial aircraft manufacturers, said the rule would be a "major step forward for protecting the environment and supporting sustainable growth of commercial aviation and the United States economy."[94] However, many environmentalists were not convinced that this rule would substantially impact the fight against the climate crisis and urged the incoming administration, under President Biden, to implement more stringent regulation to reduce overall aviation emissions.[95]

iii. The 2021 United States Aviation Climate Action Plan

In 2021, the Biden-Harris Administration and the Federal Aviation Administration launched the first-ever comprehensive aviation climate action plan.[96] The first line of the 2021 Aviation Climate Action Plan (the "Plan") states that "[t]he United States believes that addressing the climate crisis through enhanced ambition

[91] Reese Oxner, *U.S. Implementing 1st-Ever Airplane Emission Rules; Critics Say They're Ineffective*, NATIONAL PUBLIC RADIO (Dec. 28, 2020, 4:23 PM), https://www.npr.org/2020/12/28/950863508/u-s-implementing-1st-ever-airplane-emission-rules-critics-say-theyre-ineffective.
[92] UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, EPA FINALIZES AIRPLANE GREENHOUSE GAS EMISSION STANDARDS, at p. 1 (Dec. 2020), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1010TFZ.pdf.
[93] *Id.*
[94] *Id.*
[95] *Id.*
[96] *U.S. Releases First-Ever Comprehensive Aviation Climate Action Plan to Achieve Net-Zero Emissions by 2050*, U.S. DEPARTMENT OF TRANSPORTATION, https://www.transportation.gov/briefing-room/us-releases-first-ever-comprehensive-aviation-climate-action-plan-achieve-net-zero.

is a defining priority of our time."[97] The primary goal of the Plan is to achieve net-zero greenhouse gas emissions from the United States aviation sector by 2050.[98] To achieve this ambitious goal, various measures, including aircraft technology, operations, and sustainable aviation fuels, must be combined.[99] Additionally, seeing significant progress towards this goal is most crucial between now and 2030, according to the Plan.[100]

As highlighted by the Plan, historically, advances in aircraft technology have been the primary factor in mitigating the aviation industry's environmental impact.[101] While this has proven to be successful, there is a continued need for improved sustainable aviation fuel ("SAF").[102] SAF achieves a minimum of 50% reduction in greenhouse gases compared to the standard fuel used in aircrafts.[103] The White House committed to increase the production of SAF to at least three billion gallons per year by 2030.[104] It is the Plan's hope that by doing so, there will be sufficient SAF available to meet the aviation industry's demand for jet fuel in 2050, which is projected to be about thirty-five billion gallons per year.[105] Though the positive environmental impact of planes using SAF is evident, the costs associated with its research, development, and distribution will pose a challenge.[106] To overcome

[97] FEDERAL AVIATION AGENCY, UNITED STATES 2021 AVIATION CLIMATE ACTION PLAN, at p. 1, (2020).
[98] *Id.*
[99] *Id.* at 7.
[100] *Id.* at 7.
[101] *Id* at 11.
[102] *Id.* at 11.
[103] FEDERAL AVIATION ADMINISTRATION, AVIATION CLIMATE ACTION PLAN, (Nov. 9, 2021).
[104] UNITED STATES 2021 AVIATION CLIMATE ACTION PLAN, *supra* note 97, at 8.
[105] AVIATION CLIMATE ACTION PLAN, *supra* note 103.
[106] *Id.*

this challenge, the Plan proposed a SAF tax credit to help cut costs and scale production of sustainable fuels for aviation.[107] The Plan additionally proposes new and ongoing funding opportunities to support sustainable aviation fuel projects and production totaling up to $4.3 billion.[108] The proposed tax and funding opportunities will enable the Plan to see successful implementation, and potentially encourage the EPA to take affirmative steps towards reducing aviation emissions using its power under the CAA as well.[109]

In support of the 2030 initiative, several airlines, including United Airlines, Delta Airlines, American Airlines, Southwest Airlines, Alaska Airlines, and JetBlue, have pledged their commitment to increase SAF use and advance sustainability within their operations.[110] Although this is a positive step towards combating the climate crisis by the major commercial airline companies, companies that develop or rent out small luxury aircrafts for private use have stayed silent regarding their contribution.

B. Congressional Authority to Impose Taxes on the Aviation Industry

Historically, taxes have been used as a method to regulate industries, such as the aviation industry, and raise revenues to support governmental initiatives. Congress has three broad and enumerated powers that allow it to govern, regulate,

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[107] *FACT SHEET: Biden Administration Advances the Future of Sustainable Fuels in American Aviation*, WHITE HOUSE.GOV (Dept. 9, 2021) https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/09/fact-sheet-biden-administration-advances-the-future-of-sustainable-fuels-in-american-aviation/.
[108] *Id.*
[109] *Id.*
[110] *Id.*

and tax the aviation industry: The national commerce power, the taxing and spending power, and the necessary and proper power.[111]

Under the United States Constitution, Congress was granted the national commerce power.[112] The commerce power is the power to regulate commerce, including the exchange of people and things, among the several states.[113] The phrase "among the several states" is limited to commerce that takes place between states, however, the power also "extends to those activities intrastate which so affect interstate commerce."[114] Because the purpose of the aviation industry is precisely to transport people and things, whether in one state or across state lines, it is considered commerce, and thus, Congress has the enumerated power to regulate it.

The taxing and spending power grants Congress "the power to lay and collect taxes, duties, imposes and excises, to pay the debts and provide for the common defense and general welfare of the United States."[115] Where Congress can regulate a certain activity, the tax imposed may be simply a tax or a penalty.[116] For example, Congress can regulate the sale of cigarettes through the commerce power, and therefore can impose a penalty tax on the sale of cigarettes with the intent to deter or influence consumers' buying habits.[117] In the same way, Congress can regulate the

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[111] U.S. CONST. amend. I, § 8, cl. 3.; U.S. CONST. amend. I, § 8, cl. 1.; U.S. CONST. amend. I, § 8, cl. 18.
[112] U.S. CONST. amend. I, § 8, cl. 3.
[113] *Id.*
[114] Randy E Barnett & Andrew Koppelman, *The Commerce Clause*, NATIONAL CONSTITUTION CENTER, https://constitutioncenter.org/the-constitution/articles/article-i/clauses/752.
[115] U.S. CONST. amend. I, § 8, cl. 1.
[116] Robert D. Cooter & Neil S. Siegel, *Not the Power to Destroy: An Effects Theory of the Tax Power*, 98 VA. L. REV. 1195, 1198-1199 (Oct. 2012) (discussing Congress's Taxing and Spending Powers).
[117] *Id.* at 30.

aviation industry through interstate commerce and thus may impose taxes on it. Even if Congress could not regulate a sector of the aviation industry, arguably such as intrastate flights, the taxing power still allows Congress to tax that activity, so long as the purpose and effect of the revenue raised is to achieve a regulatory end and not penalize.[118] With the revenue earned from a tax, Congress can spend it to promote the general welfare of the United States and its people.[119]

Lastly, the necessary and proper clause, allows Congress "to make all laws which shall be necessary and proper for carrying into execution … all other powers by this Constitution in the Government of the United States, or in any Department or Officer thereof.[120] This power allows Congress to make laws governing interstate commerce activities, such as the aviation industry, and enforce its taxing and spending power by enacting legislation to that end.[121] The necessary and proper power extends to governmental departments and offices, which may include the Internal Revenue Service ("IRS") or the Federal Aviation Administration ("FAA").[122] With these three enumerated Constitutional powers, the aviation industry may be governed, regulated, and taxed properly.

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[118] *Id.* at 4.
[119] *Id.* at 12.
[120] U.S. CONST. amend. I, § 8, cl. 18.
[121] John Mikhail, *The Necessary and Proper Clauses*, 102 GEO. L.J. 1045, 1084 (2014) (explaining Congress's Necessary and Proper Power).
[122] *Id.* at 2.

C. Current Taxes on Jet Fuel

The IRS may impose excise taxes on various goods, services, and activities, which include flying and the fuel used to do so.[123] There is currently an excise tax on gasoline and kerosene fuel used in both commercial and noncommercial aviation.[124] Airplanes originally used gasoline, but kerosene is now the most common type of fuel used in planes.[125] Kerosene for use in aviation is taxed at a rate of 0.244 cents per gallon, whereas the tax on gasoline for use in aviation is 0.194 cents per gallon.[126] This tax is imposed on the sale of the fuel.[127] Because a federal tax is already imposed on the sale of aviation fuel, a proposed additional tax on fuel used in private jets could be a feasible solution to fund the research, development, production, and distribution of sustainable aviation fuels.

Although the aviation industry has rapidly developed and increased in popularity, the government has failed to regulate it at the same pace. The aviation industry, as it relates to environmental concerns, has been an area the government has historically demonstrated little concern for through legislation, despite having the authority to do so. This is especially true regarding the private sector. The first-ever comprehensive plan to reduce the negative environmental effects from aviation

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[123] *Excise Tax*, INTERNAL REVENUE SERVICE, https://www.irs.gov/businesses/small-businesses-self-employed/excise-tax.
[124] *Id. (*defining commercial aviation as "any use of an aircraft in the business of transporting persons or property by air for pay" and noncommercial aviation as any use of an aircraft not described as commercial aviation).
[125] *Why Airplanes Use Kerosene Rather than Plain Gasoline for Fuel*, ONE MONROE AEROSPACE (April 29, 2019), https://monroeaerospace.com/blog/why-airplanes-use-kerosene-rather-than-plain-gasoline-for-fuel.
[126] *Publication 510, Excise Taxes (Including Fuel Tax Credits and Refunds),* INTERNAL REVENUE SERVICE (July 2021), https://www.irs.gov/publications/p510.
[127] *Id.*

was initiated in 2021. The United States Aviation Climate Action Plan aims to achieve net-zero greenhouse gas emissions from aviation by the year 2050. The solutions proposed in this article are largely intended to support the government's targets set forth in this plan, often by taxing the purchase and charter of flights and the fuel necessary to do so. However, in addition to these governmental and regulatory measures, action from those within the industry is also necessary.

IV. INDUSTRY ACTION: THE BUSINESS AVIATION COMMITMENT ON CLIMATE CHANGE

The government alone cannot undo past harm or prevent future harm to the environment from flying, particularly flying private with few individuals. In addition to governmental action, airline companies, aircraft producers, and other key players within the aviation industry must do their part to combat climate change. Many of these participants, but not all, have pledged to do so through The Business Aviation Commitment on Climate Change (the "Commitment").

People often fail to distinguish private aircrafts and business aircrafts, which causes erroneous comments and opinions by the press and politicians.[128] The private aviation industry includes the use of the aircraft for business purposes or for pleasure.[129] However, the purpose of the flight distinguishes the regulations governing it.[130] As such, the Business Aviation Commitment on Climate Change

[128] Mike McCracken, *Private Aviation Versus Business Aviation–What Is The Difference?* HAWKEYE AIRCRAFT ACQUISITIONS LLC (May 4, 2015), https://www.hawkeye-aircraft.com/private-aviation-versus-business-aviation-what-is-the-difference.
[129] *Id.*
[130] *Id.*

governs business aviation narrowly, but makes no mention of private jet use for pleasure to govern private aviation more generally.[131]

In 2009, the General Aviation Manufacturers Association (the "GAMA"), a trade group that includes the top private jet makers, issued the Commitment.[132] The policy committed business jet operations to three targets: improving fuel efficiency 2% per year from 2010 until 2020, achieving carbon-neutral growth from 2020, and reducing C02 emissions 50% by 2050.[133] These targets, however, now seem modest, when compared to the net-zero emissions goals from major corporations and national governments.[134] In 2018, GAMA provided an update on its climate commitment; however, it included no data on the industries' progress towards meeting the 2020 or 2050 targets.[135] Although the business aviation community "recognizes that [it] must do [its] part to reduce aviation emissions,"[136] no similar pledge has been made by the private jet community specifically.

The government has historically failed to enact legislation upon the aviation industry to curb its negative environmental impact. However, recent moves towards climate reform and ambitious goals set forth in the Aviation Climate Action Plan

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[131] *Business Aviation Commitment on Climate Change*, GENERAL AVIATION MANUFACTURERS ASSOCIATION (GAMA), at p. 1, https://gama.aero/wp-content/uploads/GAMA-IBAC-Joint-Position-on-Business-Aviation-Tackling-Climate-Change-1.pdf.
[132] *Id.*
[133] *Business Aviation Commitment on Climate Change: An Update*, GENERAL AVIATION MANUFACTURERS ASSOCIATION (GAMA), at p. 2, https://www.ebaa.org/app/uploads/2018/01/GAMA-IBAC_Environment_Brochure.pdf.
[134] Corbin Hiar, *Climate 'Stigma' Smudges Gleaming Image of Private Jets*, E&E NEWS (Aug. 20, 2021, 7:15 AM), https://www.eenews.net/articles/climate-stigma-smudges-gleaming-image-of-private-jets/.
[135] *Id.*
[136] *Business Aviation Commitment on Climate Change*, *supra* note 131.

indicate a potentially brighter future. Because the Plan pertains to the aviation industry generally, producers and users of smaller luxury aircraft must play a more substantial role in regulating themselves. The following solutions challenge the government and those within the private airline industry to use their power and wealth for the good of the environment.

V. POTENTIAL SOLUTIONS – ANALYSIS AND FLAWS

The devastating environmental impact of celebrities using private jets, especially for trips that travel short distances with few passengers, is not easily reversible. It is not impossible, however, to imagine potentially feasible ways to mitigate this negative impact on the environment moving forward. Potential solutions may include imposing a tax on the purchase of fuel or the jet itself, banning private jet use altogether, enacting more stringent regulations regarding the types of trips and number of passengers allowed on a given jet, encouraging the use of hybrid-electric planes, and/or holding celebrities publicly and socially responsible for their higher-than-average carbon footprint on the world. While these solutions may be effective, none are without drawbacks.

A. Tax and Fee-Based Solutions

There are a variety of ways a potential solution could involve the imposition of taxes on the aviation industry. In all these proposed tax solutions, the revenue earned via the tax should be earmarked to directly fund the 2021 United States Aviation Climate Action Plan. Specifically, the proceeds should contribute to the $4.3 billion SAF tax credit goal that is aimed at helping cut costs and scale production of

sustainable fuels for aviation.[137] With this extra revenue funding the Plan, sustainable aviation fuels can be more efficiently and timely developed and distributed in mass quantities. This will make the Plan's 2030 and 2050 goals much more achievable.

i. The FAA Should Raise the Excise Tax on Commercial Fuel

The FAA should increase the already effective excise tax on commercial aviation fuel. Because kerosene fuel is the most common type of aviation fuel used today, it should be the target of this tax.[138] The current tax on kerosene fuel used in commercial aviation, which includes private aviation, is $.044 per gallon.[139] The FAA may propose increasing this tax by a small percentage or by a nominal rate per gallon. The current tax proceeds would be unchanged, but the additional tax would directly fund the research, development, production, and distribution of sustainable aviation fuels. If the $0.44 excise tax is raised by even one cent per gallon, the revenues would increase exponentially. With this additional funding, sustainable aviation fuel would develop more rapidly, and the aviation industry could move away from kerosene gas more quickly.

A likely drawback of this proposed solution is that the entire aviation industry would be subject to the tax, rather than directly targeting private aviation. This issue may not be easily addressed due to the way the IRS defines commercial aviation,

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[137] *FACT SHEET: Biden Administration Advances the Future of Sustainable Fuels in American Aviation*, *supra* note 107.
[138] *Publication 510, Excise Taxes (Including Fuel Tax Credits and Refunds),* INTERNAL REVENUE SERVICE (July 2021), https://www.irs.gov/publications/p510.
[139] *Id.*

which includes private jet use.[140] To target celebrity private jet use, the FAA would need to adjust this definition to exclude private aviation and then propose this additional excise tax on only that sector of the industry. Doing so would place the burden on the wealthy individuals who use private jets, rather than the average consumer.

ii. An Additional Fee Should be Imposed on the Purchase and Charter of Private Jets

Another potential solution could be the implementation of a fee, or tax penalty, on the purchase or charter of a private jet. The amount and means of collecting such a fee would depend on the method of payment for the private jet. As discussed, there are four ways to finance a private jet: the outright purchase of the jet, partial ownership in a jet, charter of a jet, or private jet membership.[141] For the outright purchasing of a private jet or the partial ownership of one, an additional fee could be imposed on the purchase. For example, the fee could be a fixed percentage of the purchase price. If outright purchasing, the owner would solely be responsible for payment of this fee. If engaging in a partial ownership arrangement, the co-owners could split the fee amongst themselves. For the charter of a private plane, this additional fee may be added on a per flight basis. Each time a plane is chartered, the fee would be added. All of those on the chartered plane may split the fee amongst themselves, or the individual who is chartering the plane may pay it themselves.

[140] *See supra* texts accompanying note 125.
[141] *See supra* texts accompanying notes 36–42.

Lastly, an additional annual fee for private jet memberships could be added to the current membership fees for funding the sustainable aviation fuel movement.

Because the purchase and charter of a private plane is done less frequently than other commercial flying, this idea will generate revenue more slowly than the first proposed solution. However, in contrast to the critique for the previously mentioned tax solution, this proposed idea directly targets the wealthy celebrity population who is flying private most frequently. Accordingly, the idea will face backlash from this population. This idea will also likely face political criticism, as taxing the wealthiest population of citizens is a point of contention in politics.[142] For example, it may be argued that this population is unfairly bearing a larger burden of paying for the development of sustainable aviation fuels alone, when it should be borne equally by all. On the other hand, it may be argued that this population should be paying these additional fees because their private jet use is decaying the environment at a much more rapid pace than the average traveler on a per person basis. This is not to mention the argument that this is the class of people most capable of paying for it due to their wealth. This idea, as with the first, is not without its drawbacks, but could still be an effective way to raise funds for the production and distribution of sustainable aviation fuels.

[142] Dani Di Placido*, The Controversy Over AOC's 'Tax The Rich' Dress, Explained*, FORBES (Sept. 15, 2021, 3:50 PM), https://www.forbes.com/sites/danidiplacido/2021/09/15/the-controversy-over-aocs-tax-the-rich-dress-explained (exemplifying the controversial and politically driven ideology regarding taxing the rich, as seen by Alexandria Ocasio-Cortez making a statement on the matter in her Met Gala, formally called the Costume Institute Gala, gown).

iii. Enact More Stringent Regulations on Private Jet Usage and Impose Additional Fee When Regulations are not Followed

The last potential fee or tax-based solution involves imposing an additional fee or tax on the charter of private jets for personal use that travels under a specified distance or with less than a specified number of passengers. This solution would require Congress to enact more stringent regulations concerning the minimum mile and passenger requirements for private jet use, especially for purely personal or pleasure trips. The proposed regulations do not have to be a complete ban on private flights for twelve minutes with two passengers, for example, like Kylie Jenner's trip.[143] However, it could require that trips like Jenner's, which carry few passengers over short distances, be taxed as a penalty for not following the regulation's guidelines. This penalty tax would act as a deterrent for celebrities to take frivolous trips with few passengers, in the hopes that they would instead opt for an alternative method of transportation that has less of an impact on the environment.

The primary concern with this proposed solution would come with governance. Questions that would arise concerning the implementation of this solution would include: What is to stop celebrities from lying about how many people were on board? How would the government know how many people were actually on a flight? What are the appropriate minimum requirements for the number of passengers and miles traveled? This solution may be the most challenging to implement, however, it could be the most efficient solution for reducing the number of private jets that take flight each day.

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[143] *See supra* texts accompanying notes 6–10.

B. Other Potential Solutions

i. Complete Ban on Short-Haul Flights

A more drastic potential solution would be a complete ban on all short-haul flights. While this idea may sound infeasible, it is actually being implemented in other parts of the world.[144] As of April 2022, the French government has done just that.[145] It became the first large economy in the world to ban short-haul flights altogether for the purpose of environmental protection.[146] This ban extends to any flight where a train or bus alternative of two and a half hours or less exists.[147] A flight that alternatively could be accomplished through a two hour train ride produces six times higher emissions for each passenger than if that journey was made by train.[148] The new rule is projected to eliminate twelve percent of all French domestic flights, which were largely rated as unnecessary by French air travelers.[149] The potential environmental impact of such a ban is evident. Accordingly, the United States could impose a similar ban to achieve similar results.

The central issue regarding this proposed solution is the lack of alternative methods of transportation in the United States, as compared to France. Europe's high speed train transportation system is vast, speedy, and expansive.[150] However, a

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[144] Alex Ledsom, *France Travel: Many Short-Haul Flights Outlawed From April*, FORBES (Apr. 03, 2022), https://www.forbes.com/sites/alexledsom/2022/04/03/france-travel-many-short-haul-flights-outlawed-from-april.
[145] *Id.*
[146] Leo Murray, *France's Ban on Short Flights Should be a Wake-Up Call for Britain*, THE GUARDIAN (Apr, 13, 2021, 10:37 EDT), https://www.theguardian.com/commentisfree/2021/apr/13/france-ban-short-domestic-flights-britain-air-travel.
[147] *Id.*
[148] *Id.*
[149] *Id.*
[150] Chelsea Graham, *Why Doesn't The US Have High Speed Rail?*, Sustainable America (Jan. 12, 2023), https://sustainableamerica.org/blog/why-doesnt-the-us-have-high-speed-rail/.

similar system does not exist in the United States.[151] A similar ban in the United States would have to focus instead on methods of transportation including bus and car. This would likely decrease the number of eligible short-haul flights that could be accomplished via other methods of transportation in similar or less time, as driving or bussing generally takes more time than the European high-speed trains. Additionally, this proposed solution would not only target celebrity private jet use, but also all commercial flights that are under a certain time. It is possible that a similar ban in the United States could be more restrictive and only ban private jet flights under a certain time. If done in this capacity, a complete ban would be the only effective method to eliminate Kylie Jenner style private jet flights altogether.

ii. Incentivize the Use of Hybrid-Electric Private Jets

Hybrid-electric cars have significantly grown in popularity in response to the climate crisis.[152] It seems to be that hybrid-electric planes are also on the horizon for the same reason, largely thanks to the aviation company Ampaire.[153] In 2019, Ampaire began testing and flying the first hybrid-electric planes.[154] These planes, whose combustion engines were replaced with a hybrid system, use both electricity and fuel for power.[155] Ampaire's CEO and co-founder explained that these flights measure over a thirty percent reduction in fuel compared to a traditional engine.[156]

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[151] *Id.*
[152] Carolyn Gramling, *How Electric Vehicles Offered Hope as Climate Challenges Grew*, SCIENCENEWS (Dec. 22, 2021 7:00 AM), https://www.sciencenews.org/article/electric-vehicles-cars-climate-change-challenges-2021.
[153] Sarah Pilla, *Ampaire hopes to revolutionize the skies with hybrid-electric airplanes*, SPECTRUM NEWS 1 (Feb. 28, 2022 9:10 AM), https://spectrumnews1.com/ca/la-west/transportation/2022/02/28/ampaire-is-revolutionizing-the-skies-with-hybrid-electric-airplanes.
[154] *Id.*
[155] *Id.*
[156] *Id.*

He also explains that the same core technology can be scaled to planes with up to 100 passenger seats.[157] The International Civil Aviation Organization also acknowledges the trend towards electrification across the aviation industry.[158] A heightened focus should be placed on the use of hybrid-electric aircraft for private jet use, as it could significantly reduce the carbon emissions from celebrities. In California, the Air Resources Board is offering rebates for the purchase or lease of all-electric or hybrid electric vehicles.[159] Another California initiative offers grants for the purchase of zero-emission busses to replace gas or diesel buses.[160] The FAA could implement a similar incentive program for the purchase or charter of hybrid-electric private jets.

The major hindrance of the use of hybrid planes would be the costs associated with them. Like hybrid cars, hybrid planes would likely be more costly to purchase, charter, and fly. However, should a celebrity have the option to purchase a gas-powered or electric-powered private jet, an incentive program such as the one proposed would make the price of an eco-friendlier option more comparable and attractive. This potential solution would support the 2050 zero-emissions goal; however, it would take longer to implement, as hybrid planes are a more recent technological development and are not commonly used at this point.

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[157] *Id.*
[158] *Electric and Hybrid Aircraft Platform for Innovation* (E-HAPI), ICAO, https://www.icao.int/environmental-protection/Pages/electric-aircraft.aspx.
[159] *California Laws and Incentives*, U.S. DEPARTMENT OF ENERGY – ENERGY EFFICIENCY AND RENEWABLE ENERGY ALTERNATIVE FUELS DATA CENTER (last visited Apr. 10, 2023)
[160] *Id.*

VI. CONCLUSION

The negative impact on the environment due to celebrities' private jet use is evident and in urgent need of change. While the environmental challenges plaguing the planet are not newly developed, the rate at which further damage is occurring is beginning to alarm the public in new ways. This is especially evident in the era of social media and the increasing infatuation with celebrities. Now more than ever before, people are noticing that celebrities, who make up such a small percentage of the population, are having the largest negative impact on the environment. The decision to travel via private jet not only impacts the individual celebrity's health and well-being, but also equally affects the health and well-being of every person on the planet.

The United States government is beginning to take strides to stall aviation emissions' detrimental effect on the planet. However, to achieve net-zero aviation emissions by 2050, and more generally, an environmentally healthy future, the United States Government needs to do more to combat this problem. There are a variety of tax and fee-based solutions to fund the 2021 United States Aviation Climate Action Plan, such as raising the current excise tax on commercial fuel, charging an additional fee on the purchase or charter of a private jet, or imposing additional fees on the charter of flights which travel minimal distances or with few passengers. Other solutions to reduce private jet emissions altogether may include a complete ban on short-haul flights or the implementation of an incentive program for the use of hybrid-electric jets over gas powered private planes. All these proposed

solutions would help prevent the climate crisis from soaring to new heights, which is essential to the wellbeing of our planet.

A BLAST FROM THE PFAST: FOREVER CHEMICALS COMING BACK TO HAUNT US AND HOW INTERNATIONAL REGULATORY SCHEMES CAN SUPPLEMENT UNITED STATES LAW

Mackenzie Pensyl[1]

I. INTRODUCTION

In 2019, Mark Ruffalo starred as Robert Bilott in the film Dark Waters.[2] Dark Waters follows an Ohio attorney as he uncovers severe pollution and pursues a suit against a major chemical company, DuPont.[3] The film is based on the real events and life of Robert Bilott, who investigated and built a case for residents of Parkersburg, West Virginia against DuPont for dumping toxic waste into the town landfill, thereby contaminating the drinking water.[4] DuPont's waste subjected the people of Parkersburg to exposure and consumption of carcinogenic chemicals. Through Bilott's work, thousands of residents were able to get payouts from DuPont for medical ailments.[5] Though this film is a drama, the story is far from fiction. It is the real story of the impact of per- and poly-fluoroalkyl substances (PFAS), and it is not limited to Parkersburg. This PFAS story is one that stretches internationally to nearly every country.

PFAS is a general name for a family of thousands of "forever chemicals."[6] They are lingering man-made carcinogenic chemicals that are used in many everyday

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[1] Mackenzie is a candidate for J.D., May 2023, The University of Akron School of Law. B.S. in Biology and Psychology, Minor in Legal Studies, 2020, The University of Mount Union.
[2] Alejandro De La Garza, *Dark Waters Tells the True Story of the Lawyer Who Took DuPont to Court and Won. But Rob Bilott's Fight is Far From Over,* TIME MAGAZINE (Nov. 25, 2019), https://time.com/5737451/dark-waters-true-story-rob-bilott/ [https://perma.cc/8FBC-9HYK].
[3] *Id.*
[4] *Id.*
[5] *Id.*
[6] U.S. ENV'T PROT. AGENCY, *PFAS Explained,* EPA.GOV, https://www.epa.gov/pfas/pfas-explained (last updated Oct. 18, 2021) [https://perma.cc/HK2H-GV8W] (explaining the EPA's understanding of PFAS).

items.[7] Products ranging from non-stick pans to food packaging contain PFAS.[8] Virtually everyone on Earth has been exposed to some sort of PFAS contamination. Yet, there is currently no comprehensive federal regulation for PFAS in the United States.

PFAS contamination is one of the largest threats to the environment and human health right now. However, many Americans are not even aware of the problems PFAS pose. The Environmental Protection Agency (EPA) has not yet regulated these chemicals, but it recommends that safe drinking water contain levels of PFAS of less than 70 parts per trillion.[9] Many adults and children surrounding large disposal sites are subjected to increased exposure to these dangerous chemicals.[10] The average American has already been exposed to PFAS in such large quantities that the chemicals are present in the majority of people's blood. Currently, the average person living in the United States likely has around 9.7 parts per billion PFAS in his or her own blood.[11] Statistics for individuals closer to PFAS sources can also be staggering.[12]

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[7] *Id.*
[8] *Id.*
[9] Erin E. O'Brien, *Reform Needs to Happen Pfast: The Importance of Federal Per- and Polyfluoroalkyl Substance Regulation*, 123 W. VA. L. REV. 233, 234 (2020).
[10] Garret Ellison, *3M, Wolverine settle pollution lawsuit with Michigan family*, MLIVE (Feb. 21, 2020), https://www.mlive.com/news/ann-arbor/2020/02/3m-wolverine-settle-pollution-lawsuit-with-michigan-family.html. [https://perma.cc/GK7A-J56B].
[11] Rebecca Russel, *PFAS levels in Belmont boy's blood 50 times higher than national average*, FOX17 W. MI. (Jan. 10, 2018), https://www.fox17online.com/2018/01/10/pfas-levels-in-belmont-boys-blood-50-times-higher-than-national-average/.
[12] *Id.* (explaining a Michigan boy's blood contained 484 parts per billion PFAS in his bloodstream compared to the average around 9.7 parts per billion).

Families living in and around manufacturers using PFAS have found alarming amounts of forever chemicals in their blood. In 2018, a Michigan family, the McNaughtons, endured a nightmare after discovering their water supply was contaminated with PFAS from a nearby 3M distribution site.[13] But the real shock came when they discovered their twenty-month-old son's blood contained around 484 parts per billion of PFAS.[14] The McNaughton family realized too late that its water source was contaminated. They became the lead plaintiffs in a suit against 3M and another manufacturer for the contamination of the drinking water.[15] In February of 2020, the McNaughton family settled out of court with 3M for an unspecified amount.[16] Their son is now two years old, and the parents note that he is still experiencing immune-system issues and abnormal health problems.[17] The McNaughton family's story is concerning. And, to add insult to injury, the United States still lacks comprehensive legislation to deal with PFAS.

Currently, proposed legislation titled the PFAS Action Act is making its way through Congress.[18] However, this proposed Act will not do enough to fix the problems the world is facing with these forever chemicals. PFAS are not under any official regulation by the Environmental Protection Agency ("EPA"). These chemicals contribute to widespread environmental and health issues resulting from their

[13] *Id.*
[14] *Id.*
[15] *Id.*
[16] Ellison, *supra* note 10.
[17] Russel, *supra* note 11.
[18] H.R. 2467, 117th Cong. (2021).

release into drinking and ground water.[19] PFAS are gaining attention from the public as the resulting health effects become more prevalent in the media.

The EPA started to make progress in regulating PFAS under several major pieces of regulation.[20] Unfortunately, the attempts to regulate are underinclusive and unenforced. They do not include all chemicals in the PFAS family.[21] They also fail to hold companies accountable for their contributions to pollution.[22] The options that are currently available are not enough to protect people and the environment from PFAS contamination.

Other countries have proposed differing solutions to deal with and regulate these forever chemicals and emerging contaminants. European countries have come up with a variety of solutions that would be advantageous supplements to the regulations the United States already has in place.[23] Adding these ideas to the current legislative plan for combatting PFAS would be more effective in preventing further contamination. PFAS contamination cannot be stopped by the current legislation making its way through Congress or the proposed regulations by the EPA; the answer to the PFAS problem lies in approaches borrowed from other countries

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[19] U.S. ENV'T PROT. AGENCY, *supra* note 6.

[20] U.S. ENV'T PROT. AGENCY, *PFAS Strategic Roadmap; EPA's Commitments to Action 2021-2024,* EPA.GOV (Oct., 2021), https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf [https://perma.cc/6S22-VDYJ] (describing the EPA's plan to address PFAS contamination regulation in the upcoming years).

[2121] *Id.*

[22] U.S. ENV'T PROT. AGENCY, *supra* note 6; *see* background *infra* Section II.B.1 (discussing the downfalls of the current proposed and in place legislation dealing with PFAS).

[23] John Gardella, *Cos. Should Prepare Now For European PFAS Regs*, LAW360 (July 16, 2020), https://law360.com/ (search "Cos. Should Prepare Now For European PFAS Regs" from search bar; then follow hyperlink) (explaining the steps taken by European countries to address forever chemical contamination).

and international organizations to create a more aggressive and expansive regulatory scheme.

This note details proposals for supplementing current United States legislation to be more effective in regulating forever chemicals like PFAS. The first section of this paper will provide an overview of PFAS and the problematic attempts at regulation so far. The next section analyzes the current PFAS Action Act and its faults. Finally, the third section proposes multiple ideas and models gleaned from other nations for improving the current regulatory plan to create a better comprehensive approach to PFAS legislation. In examining the current United States approaches with the strategies taken by other nations, the goal is to find a way to use the strengths of the other proposals to complement the current United States plan.

II. BACKGROUND

A. PFAS; What are they and why do they matter?

PFAS are per-polyfluoroalkyl substances, a group of synthetic man-made chemicals used in many production and manufacturing industries.[24] PFAS are made up of organic compounds including a distinguishable feature of fluorinated carbon chains.[25] They are a family of thousands of different chemicals with similar chemical structures.[26] The most commonly used chemicals in the PFAS family are per-fluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). These two chemicals are the most prevalent in contamination reports, though the entire PFAS

[24] U.S. ENV'T PROT. AGENCY, *supra* note 6.
[25] Amila O. De Silva, et. al., *PFAS Exposure Pathways for Humans and Wildlife: A Synthesis of Current Knowledge and Key Gaps in Understanding,* 40 ENV'T. TOX. & CHEM. 631, 632 (2021).
[26] O'Brien, *supra* note 9, at 234.

family is potentially harmful.[27] The chemical characteristics of PFAS are what contribute to their disastrous effect on both humans and the environment. They are known as forever chemicals due to their extremely long half-life and bioaccumulation properties.[28] Chemicals that bioaccumulate will build in concentration as they remain in a living organism or soil.[29] Due to their chemical composition, PFAS are highly resistant to biodegradation and extreme environmental factors.[30] This means that they can be incredibly difficult to break down and remain in the environment indefinitely. These chemicals are also easily absorbed into the soil or waterways in the areas where they are discharged.[31]

The chemical makeup of PFAS is what makes them desirable for manufacturing consumer products. Major companies like DuPont, 3M, and GORE-TEX have utilized PFAS for decades in manufacturing their widely used non-stick and water resistant products.[32] These forever chemicals have water-repelling, non-stick, and preservation properties that companies utilize in day-to-day processing and production.[33] PFAS are commonly found in cleaning products, non-stick pans, waterproof or repellant fabrics, clothing, firefighting foams, plastic packaging, and insulation.[34] The ease and convenience of products containing PFAS allowed them to

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[27] U.S. ENV'T PROT. AGENCY, *supra* note 6.
[28] *Id.*
[29] Hannah Levine, *Zombie Chemicals-Learning from Our Past to Prevent Haunting in the Future: Why the EPA Should Regulate Pfas Chemical Compounds*, 21 VT. J. ENV'T. L. 177, 184 (2019).
[30] O'Brien, *supra* note 9, at 234.
[31] Levine, *supra* note 29, at 183.
[32] *Id.* at 182.
[33] Noel M. Johnson, *Me-Fas, You-Fas, We All Eat Pfas: What to Do About the Forever Chemical*, 21 U. PITT. J. TECH. L. POL'Y 134, 136 (2021).
[34] U.S. ENV'T PROT. AGENCY, *supra* note 6.

quickly make their way into nearly every American household. The widespread use of and demand for PFAS products has led to the prevalence of PFAS contamination in the United States.

PFAS are distributed into the environment through products, exposure, and consumption.[35] The most prevalent PFAS in the environment, PFOA and PFOS, come into contact with consumers in different ways. PFOA exposure typically results from contact with products containing fluoropolymer properties, that is water repellant or resistant properties.[36] PFOS exposure usually results from contact with packaging on food or clothing items containing PFAS.[37] In general, PFAS tend to enter the environment through waterways and soil absorption.[38] Food packaging containing PFAS will end up in landfills, and the soil can absorb the chemicals.[39] The EPA listed common sources of PFAS contamination and exposure as drinking water, soil near manufacturing waste sites, fire-extinguishing foam, manufacturing waste and materials, food and food packaging, household products, personal care products, and biosolids like fertilizer.[40] Most Americans have been exposed to PFAS contamination through their use or consumption of consumer products.[41] Fifteen million Americans are exposed to PFAS from their tap water.[42] This fact is more alarming considering

[35] U.S. ENV'T PROT. AGENCY, *Our Current Understanding of the Human Health and Environmental Risks of PFAS,* EPA.GOV, https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas (last updated Dec. 20, 2021) [https://perma.cc/67P8-X8DP].
[36] De Silva et al., *supra* note 25, at 633.
[37] *Id.*
[38] Levine, *supra* note 29, at 183.
[39] *Id.*
[40] U.S. ENV'T PROT. AGENCY, *supra* note 35.
[41] *Id.*
[42] Levine, *supra* note 29, at 183.

that research shows the detrimental effects PFAS can have on people and their surroundings.

PFAS can have adverse effects on human health and the environment. PFAS' chemical composition makes them a forever chemical.[43] One common characteristic of forever chemicals is that they remain in the environment almost indefinitely.[44] Even more startling, forever chemicals like PFAS bioaccumulate once they are in the environment.[45] These properties result in the adverse health effects on humans. The EPA's research on human health effects provides a disturbing overview of potential damage from PFAS exposure.[46] PFAS have been shown to cause issues with the reproductive system, development, and the immune system.[47] Research has found that PFAS are linked to various cancers, specifically kidney and testicular cancer.[48] PFAS exposure during pregnancy can have disastrous consequences including birth defects, learning disabilities, miscarriages, and fertility issues.[49] Additionally, exposure to PFAS can potentially render vaccines ineffective.[50] The current pandemic has amplified this concern of PFAS exposure on human health due to the increasing importance of vaccines in society.[51]

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[43] U.S. ENV'T PROT. AGENCY, *supra* note 35.
[44] Levine, *supra* note 29, at 180.
[45] O'Brien, *supra* note 9, at 236.
[46] U.S. ENV'T PROT. AGENCY, *supra* note 35.
[47] *Id.*
[48] Carly Johnson, *How the Safe Drinking Water Act & the Comprehensive Environmental Response, Compensation, and Liability Act Fail Emerging Contaminants: A Per- and Polyfluoroalkyl Substances (Pfas) Case Study*, 42 Mitchell Hamline L.J. PUB. POL'Y & PRAC. 91, 93 (2020).
[49] *Id.* at 100.
[50] *Id.*
[51] Mark P. Nevitt and Robert V. Percival, *Can Environmental Law Solve the "Forever Chemical" Problem?*, 57 WAKE FOREST L. REV. 1, 9 (2021).

The survival of the ecosystems where PFAS are concentrated is also at risk.[52] Animal exposure to PFAS causes similar effects to those seen in humans; mostly affecting the reproductive and immune systems.[53] Plants and vegetation uptake PFAS from groundwater and soil. At that point, the plants are contaminated and any organism using them as a food source will also be contaminated.[54] Plant death and visible abnormalities in vegetation are also common in areas of PFAS groundwater concentration.[55] Additionally, due to the presence of PFAS in some fertilizer, there is a growing concern that crops will be negatively affected.[56]

The prevalence of PFAS in both humans and the ecosystem led to a recent push for action from regulatory agencies like the EPA. Due to the severity of PFAS contamination, the federal government needs to create stronger regulations to curb contamination and prevent further exposure.

B. Previous attempts to regulate PFAS.

Domestically, the federal government tried multiple strategies to address and limit PFAS contamination in the United States. One of the earliest attempts was a voluntary program known as the PFAS Stewardship Program.[57] This program provided an option for major manufacturers and producers of PFAS products to gradually reduce PFAS use, specifically limiting PFOA use.[58] The program was

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[52] Leticia M. Diaz & Margaret R. Stewart*, "Forever Chemicals": Forever Altering the Legal Landscape*, 7 BELMONT L. REV. 308, 323 (2020).
[53] Johnson, *supra* note 48, at 100.
[54] *Id.*
[55] *Id*. at 101.
[56] *Id*. at 100.
[57] O'Brien, *supra* note 9, at 244.
[58] U.S. ENV'T PROT. AGENCY, *Fact Sheet: 2010/2015 PFOA Stewardship Program,* EPA.GOV, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program (last updated Mar. 4, 2021) [https://perma.cc/XN8Y-L8B2].

implemented by the EPA and had goals of reducing PFAS waste and ultimately stopping use of PFAS by 2015.[59] The program successfully led to a reduction of PFOA used in manufacturing processes.[60] Yet, the program's time period ended and there is no enforcement or incentive to continue the practices that were implemented during the program.[61]

Because PFAS exposure commonly occurs through drinking water, the federal government also attempted to control the PFAS problem under the Safe Drinking Water Act (SDWA).[62] Pursuant to this statutory directive, the EPA issued a health advisory for PFAS chemicals under the SDWA.[63] This health advisory proposed a limit of PFAS present in the drinking water supply before there is a serious risk of adverse health problems.[64] However, this health advisory is an unenforceable limit on PFAS use and serves only as an informative suggestion to manufacturers and producers.[65] Under the SDWA, the EPA has also made progress in issuing a National Primary Drinking Water Regulation (NPDWR).[66] This regulation, if passed, will make those health advisories enforceable. It would enable the EPA to create and enforce maximum contaminant levels for amounts of PFAS in drinking water.[67] This

[59] O'Brien, *supra* note 9, at 245.
[60] U.S. ENV'T PROT. AGENCY, *supra* note 58.
[61] *Id.*
[62] U.S. ENV'T PROT. AGENCY, *EPA Actions to Address PFAS,* U.S. EPA, https://www.epa.gov/pfas/epa-actions-address-pfas (Last updated Jan. 21, 2022) [https://perma.cc/4KY4-MHHB].
[63] U.S. ENV'T PROT. AGENCY, *Drinking Water Health Advisories for PFOA and PFOS: Health Advisories,* U.S. EPA, https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos [https://perma.cc/MM29-D759].
[64] Levine, *supra* note 29, at 181.
[65] *Id.*
[66] U.S. ENV'T PROT. AGENCY, *supra* note 9.
[67] *Id.*

remains one of the most promising ways the EPA is attempting to diminish PFAS use. However, the NPDWR would focus only on PFOA and PFOS.

Another important step being taken is the drafting of the PFAS Action Act (the "Act").[68] This Act is currently pending in the Senate after being passed as a bill in the House of Representatives.[69] This is the most recent piece of legislation aimed at preventing further PFAS contamination. It proposes a number of improvements to the current regulatory scheme in the United States. The first proposal under the Act is the designation of PFOA and PFOS as hazardous chemicals under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) within one year of the Act's passage.[70] It would also force the EPA to determine whether the other PFAS should be designated under CERCLA within five years.[71] This designation would allow easier enforcement of PFAS regulations and monitoring of manufacturers responsible for the release of PFOA and PFOS into the environment. The Act also proposes altered testing requirements, including required testing. In short, any PFAS chemicals found in the environment would be required to undergo toxicity testing to determine any potential risks.[72]

Additionally, the Act would establish manufacturing and processing notices under the Substances Control Act. Distributors of products containing PFAS would have to place warnings of the health risks of PFAS on their products.[73] As mentioned

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[68] H.R. 2467, 117th Cong. (2021).
[69] *H.R. 2467-PFAS Action Act of 2021*, CONGRESS.GOV (2021), https://www.congress.gov/bill/117th-congress/house-bill/2467 [https://perma.cc/K4UB-NFKB] (last visited Jan. 25, 2022).
[70] H.R. 2467.
[71] *Id.*
[72] *Id.*
[73] *Id.*

above, the EPA would also issue a National Primary Drinking Water Regulation under the SDWA.[74] The proposed regulation would provide standards of use for PFOA and PFOS and allow agencies to closely monitor manufacturers to ensure compliance.[75] The Act would list PFAS as hazardous air pollutants and allocate funding for grants to clean up PFAS contamination sites.[76] The PFAS Action Act has been sent to a committee in the Senate where it awaits a decision.[77]

In October of 2021, the EPA released a new PFAS Roadmap listing the goals for regulations and monitoring of PFAS in the next few years.[78] The new EPA approach has placed an emphasis on some major areas of PFAS regulation. The first area of concern under the 2021 PFAS Roadmap is addressing not only reclamation efforts, but also reducing circulation of PFAS products in commerce in the United States.[79] Another area the PFAS Roadmap focuses on is preventing PFAS and other forever chemicals from getting into the environment altogether. The EPA plans to limit the disposal methods and cleanup sites that are causing major contamination of the environment.[80] The EPA also wants to encourage holding manufacturers accountable for PFAS pollution..The point is to put pressure on major companies to clean up contamination that they are responsible for.[81] Additionally, the PFAS

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[74] *Id.*
[75] *Id.*
[76] H.R. 2467.
[77] *Id.*; PFAS Action Act of 2021, https://www.congress.gov/bill/117th-congress/house-bill/2467/text (last visited Mar. 20, 2022) [https://perma.cc/66Q3-M2WN] (describing the current progress of the PFAS Action Act through the legislative process).
[78] U.S. ENV'T PROT. AGENCY, *supra* note 20.
[79] *Id.*
[80] *Id.*
[81] *Id.*

Roadmap shifts attention to research-based decision-making as a result of funding new research programs and scientific developments.[82] The goal of the new research is to make informed regulations that will decrease the adverse effects of pollution on the community. Finally, the PFAS Roadmap places an emphasis on providing equal protections for those lower-income and disadvantaged communities who are the most vulnerable to pollution effects and risks.[83]

In November of 2022, the EPA issued a progress report on the 2021 PFAS Roadmap.[84] In this progress report, the EPA highlighted some key accomplishments following the October 2021 PFAS Roadmap. To start, the EPA issued its first testing order including PFAS under the goal of directing research toward emerging chemicals.[85] Also, the EPA is involved in implementing Executive Order 14057 to help prioritize federal spending on products that do not contain PFAS.[86] Additionally, in December of 2021, the EPA finalized an Unregulated Contaminant Monitoring Rule requiring testing for almost thirty PFAS in drinking water.[87] The EPA has also recommended water quality criteria for PFOA and PFOS as of April of 2022.[88] The criteria is meant to protect aquatic life by preventing PFAS from entering into the environment.[89] The EPA also announced that it has made progress in its plans to

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[82] *Id.*
[83] *Id.*
[84] U.S. ENV'T PROT. AGENCY, *EPA's PFAS Strategic Roadmap: A Year of Progress,* EPA.GOV (Nov., 2022), https://www.epa.gov/system/files/documents/2022-11/PFAS%20Roadmap%20Progress%20Report_final_Nov%2017.pdf [https://perma.cc/66NS-J845] (describing the EPA's progress on the October 2021 roadmap).
[85] *Id.*
[86] *Id.*
[87] *Id.*
[88] *Id.*
[89] *Id.*

create more regulations and hold large manufacturers accountable for their contributions.

Additionally, the progress report stated that President Biden has provided over fifty million dollars in funding for the EPA to invest in drinking water and wastewater infrastructure through the Bipartisal Infrastructure Law (BIL).[90] The EPA announced that it can use this funding for grants and programs to address emerging contaminants like PFAS.[91]

C. International methods for PFAS elimination and cleanup.

The United States is not the only country working to remove PFAS from its products and market. One of the most notable international organizations moving to make changes in their regulation of PFAS is the European Union ("EU").[92] The EU is attempting to control PFAS contamination through the Registration, Evaluation, Authorization, and Restriction of Chemicals ("REACH") program.[93] Under REACH, responsibility for cleanup efforts and funding reclamation projects will shift from the government to the organizations that caused contamination of the site.[94] REACH also placed restrictions on products being sold to the EU containing PFAS.[95] Some PFAS were listed under REACH as Substances of Very High Concern ("SVHC").[96] This designation is similar to the above-mentioned CERCLA designation, but harsher because it lists those chemicals that are considered to be carcinogens. Also, REACH

[90] U.S. ENV'T PROT. AGENCY, *supra* note 84.
[91] *Id.*
[92] Gardella, *supra* note 23.
[93] *Id.*
[94] *Id.*
[95] *Id.*
[96] *Id.*

is starting to regulate newly emerging PFAS, known as GenX chemicals. Companies have increased use of these chemicals to try to find a way around PFAS regulation.[97] These restrictions have generally limited PFAS products to those which are of essential use.[98] Later, this note will explain essential use both as a method and a phrase.

The EU, like the United States, has regulatory bodies in place that create and control drinking water legislation and standards.[99] Currently, there are proposals to limit the accepted amount of PFAS in drinking water to 0.5 micrograms per liter.[100] This is a regulation for the entire PFAS family and not just those commonly found in the water supply.[101] The regulation allows the EU to monitor drinking water exposure and gives the government a basis of enforcement to punish those who violate the regulation standards.

Additionally, there are other international organizations working together to reduce the production of PFAS products. The Stockholm Convention (the "Convention") is a global treaty formed to protect human health from exposure to forever chemicals and to remove them from the environment.[102] The Convention created a list known as Annex A.[103] Annex A contains chemicals that members of the

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[97] *Id.*
[98] Kathleen Garnett and Geert Van Calster, *The Concept of Essential Use: A Novel Approach to Regulating Chemicals in the European Union*, 10:1 TRANSNAT'L ENV'T L. 159, 163 (2021).
[99] Gardella, *supra* note 23.
[100] *Id.*
[101] *Id.*
[102] *The Convention: Overview*, STOCKHOLM CONVENTION (2019), http://www.pops.int/TheConvention/Overview/tabid/3351/Default.aspx [https://perma.cc/7NHC-C4P9].
[103] *Id.*

Convention are encouraged not to use in their manufacturing. Currently, Annex A lists PFOA as an encouraged prohibited chemical.[104]

Some nations, like Denmark, have taken efforts to prevent further PFAS damage.[105] They have initiated a complete ban of PFAS in any of their products that come into contact with food to try and limit exposure.[106] The problem with these new chemicals is they have the potential to be just as harmful and there is less research on their use.[107] They are known as GenX chemicals and pose a serious risk of creating a whole new class of carcinogenic and dangerous forever chemicals because of the movement away from PFAS use.[108] When regulations of PFAS are imposed and enforced, companies will look for alternatives to meet the demand for their products. This will ultimately result in GenX chemicals replacing PFAS, unless preventative action is taken.

Both at home and internationally, governments are moving toward decreased use of PFAS in manufacturing and production. Combining aggressive global strategies to eliminate PFAS with the United States' current regulations, the federal government has an opportunity to effectively combat forever chemicals.

III. THE CURRENT PROPOSED LEGISLATION AND REGULATIONS ARE NOT ENOUGH

The proposed regulations in the United States fall short of offering a sufficient solution to this environmental problem. The legislation moving through Congress will

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[104] *Id.*
[105] Gardella, *supra* note 23.
[106] *Id.*
[107] *Id.*
[108] Diaz, *supra* note 52, at 309.

do little to prohibit further introduction: simply put, the current legislative response is not proportional to the problems these forever chemicals pose. Other developed nations, though, continue to make progress in preventing further PFAS damage. The United States must amend its current plan for PFAS to include the entirety of the PFAS family in more aggressive regulations borrowed from other nations to address a problem of this magnitude.

A. PFAS Action Act proposes a minor solution to a major problem.

The PFAS Action Act currently sent to committee in the Senate will not be enough to slow the present pace of PFAS contamination. There are various shortcomings with the proposed legislation. Fixing a crisis the size of PFAS contamination requires more than a band-aid solution that ignores the root of the problem.

i. The PFAS Action Act only includes well-known PFAS.

One of the biggest problems with the PFAS Action Act is its focus on PFOA and PFOS.[109] PFOA and PFOS are major contributors to environmental contamination, but they are not the only threat.[110] In reality, those are just two of the thousands of chemicals that make up the PFAS family.[111] Due to the size of the PFAS family, consisting of nearly 5,000 chemicals, a substance-by-substance approach to regulation is impractical.[112]

A proposed solution in the Act is the designation of PFOA and PFOS as hazardous substances under CERCLA.[113] The Act also gives the EPA five years to decide

[109] H.R. 2467.
[110] U.S. ENV'T PROT. AGENCY, *supra* note 6.
[111] *Id.*
[112] Garnett and Van Calster, *supra* note 98, at 163.
[113] H.R. 2467.

whether to designate the remainder of the PFAS family.[114] Additionally, the PFAS Action Act proposes a NPDWR for PFOA and PFOS that must be imposed within two years of the Act's passage.[115] Like the CERCLA designation, it would be more effective to include all PFAS in the proposed regulation instead of limiting restrictions to just PFOA and PFOS. Initially, the CERCLA designation and NPDWR proposal seem like steps in the right direction. Sadly, however, those steps are to the side, not forward. The Act is centered on designating well-researched chemicals as opposed to the entire group. The problem is that this method will only make it more difficult for regulation to keep up with contamination caused by similar substances as PFOA and PFOS are replaced in manufacturing.[116]

As a solution, the Act should start by listing all PFAS as hazardous substances. Designating PFAS as a category would prevent inevitable substitutes for PFOA and PFOS from escaping the restrictions implemented in the proposed legislation. Including all PFAS in the Act prevents having to continuously push legislation as science changes and identifies additional dangerous members of the PFAS family. Many of the PFAS chemicals have not been well researched or tested yet.[117] If the EPA continues with its current chemical-by-chemical approach to regulation, it will likely have to propose new regulations every time a new chemical is discovered or utilized in manufacturing. This will be both expensive and time-consuming. It may be easier in the short term to regulate a little at a time to get the legislation to pass.

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[114] *Id.*
[115] *Id.*
[116] Johnson, *supra* note 33, at 139.
[117] *Id.*

However, the lack of comprehensive regulation will fail to protect the people and environment as needed. It is not practical to regulate in a chemical-by-chemical fashion until thousands of chemicals are researched.[118] Forever chemicals should be presumed hazardous until it can be shown otherwise.

A major concern in designating the entire PFAS family is that it will be too big of a shock for the manufacturing and production industries to absorb.[119] The towns that have grown around these large factories rely on their economic activity and job opportunities to sustain their community.[120] While economic growth and maintenance are important, the health and safety of the community should take priority. Taking out one or two chemicals at a time from the economy will only further delay the progression of economic cleanup. There are alternatives available to the industries that rely on PFAS; they just come at a cost.[121] But the benefits of those alternatives are healthy citizens and a clean environment. This would lead to short-term consequences for the current market, but long-term benefits of a sustainable manufacturing process and healthy communities.

The effect on manufacturing will undoubtedly be significant. But the fact is that without significant impact, no effective change can be made. This is not a problem of prevention of future environmental damage. The PFAS problem is here, and there is no longer an opportunity for prevention. By designating all PFAS as hazardous

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[118] *Id.*
[119] Lydia Gonzalez Gromatzky, CONGRESS PRESSES FORWARD ON PFAS MEASURES, 26 WESTLAW J. ASBESTOS 10, 48 (2021).
[120] *Id.*
[121] *Id.*

chemicals under CERCLA, the legislature could begin to require sustainable alternatives to prevent even more environmental damage.

ii. *The PFAS Action Act will be difficult to enforce without strict liability.*

The CERCLA designation of PFOA and PFOS would subject major companies to strict liability for their role in community contamination.[122] Yet, most of the PFAS family are not included.[123] As a result, the Act fails to hold manufacturers strictly liable for the release of PFAS chemicals that are not PFOA and PFOS. CERCLA allows courts to hold major contaminators strictly liable for any damage done to the environment and for cleanup and restoration costs.[124] Currently, there are suits addressing PFAS cleanup and contamination pending in state courts.[125] However, plaintiffs have had difficulty proving that manufacturers are the source of contamination.[126] It is nearly impossible to trace a specific chemical back to its origin with certainty. Thus, much of the litigation has been unsuccessful in attributing contamination to manufacturers and holding them responsible.[127]

A strict liability provision in PFAS legislation would solve some of the problems plaintiffs are having with source identification. It would hold manufacturers accountable for discharging PFAS waste into the environment.[128] The Clean Water

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[122] Johnson, *supra* note 50, at 142.
[123] H.R. 2467.
[124] Johnson, *supra* note 50, at 142; *see infra* text accompanying note 167.
[125] Lawrence G. Cetrulo, *PFAS Litigation: Introduction*, TOXIC TORTS LITIGATION GUIDE § 48:17 (Dec. 2021) (listing suits against PFAS manufacturers in various states including Colorado, West Virginia, Ohio, North Carolina, and Minnesota).
[126] Lawrence G. Cetrulo, *PFAS Litigation: Causation*, TOXIC TORTS LITIGATION GUIDE §48:20 (Dec. 2021).
[127] *Id.*
[128] Kepten D. Carmichael, *Strict Criminal Liability for Environmental Violations: A Need for Judicial Restraint*, 71 INDIANA L.J. 729, 747 (1996), http://ilj.law.indiana.edu/articles/71/71_3_Carmichael.pdf [https://perma.cc/2BZ2-PSXQ].

Act (the "CWA") can be a model.[129] It has a strict liability provision that applies to anyone who knowingly violates the act.[130] A strict liability provision guarantees manufacturer accountability if it is shown that the company failed to comply with CWA standards.[131]

However, there are potential problems with enforcing strict liability against manufacturers.[132] Strict liability creates a risk of assigning blame to the wrong corporation.[133] There are likely areas where multiple sources are contributing to the contamination in the environment. In these areas, it is possible that the responsibility could be apportioned based on fault.[134] Toxic tort, diethylstilbestrol ("DES"), and asbestos cases can serve as a model for PFAS liability as well.[135] In these cases, market share liability determined the share of fault afforded to each manufacturer in suits brought against them.[136] By implementing a similar system with PFAS contamination, the government could hold manufacturers responsible for the proportion of hazardous chemicals they discharged by attributing liability proportional to the percentage of products they distributed into the market. In short,

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[129] 33 U.S.C § 1251.
[130] Carmichael, *supra* note 128, at 744.
[131] *Id.*
[132] *Id.*
[133] *Id.*
[134] Andrew B. Nace, *Market Share Liability: A Current Assessment of a Decade-Old Doctrine*, 44 VAND. L. REV. 395, 414 (1991), https://scholarship.law.vanderbilt.edu/cgi/viewcontent.cgi?article=2472&context=vlr [https://perma.cc/SY6L-8BL6].
[135] Sindell v. Abbott Lab'y, 607 P.2d 924, 612 (Cal. 1980) (deciding that if causation could not be attributed to one manufacturer, multiple manufacturers of the same chemical could be held accountable relative to the share of the product they produced).
[136] *Id.*

every manufacturer could be responsible for the amount of pollution its processes and products put into the environment.[137]

Placing manufacturers and producers in charge of their own cleanup efforts may also be effective.[138] These projects are time-consuming and expensive. Requiring states to pay a fine for a violation of environmental regulation will be less effective than requiring manufacturers to oversee and fund reclamation projects. The goal would be to prevent future contamination by making companies responsible for their own contamination. Essentially, it would encourage better business practices by providing incentives to clean up the industrial processes that create the waste.

It may be argued that the companies would not act in good faith to remediate PFAS.[139] Of course, it can be hard to imagine that companies would be willing to put their best effort into fixing their own mess. However, the EPA or another agency should oversee these efforts to ensure they align with the goals of contamination clean up. Placing an agency or regulatory body in a supervisory role would help this problem. In failing to sufficiently clean up their waste, the responsible parties would simply be punishing themselves further and increasing their own costs should they choose to not follow regulations.

Currently, the PFAS Action Act proposes regulation enforcement through monetary fines.[140] Fines are a common way the government tries to enforce its laws against large corporations. Small fines do not deter these large companies from using

[137] Nace, *supra* note 134, at 414.
[138] Gardella, *supra* note 23.
[139] Carmichael, *supra* note 128, at 744.
[140] H.R. 2467.

PFAS to make products that generate millions of dollars in profits.[141] PFAS are incredibly profitable chemicals.[142] But forcing manufacturers to fund reclamation efforts would waste both time and money for as long as they choose to violate the regulation.

iii. GenX chemicals are not regulated under the PFAS Action Act.

GenX chemicals are new emerging forever chemicals that are advancing as a replacement for PFAS.[143] These chemicals are on the fast track to becoming the next forever chemical problem for the world if they are left unregulated. The Act contains no protection from these chemicals.[144] The only provision for GenX chemicals states the EPA will investigate "methods and means" to prevent their introduction into the environment.[145] This failure to consider restrictions of GenX chemicals will ultimately render any regulation ineffective as a new class of forever chemicals emerges and replaces PFAS.[146]

PFAS regulation needs to include restrictions on GenX substances. Ignoring GenX chemicals will render any PFAS legislation useless against a new group of forever chemicals that could prove to be just as harmful.[147] Aggressive regulation of GenX is necessary to prevent future harm from current inaction. GenX chemicals need to be placed under broad restriction until research can determine whether they

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[141] Miranda Goot, *Emerging Thoughts: A Principled Framework for Regulating Genx As an Emerging Contaminant*, 98 N.C. L. Rev. 629, 633 (2020).
[142] U.S. ENV'T PROT. AGENCY, *supra* note 6.
[143] Goot, *supra* note 141, at 630.
[144] H.R. 2467.
[145] H.R. 2467, 117th Cong. § 12 (2021).
[146] *Id.*
[147] Goot, *supra* note 141, at 642.

are harmful or not.[148] Releasing a chemical into the environment when the exact danger is unknown will end up costing more in cleanup efforts later. Starting with more aggressive restrictions is the safest way to prevent GenX chemicals from getting beyond legislative control.[149] Strict regulation will prevent the law from falling further behind the science of these chemicals. It would also reduce the need for future legislation to fix what current legislation ignored. Without comprehensive regulation of GenX chemicals, it would be like allowing a new medicine into circulation without first identifying any potential side effects.

The method the government uses to regulate new chemicals, starting with research and ending in regulation, is backwards.[150] The industry should start by preventing GenX use in production until they are found to be safe for use through research.[151] If the EPA waits to research and regulate these chemicals, then the damage will already have been done. This is the same situation that has led to PFAS contamination becoming unmanageable. Although an argument can be made that harsh regulations may have a negative impact on innovation, these regulations could also lead to the development of sustainable substitutes in the manufacturing industry. Implementing aggressive regulation could be the catalyst for the development and research of safe alternatives to PFAS.

[148] *Id.*
[149] *Id.*
[150] Garnett & Van Calster, *supra* note 98, at 165.
[151] *Id.*

IV. RECOMMENDATIONS

The United States can improve its regulatory and legislative approaches for PFAS by borrowing solutions from international organizations and other countries. European countries use strategies such as banning forever chemicals, either partially or completely, shifting responsibility to manufacturers of PFAS products, and implementing regulatory schemes to categorize dangerous chemicals. Any of these solutions could supplement and improve current proposals for regulating PFAS in the United States.

A. Model approaches from European countries and organizations.

i. Borrowing bans for manufacturing from the Stockholm Convention.

The concern with PFAS contamination is a global concern. And there are other countries working toward their own solutions to PFAS contamination and exposure.[152] As a part of an international effort to limit contamination, the United States can find inspiration from other countries' regulatory schemes for managing the use of forever chemicals. One of the most comprehensive regulatory schemes came out of the Stockholm Convention on Persistent Organic Pollutants (the Convention) in which the EU played a major role.[153]

A notable regulation discussed at the Convention concerning PFAS was preventing the use of products containing or manufactured with PFAS, specifically PFOA.[154] The countries in the Convention are dedicated to limiting not only their own

[152] Gardella, *supra* note 23.
[153] *Id.*
[154] *Id.*

production and manufacturing of these products, but also their intake of these products from other countries.[155] This allows them to influence other nations' regulations by refusing to do business with manufacturers in nations that have not yet prohibited the use of these chemicals.[156] In doing so, they are placing economic pressure to implement more aggressive regulations and bans on the use of PFAS products around the world. Part of the reason this approach is effective is that many of the countries involved in the Convention are major economic players.[157] There are 184 countries that are signatories and members of this global treaty.[158] The United States, one of the largest economic powers in the world, however, is not a part of the agreement.[159] The substantial impact the United States has on the global economic market would create an even greater impact on the regulatory schemes of other nations. The benefit of a significant possible impact supports the United States joining the Convention or adopting a similar national policy. The United States needs to come up with a policy like that of the EU in the Convention.[160] The regulation of PFAS should not be just for national manufacturing but global manufacturing as well. The policy should ban forming agreements with international producers and manufacturers unless they agree to comply with internal PFAS regulations.[161] This

[155] *Persistent Organic Pollutants Review Committee (POPRC)*, STOCKHOLM CONVENTION (2019), http://www.pops.int/TheConvention/POPsReviewCommittee/OverviewandMandate/tabid/2806/Default.aspx [https://perma.cc/QFD4-VEV2].
[156] *Id.*
[157] *Id.*
[158] STOCKHOLM CONVENTION, *supra* note 155.
[159] Gardella, *supra* note 23.
[160] STOCKHOLM CONVENTION, *supra* note 155.
[161] Gardella, *supra* note 23.

would lessen the trade of PFAS products from other countries into the United States, diminishing American exposure to PFAS.[162]

This approach will understandably be met with resistance. Large manufacturers and corporations will argue that this is not feasible and would be too drastic a change to the United States and global markets.[163] While it is important to acknowledge that this approach would have a significant impact on the way the United States does business internationally, it is not impossible or even unreasonable. One hundred and eighty-four countries, including the EU, China, Japan, and Canada, are already participating in a similar scheme in the Stockholm Convention.[164] Those are major economic players.[165] It would be nothing novel for the United States to implement its own manufacturing and production ban on PFAS products.

However, the United States must take steps to enforce such a ban.[166] While the enforcement may be a major change, it is ultimately necessary to fix this major problem. United States regulation and bans of PFAS use in manufacturing would make a significant difference in the exposure routes of PFAS to humans.[167] Yet, this change would be insufficient if the United States simply allows those domestic manufacturers to be replaced by foreign manufacturers.

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[162] *Id.*
[163] Elicia Mayuri Cousins, Lauren Richter, Alissa Cordner, Phil Brown, & Sokona Diallo, *Risky Business? Manufacturer and Retailer Action to Remove Per- and Polyflorinated Chemicals From Consumer Products*, 29 NEW SOLUTIONS 242, 254 (2019).
[164] STOCKHOLM CONVENTION, *supra* note 155.
[165] *Id.*
[166] Levine, *supra* note 29, at 193.
[167] *Id.*

ii. Recreating REACH provisions in the United States.

The EU's REACH provisions should be adopted in the United States.[168] One of the main advancements from REACH is that it shifted the costs of paying for, protecting, and promoting PFAS research and reclamation from the government to responsible parties.[169] REACH is similar to CERCLA because, under its regulations, responsible parties would be required to manage risks of exposure to the chemicals they release.[170] This is like the strict liability provision of CERCLA.[171] However, it is not just strict liability under REACH. Instead, it encourages company responsibility before contamination litigation begins.[172] REACH requires that companies provide information about any hazardous compounds to consumers.[173] It also requires companies to manage potential risks and assess safety issues of the chemicals being used.[174]

The EU is using prevention methods prior to the start of litigation through REACH.[175] REACH emphasizes accountability earlier in the process by putting more responsibility in the hands of companies that manufacture PFAS products.[176] Under this approach, companies must think of the consequences of their actions. The responsibility placed on the companies from the initial development of the products

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[168] Gardella, *supra* note 23.
[169] *Id.*
[170] *REACH*, EUROPEAN COMMISSION, https://ec.europa.eu/environment/chemicals/reach/reach_en.htm [https://perma.cc/8VDM-2EK2].
[171] Nace, *supra* note 133, at 414; *See supra* text accompanying notes 121-23.
[172] EUROPEAN COMMISSION, *supra* note 170.
[173] Gardella, *supra* note 23.
[174] EUROPEAN COMMISSION, *supra* note 170.
[175] *Id.*
[176] *Id.*

through the distribution of the products serves as a reminder of potential litigation if regulations are not followed.[177]

The United States should implement a similar system to emphasize PFAS manufacturer and producer liability from the initial steps of production.[178] The goal would be to include this as part of a strict liability provision to ensure responsibility among those parties who are the source of major pollutants.[179] It will be easier to hold companies responsible for violating regulations if the companies are aware from the beginning of the manufacturing process that there are consequences of failing to abide by the laws.[180]

Manufacturers may misuse their responsibility under such a provision. For example, if manufacturers can create their own warning labels for chemical pollutants, they may do so in a way that tries to reduce liability.[181] However, it is unlikely that assigning more responsibility will mean assigning total responsibility.[182] This would require government supervision, like the Stewardship program where companies were working with the government to phase out PFAS use.[183] The EPA or another agency could create minimum standards to be followed by the manufacturers. The companies would then be responsible for following the standards and implementing them.[184] If not done correctly, they can be held

[177] Gardella, *supra* note 23.
[178] EUROPEAN COMMISSION, *supra* note 170.
[179] *Id.*
[180] Gardella, *supra* note 23.
[181] *Id.*
[182] Levine, *supra* note 29, at 183.
[183] U.S. ENV'T PROT. AGENCY, *supra* note 59.
[184] EUROPEAN COMMISSION, *supra* note 170.

responsible at various points in the manufacturing process, not just after the contamination has occurred.[185]

The United States should create more responsibility for PFAS manufacturers from the beginning of their production. This type of provision in the United States legislation for PFAS would aid in strict liability enforcement and help in future litigation against the companies.[186]

iii. The Denmark ban.

In 2020, Denmark banned the use of PFAS in any food containers or products that regularly come into contact with food.[187] The United States should implement a similar comprehensive ban on its food packaging. One of the biggest areas of exposure is food and water consumption.[188] Denmark has already realized this and taken action to stop one of the major pathways of PFAS contamination.

The United States legislature creating a ban like Denmark's would be a huge step in regulating exposure to PFAS. Complete bans are the most effective way to prevent exposure to forever chemicals.[189] Simply banning all PFAS from any product all at once would be too drastic for legislators to consider.[190] Starting with one of the main concerns in banning the use of PFAS in food packaging can prompt a shift to complete prohibition of PFAS use.[191] Consider it like dipping your toe in the water

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[185] *Id.*
[186] Carmichael, *supra* note 127, at 751.
[187] *Denmark Bans PFAS Chemicals in Food Contact Paper and Board*, SAFEGUARDS (May 31, 2020), https://www.sgs.com/en/news/2020/05/safeguards-07320-denmark-bans-pfas-chemicals-in-food-contact-paper-and-board [https://perma.cc/KPY9-K6QM].
[188] O'Brien, *supra* note 9, at 234.
[189] SAFEGUARDS, *supra* note 187.
[190] Garnett & Van Calster, *supra* note 98, at 163.
[191] SAFEGUARDS, *supra* note 187.

before completely submerging yourself in the pool. Here, the pool is comprehensive PFAS legislation.

Passing comprehensive bans is not a task to be taken lightly. It would take time and effort to get such a ban to be accepted and signed into law. But following Denmark's lead of cutting off PFAS contamination in one area of exposure could create an easier legislative pathway in the future.[192] The EPA and other agencies can begin the process of a complete PFAS ban by getting manufacturers and legislators to comply with smaller comprehensive bans.[193] If this can be done successfully, then later legislation to ban PFAS will have a better chance of being implemented.

B. The Essential Use Method.

The threat of a total ban like Denmark's may open the door for considering slightly less disruptive regulations. One method that is gaining support in Europe is the Essential Use Method.[194] The term "essential use" has been proposed in REACH and the Convention but the concept itself is different.[195] Essential use is a concept of regulatory control in dealing with hazardous substances.[196] Current legislation uses a risk analysis approach to determine what chemicals are prohibited and create permissible level regulations. Essential use is a concept that focuses on the chemical's function and uses in society, but still looks at the potential risks.[197]

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[192] *Id.*
[193] Garnett & Van Calster, *supra* note 98, at 163.
[194] *Id.*
[195] EUROPEAN COMMISSION, *supra* note 170; STOCKHOLM CONVENTION, *supra* note 154.
[196] Garnett & Van Calster, *supra* note 98, at 161.
[197] Ian T. Cousins, et al., *The Concept of Essential Use for Determining When Uses of PFASs Can be Phased Out*, 21 ENV. SCIENCE PROCESSES & IMPACTS, 1805 (May 27, 2019) https://pubs.rsc.org/en/content/articlelanding/2019/em/c9em00163h [https://perma.cc/QP3Q-X99T].

The Essential Use Method could serve as a potential alternative to a complete PFAS ban.[198] One of the strengths of the Essential Use Method is that it begins by categorizing the entire PFAS family as hazardous and as risks to human health.[199] Such a method would eliminate the issue of current regulation only dealing with PFOA and PFOS.[200] It also reverses the normal order of the United States legislative process. Instead of assuming all chemicals are safe and then regulating against them as health risks are researched, the Essential Use Method would start from the other side.[201] All PFAS would be considered dangerous for use unless they are proven safe.[202] This would prevent contamination that occurs before research can be done on other hazardous substances.

The Essential Use Method consists of a regulatory scheme covering three categories of substances and products.[203] The first of these categories is the non-essential use category.[204] Non-essential use products and substances are those that are convenient, but unnecessary for society to function.[205] This group of products would be phased out of use in manufacturing and production because they are not required for safety or health reasons.[206] Under non-essential use, products do not need to have an alternative to be non-essential.[207] They are simply not necessary to

[198] Garnett & Van Calster, *supra* note 98, at 179.
[199] *Id.* at 167.
[200] H.R. 2467; *see* analysis *supra* section III.A.1 (describing the issue of the PFAS Action Act not including the entirety of the PFAS family).
[201] Garnett & Van Calster, *supra* note 98, at 165.
[202] *Id.*
[203] Cousins et. al., *supra* note 197, at 1804.
[204] Garnett & Van Calster, *supra* note 98, at 167.
[205] *Id.*
[206] *Id.*
[207] *Id.*

have in circulation because they are primarily utilized for convenience.[208] In short, they would be prohibited from manufacturing because they are not essential for society to function.

The next category consists of products with substitutable uses.[209] Products that fall into this category are those that have an alternative that performs the same function and is less dangerous.[210] The Essential Use Method states that these products are important enough to not be removed entirely but their substitutes should be made widely available and implemented instead of the PFAS versions of the products. [211]

The final category is essential use. Essential use products are those that serve a very important function.[212] These products are often needed for either health or safety reasons and have no current alternatives that are feasible for use or widely available.[213] This may include any PFAS products in the medical field or PFAS products used in protection from other hazardous substances.[214] This category of PFAS products cannot be phased out until an alternative is available because they are necessary for society to function safely.[215]

While other regulatory schemes consider what they term essential use in their proposals, the Essential Use Method concept is different. For example, the

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[208] *Id.*
[209] *Id.*
[210] Garnett & Van Calster, *supra* note 98, at 167.
[211] *Id.*
[212] *Id.*
[213] *Id.* at 169.
[214] *Id.*
[215] *Id.* at 167.

Convention implements a similar consideration.[216] It considers the use and purpose of some of the chemicals it regulates.[217] But the difference is that under the Convention, a company need only request that a product be considered for an exemption based on its use.[218] However, under the Essential Use Method, the product would fall into one of three categories based on objective factors not influenced by the companies who make the product.[219]

REACH also uses the term essential use in some of its provisions.[220] But like the Convention, it is not using it in association with the Essential Use Method.[221] It does not consider the societal and environmental impacts of the products like the Essential Use Method does when placing chemicals in one of three categories.[222] While plans and schemes describing essential use have been implemented, the actual Essential Use Method is not currently incorporated into legislation in Europe or elsewhere.[223]

It is argued that the Essential Use Method is not considerate enough of the profitable market of PFAS products that has encouraged widespread use.[224] Large corporations are likely worried that the focus on environmental cleanup will overlook profitability of their products. However, the Essential Use Method still considers

[216] STOCKHOLM CONVENTION, *supra* note 154.
[217] Garnett & Van Calster, *supra* note 98, at 169.
[218] *Id.*
[219] *Id.*
[220] EUROPEAN COMMISSION, *supra* note 169.
[221] Garnett & Van Calster, *supra* note 98, at 169.
[222] *Id.*
[223] Cousins et al., *supra* note 197, at 1805.
[224] Garnett &Van Calster, *supra* note 98, at 167.

economic interests in its determination of which category PFAS should be under.[225] It simply adds to this both social and environmental considerations so that essential use is not associated only with economic use. This method is also fair in recognizing the issues that will come with a total chemical ban of PFAS products.[226] It provides an alternative to gradually phase PFAS out without being a detriment to the market for these products.[227]

The Essential Use Method is one that would likely change the United States' chemical regulations for the better. The Essential Use Method would categorically define PFAS, and the model could be used for other emerging forever chemicals as well.[228] It would reverse the process of assuming chemicals are safe until deemed hazardous and state that chemicals should be deemed hazardous until proven safe for use.[229] This reversal of the United States' current regulatory scheme for PFAS is needed for substantial change to happen.

V. CONCLUSION

Forever chemicals, like PFAS, are given their name for a reason. These types of chemicals will not disappear quickly and will remain a problem if they are not effectively regulated. PFAS contamination is so prevalent today because previous regulations have failed to confront this decades-long problem. While the United States government has taken some steps toward comprehensive regulation and control of forever chemicals, these attempts have not created a real solution. The

[225] *Id.*
[226] *Id.* at 169.
[227] *Id.*
[228] *Id.* at 163.
[229] *Id.* at 169.

PFAS Action Act is a starting point, but it needs to be supplemented with more restrictive regulations. New regulations should include the entire PFAS family of chemicals, in addition to GenX emerging chemicals, and a strict liability provision for manufacturers. In modeling future regulatory schemes, the United States legislators should look to the Stockholm Convention, the EU, and Denmark for examples of effective protection from PFAS contamination. The Essential Use Model would also be a beneficial model for creating interim policies until a total or more severe ban can be enforced.

To solve the forever chemical crisis, strict regulations and strong legislation are necessary to catalyze a movement to safe alternatives to PFAS. Substance-by-substance approaches are time-consuming and ineffective. A comprehensive scheme utilizing methods from international organizations can effectively speed up the progress of PFAS legislation. Other nations are refusing to accept the problems caused by the inaction by their legislators and government. So too here. The methods proposed may be costly, but they are reasonable considering the extent of the problem the world is facing with forever chemicals. Both globally and nationally, people can no longer ignore the persistence of PFAS in the environment. The proposed regulations will not reverse the damage from PFAS exposure, but by taking a more aggressive approach to PFAS product use, the United States can start to shift focus from restriction to restoration.

The Road to Recycling: The Foggy Future of Electric Vehicle Batteries

Patrick Scully[1]

I. BACKGROUND

A. Climate Change

Climate change, while an ever-expanding definition, refers to the warming of the Earth's climate system.[2] The term "climate change" is a neologism that has taken on many iterations and forms, including global warming, climate crisis, climate breakdown, and environmental destruction.[3] Climate change, itself, is not novel, however. Long before its coinage, humans suspected that human activity affected the climate.[4] There is now a growing consensus that human influence is the catalyst causing extensive changes in Earth's atmosphere and meteorology.[5] "Human influence" can include deforestation, overpopulation, and pollution; however, there is perhaps no greater contributor to climate change than greenhouse gas emissions.[6]

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[2] *What is Climate Change,* https://www.un.org/en/climatechange/what-is-climate-change, UNITED NATIONS (last visited Apr. 30, 2023).

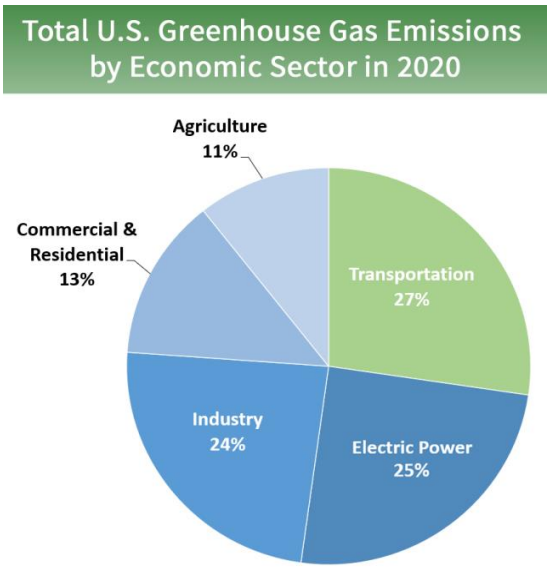
[3] Joel Makower, *What's the (Right) Word on Climate Change?*, GREENBIZ (May 19, 2019), https://www.greenbiz.com/article/whats-right-word-climate-change.

[4] Greek philosopher Theophrastus, a pupil of Aristotle, observed how deforestation and mass hunting altered the local ecosystem; Swedish scientist Svante Arrhenius was the first to hypothesize that greenhouse gas emissions correlated with a warming of the Earth's atmosphere. THE DISCOVERY OF GLOBAL WARMING, *Introduction and Summary: A Hyperlinked History of Climate Change Science,* HISTORY.ORG, (Apr. 2022) https://history.aip.org/climate/summary.htm.

[5] M.R. Allen & P.A. Scott, *Estimating Signal Amplitudes in Optimal Fingerprinting, Part I: Theory,* CL. DYN. 21, 477 (Nov. 2003).

[6] *What is Climate Change, supra* note 2.

Greenhouse gases refers to "any gas that has the property of absorbing infrared radiation emitted from Earth's surface and reradiating it back to Earth's surface."[7] Examples of greenhouse gases include carbon dioxide, methane, and nitrous oxide.[8] And while these gases occur naturally, today most greenhouse gases are the direct result of man-made industrialization.[9]



Natural greenhouse gases cycle through the Earth's atmosphere, with certain amounts preserved within the atmosphere and any remaining quantities ascending into space.[10] Man-made greenhouse gases have corrupted this equilibrium. Industrialization created an influx of greenhouse gases rising to the Earth's atmosphere, trapping a surplus of heat within the atmosphere.[11] In essence,

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[7] Michael E. Mann, *greenhouse gas*, ENCYCLOPEDIA BRITANNICA (Sep. 5, 2022), https://www.britannica.com/science/greenhouse-gas.
[8] *What are Greenhouse Gases,* U.S. DEP'T OF TRANSP. (last updated July 21, 2016), https://www.transportation.gov/sustainability/climate/what-are-greenhouse-gases.
[9] *Sources of Greenhouse Gas Emissions,* U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions (last visited May 1, 2023).
[10] *Id.*
[11] *Id.*

greenhouse gases inundate Earth with the very heat that sustains life.[12] In fact, "human activities are responsible for almost all the increase in greenhouse gases in the atmosphere over the last 150 years."[13] This correlation is not coincidental. The advent of the Industrial Revolution two hundred years ago ushered in a new era of human ingenuity, economics, and technology, but with unanticipated costs.[14] The Industrial Revolution hinged on the extraction, manufacturing, and burning of fossil fuels.[15] Fossil fuel consumption is the leading contributor to releasing greenhouse gases into the atmosphere, making it a substantial factor to the ever-escalating climate crisis.[16]

Although these environmental impacts were self-evident for decades, it was not until the 1960s that popular, collaborative efforts to reverse these environmental impacts arose.[17] Since then, the past sixty years witnessed a global, conceded effort to offset centuries of human influence on the climate.[18] The objectives of these efforts are predominantly committed to the overall reduction and replacement of greenhouse gas emissions. While these efforts have garnered momentum, the reliance of fossil fuels remains the heart of many national economies.[19]

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[12] *Id.*
[13] *Id.*
[14] *Industrial Revolution*, ENCYCLOPEDIA BRITANNICA (OCT. 27, 2022), https://www.britannica.com/event/Industrial-Revolution.
[15] Hannah Ritchie, Pablo Rosado, & Max Roser, *Fossil Fuels,* OUR WORLD IN DATA, https://ourworldindata.org/fossil-fuels (last visited Apr. 30, 2023).
[16] *Id.*
[17] Sarah Pruitt, *How the First Earth Day was Born from 1960s Counterculture,* HISTORY (last updated Apr. 21, 2021), https://www.history.com/news/first-earth-day-1960s-counterculture.
[18] *Id.* The environmental grassroots movements of the 1960s spurred U.S. policy, including the founding of the EPA and passage of policies such as the Clean Air Act, Clean Water Act, and Endangered Species Act. *Id.*
[19] *See generally*, *The Evidence is Clear: The Time for Action is now. We can Halve Emissions by 2030,* THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (Apr. 4, 2022),

Electric power, manufacturing, and agriculture are but a few of the examples of private industries contributing to greenhouse gas emissions; however, the "transportation sector generates the largest share of greenhouse gas emissions" in the United States.[20] Transportation includes any mode in which people and goods are moved.[21] While advances in transportation technology engendered greater communication, trade, and cohesion, the carbon dioxide emissions released from gas-based engines subsist as one of the greatest forms of pollution.[22] Thus, a leading campaign in climate change mitigation focuses on minimalizing the reliance on gas-fueled vehicles.[23] In doing so, this campaign gave rise to a new industry: electric vehicles.

B. History of Electric Vehicles

An electric vehicle is defined as "a vehicle that can be powered by an electric motor that draws electricity from a battery and is capable of being charged from an external source."[24] Contrastingly, gas-powered vehicle engines are powered by fossil fuels.[25] Gas-fueled vehicles are equipped with batteries as well, but those batteries

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https://www.ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease/. It warns that greenhouse gas emissions must peak before 2025 and decline accordingly to reduce global warming from 1.5°C. *Id.*

[20] *Sources of Greenhouse Gas Emissions*, *supra* note 9.

[21] *Id.*

[22] *Id.*

[23] David Shepardson & Ben Klayman, *U.S. Government to End Gas-Powered Vehicle Purchases by 2035 Under Biden Order*, REUTERS (Dec. 8, 2021), https://www.reuters.com/world/us/biden-pledges-end-gas-powered-federal-vehicle-purchases-by-2035-2021-12-08/.

[24] *Electric Vehicle (EV) Definition,* DEP'T OF ENERGY, https://afdc.energy.gov/laws/12660, (last visited Apr. 30, 2023).

[25] Christopher G. Foster, Ken W. Purdy & George C. Cromer, *automobile*, ENCYCLOPEDIA BRITANNICA, https://www.britannica.com/technology/automobile, (last visited May 1, 2023).

do not power the vehicle's engine.[26] Rather, gas-fueled batteries simply power the ignition and internal circuits of the vehicle.[27]

While electric vehicles may seem new and innovative, electric vehicles emerged concurrently with gas-fueled cars.[28] Electric vehicles first became available to the public in the late 1890s to early 1900s.[29] By 1912, electric vehicles outnumbered gas-powered vehicles in the United States.[30] However, the electric vehicle industry was soon eclipsed by gas-powered manufacturers.[31] Numerous factors contributed to the decline of electric vehicles, including the limited range of their power, the affordability of gasoline, and inferior speed and power.[32]

For the next century, gas-fueled vehicles dominated the automotive industry.[33] Despite this, electric vehicle experimentation was not totally defunct.[34] Government intervention on climate change prompted manufacturers to research further into electric vehicle sustainability.[35] One of the earliest examples of government intervention was the 1990 California Air Resources Board's proposal to move away from fossil fuel powered vehicles.[36] As a result, companies like Ford and General

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[26] *Id.*
[27] *Id.*
[28] *Id.*
[29] *Id.*
[30] *Id.*
[31] ENCYCLOPEDIA BRITANNICA, *supra* note 25.
[32] *Id.*
[33] *Id.*
[34] *Id.*
[35] *Id.*
[36] The California Air Resources Board was formed to monitor and control air quality in California. *Zero-Emission Vehicle Program,* CALIFORNIA AIR RESOURCES BOARD, https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-program/about (last visited Apr. 30, 2023)

Motors developed electric vehicles.[37] For a time, these efforts remained tentative, with no intention for mass production.[38]

Nevertheless, the phase-out of fossil fueled vehicles only garnered greater attention since the 1990s.[39] For example, the Kyoto Protocol and Paris Agreement represent global efforts to shift away from gas-powered cars.[40] The United States heralded such initiatives, primarily by states introducing legislation that bans the outright sale of gas-powered cars.[41] Perhaps the principal champion of such legislation is California, with the last few years witnessing groundbreaking enterprises to combat climate change. Most notably, California Governor Gavin Newsom issued Executive Order N-79-20 in September of 2020.[42] The order bans the outright sale of fossil-fueled cars by 2035.[43] The initiative is daring, faced with numerous obstacles including industrial reinvention, remodeling state infrastructure, and the unknown economics behind such an undertaking.[44]

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[37] *See* Bradley Berman, *Ford Electric Cars: Past, Present, and Future,* INSIDEEVS (Jan. 22, 2019), https://insideevs.com/features/342330/ford-electric-cars-past-present-and-future/ (Ford spokesperson Tim Holmes noted that "we don't believe that this [electric vehicles] is the future of environmental transport for the mass market"); *General Motors EV1,* Electric Vehicle News, https://electricvehiclesnews.com/History/Companies/General_Motors_EV1.htm, (last visited Nov. 15, 2022).
[38] *See* Berman, *supra* note 37.
[39] Kevin Heanue & Susan B. Petty, *Sustainable Transportation: The Road From Kyoto,* 61 PUBLIC ROADS 5 (1998).
[40] *Id.*
[41] *See generally* Peter Jones, *What States Are Banning Gas Cars,* MOTOR AND WHEELS (Aug. 15, 2022), https://motorandwheels.com/what-states-banning-gas-cars/.
[42] *Governor Newsom Announces California Will Phase Out Gasoline-Powered Cars & Drastically Reduce Demand for Fossil Fuels in California's Fight Against Climate Change,* OFFICE OF GOVERNOR GAVIN NEWSOM (Sept. 23, 2022), https://www.gov.ca.gov/2020/09/23/governor-newsom-announces-california-will-phase-out-gasoline-powered-cars-drastically-reduce-demand-for-fossil-fuel-in-californias-fight-against-climate-change/.
[43] Cali. Exec. Order No. N-79-20 (Sept. 23, 2020).
[44] Alvin Powell, *California Dreaming? Nope,* THE HARVARD GAZETTE (Sept. 9, 2022), https://news.harvard.edu/gazette/story/2022/09/what-to-expect-from-california-gas-powered-car-ban/.

Nevertheless, this moment spells a new shift in the electric vehicle movement. Not only this, but the United States may see more states follow suit, with seventeen states proffering similar initiatives.[45]

The advocation for electric vehicles lie in their capability to combat climate change.[46] The focal point of these measures looks at the reduction of greenhouse gases when compared to gas-fueled vehicles.[47] Electric vehicles release no tailpipe pollutants, reducing the reliance of fossil-fuels on the transportation sector.[48] The movement of electric vehicles from gas-fueled vehicles, while not perfect, represents a vital campaign to reduce the effect of human influence on the climate.[49]

However, the shift to electronic vehicles is not without controversy. This skepticism rests in the belief that electric vehicles are merely a procrastination effort to truly combat climate change.[50] Critics particularly highlight the carbon emission burden placed on vehicle production and the generation of the energy needed to power electric vehicles.[51] Electric vehicle production will still require most of the same

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[45] Jones, *supra* note 41. Colorado, Connecticut, Maine, Maryland, Minnesota, New Jerseys, New Mexico, Nevada, Oregon, Pennsylvania, Rhode Island, and Vermont have offered policies similar to California's. *Id.*

[46] Zeke Hausfather, *Factcheck: How Electric Vehicles Help to Tackle Climate Change,* CARBON BRIEF CLEAR ON CLIMATE, https://www.carbonbrief.org/factcheck-how-electric-vehicles-help-to-tackle-climate-change/ (last updated Jul. 2, 2020).

[47] *Id.*

[48] Jeremy J. Michalek et al., *Valuation of Plug-in Vehicle Life-Cycle Air Emissions and Oil Displacement Benefits*, 108 NATIONAL LIBRARY OF MEDICINE, 1 (Sept. 26, 2011), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3189019/.

[49] *Id.*

[50] Jason Henderson, *EVs are not the Answer: A Mobility Justice Critique of Electric Vehicle Transitions*, ANNALS OF THE AMERICAN ASSOCIATION OF GEOGRAPHERS 1 (May 4, 2020), https://www.researchgate.net/profile/Jason-Henderson-3/publication/341138675_EVs_Are_Not_the_Answer_A_Mobility_Justice_Critique_of_Electric_Vehicle_Transitions/links/60199a1345851589397a2c58/EVs-Are-Not-the-Answer-A-Mobility-Justice-Critique-of-Electric-Vehicle-Transitions.pdf.

[51] *Id.*

minerals, elements, and metals needed to produce gas-fueled cars.[52] Additionally, if the global numbers of electric vehicles increase as predicted, "then one third of total global energy would need to be electric."[53] Still, a massive shift to electric vehicle represents a significant reversal of many forms of pollution within the United States.

As of September 2022, there are an estimated 2.5 million electric vehicles on the road in the United States.[54] However, 2.5 million encompasses merely one percent of the total vehicles in the United States.[55] Initiatives, such as California's, are designed to steadily increase these numbers with certain estimates speculating that by 2050, 50% of vehicle sales will be electric.[56] With the expanding electric vehicle industry comes more concerns for environmentally friendly production, maintenance, and disposal.[57] And although electric vehicles developed as a key contributor to reduce greenhouse gas emissions, there remains secondary environmental effects of their production.[58] One such contributor is electric vehicle batteries, the backbone of the vehicle.[59]

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[52] *Id.* at 10.
[53] *Id.* at 9.
[54] Sebastian Blanoc, *Electric Cars' Turning Points May be Happening as U.S. Sales Numbers Start to Climb,* CAR AND DRIVER (Aug. 8, 2022), https://www.caranddriver.com/news/a39998609/electric-car-sales-usa/.
[55] *Id.*
[56] Ira Boudway, *More Than Half of U.S. Car Sales will be Electric by 2030,* BLOOMBERG (Sept. 20, 2022), https://www.bloomberg.com/news/articles/2022-09-20/more-than-half-of-us-car-sales-will-be-electric-by-2030.
[57] Jane Marsh, *Electric Vehicles and Their Impact on the Environment,* BIOFRIENDLY PLANET (Nov. 14, 2022), https://biofriendlyplanet.com/environment-issues/electric-vehicles-and-their-impact-on-the-environment/.
[58] *Id.*
[59] *Id.*

II. GROWING CONCERNS

A. Electric Vehicle Batteries

An automotive battery provides the power to start the gasoline-powered vehicle's engine and provide the electricity flowing within.[60] Automotive batteries, however, were not initially utilized to start engines; engines, originally, started by hand cranking the engine.[61] Batteries simplified this process, storing the power needed to ignite vehicle engines.[62] By the 1920s, automotive batteries, principally lead-acid batteries, were widely used.[63] Today, lead-acid batteries make up the vast majority of the automotive battery industry.[64]

Lead-acid batteries were originally utilized by electric vehicles as well, but their use proved limiting. [65] Simply, lead-acid batteries, especially the size needed for electric vehicles, store lower energy, perform substandard in cold temperatures, and have shorter lifespans.[66] With the electric vehicle sector rapidly growing, lithium-ion batteries emerged as the ideal candidate to replace lead-acid batteries.[67] Lithium-ion batteries now dominate the electric vehicle industry, with nickel-metal-hydride batteries and ultracapacitors close behind.[68] Although more expensive than lead-acid

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[60] *How Does a Car Battery Work and How is it Constructed,* VARTA https://batteryworld.varta-automotive.com/en-gb/how-does-car-battery-work (last visited Apr. 30, 2023).
[61] Andrew Sheldon, *The History of Car Batteries,* THE AMERICAN AUTOMOBILE ASSOCIATION (Feb. 18, 2022), https://magazine.northeast.aaa.com/daily/life/cars-trucks/auto-history/the-history-of-car-batteries/.
[62] *Id.*
[63] *Id.*
[64] *Id.*
[65]*General Motors EV1*, *supra* at note 37.
[66] *Batteries for Electric Vehicles*, DEP'T OF ENERGY, https://afdc.energy.gov/vehicles/electric_batteries.html (last visited Nov. 12, 2022).
[67] Bruno Scrosati *History of Lithium Batteries,* 15 SPRINGER-VERLAG 1623, 1629 (Feb. 23, 2011), https://link.springer.com/article/10.1007/s10008-011-1386-8.
[68] *Batteries for Electric Vehicles, supra* note 66.

batteries to produce, lithium-ion batteries provide higher storage capacity, greater efficiency, and a longer lifespan with slower degradation over time.[69]

Nevertheless, lithium-ion and nickel-metal-hydride batteries are bound to the same environmental issues posed by electric vehicle production.[70] First, electric vehicle batteries are composed of various precious metals and minerals, primarily procured by mining.[71] Mining not only depletes finite metals, but also requires significant amounts of fossil fuels to power these efforts, releasing greenhouse gases repetitiously.[72] Second, the processing of those metals and minerals into the batteries themselves, likewise, require mass amounts of fossil fuels and pollution.[73] After the batteries are created, they are placed in their destined vehicles and run at capacity for the next ten-plus years.[74] Inevitably, however, electric vehicle batteries face their last environmental issue: post-degradation management.[75]

Each electric vehicle battery is subject to varying paces of degradation, depending on the amount of miles covered by an engine over a period of time.[76] However, battery retirement is foreseeable with any electric battery, whether

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[69] *Id.*
[70] *The Environmental Impact of Lithium Batteries,* INSTITUTE FOR ENERGY RESEARCH (Nov. 12, 2020), https://www.instituteforenergyresearch.org/renewable/the-environmental-impact-of-lithium-batteries/.
[71] *Id.*
[72]Andrew Manberger and Bjorn Stenqvist, *Global Metal Flows in the Renewable Energy Transition: Exploring the Substitutes, Technological Mix and Development,* SCIENCE DIRECT 226 (May 2, 2019), https://www.sciencedirect.com/science/article/pii/S0301421518302726.
[73] *Id.*
[74] Leila Ahmadi et al., *Environmental Feasibility of Re-use of Electric Vehicle Batteries,* SCIENCE DIRECT 65, 69 (Jan. 8, 2014), https://www.sciencedirect.com/science/article/abs/pii/S2213138814000071.
[75] *Id.* at 65.
[76] *Id.*

lithium-ion or nickel-metal-hydride.[77] When an electric vehicle battery nears the end of its lifecycle, the electric vehicle enters into its "end-of-life management."[78] That is, the electric vehicle owners are faced with disposing of their battery in a myriad of ways; the batteries can either be thrown out, reused and repurposed, or recycled.[79]

Today, electric vehicle batteries are the most important element of the vehicle. They are a mainstay of environmental efficiencies and gateways to resourceful energy storage. Their disposal represents a new avenue of environmental concerns that has yet to be fully addressed by the government or manufacturers. Battery recycling is one means to reduce the growing environmental impact of electric vehicle batteries.

B. Battery Recycling

Automotive batteries, from lithium-ion to lead-acid batteries, are composed of precious, potentially toxic, metals.[80] Battery metals, themselves, are not necessarily toxic in their existing form, but become problematic when exposed to liquids.[81] In particular, mercury, cadmium, and lead, when exposed to water, may seep into groundwater, contaminating water supplies in local communities.[82] Likewise, mercury, cadmium, and lead, when incinerated, concentrate into fly ash or stack gas,

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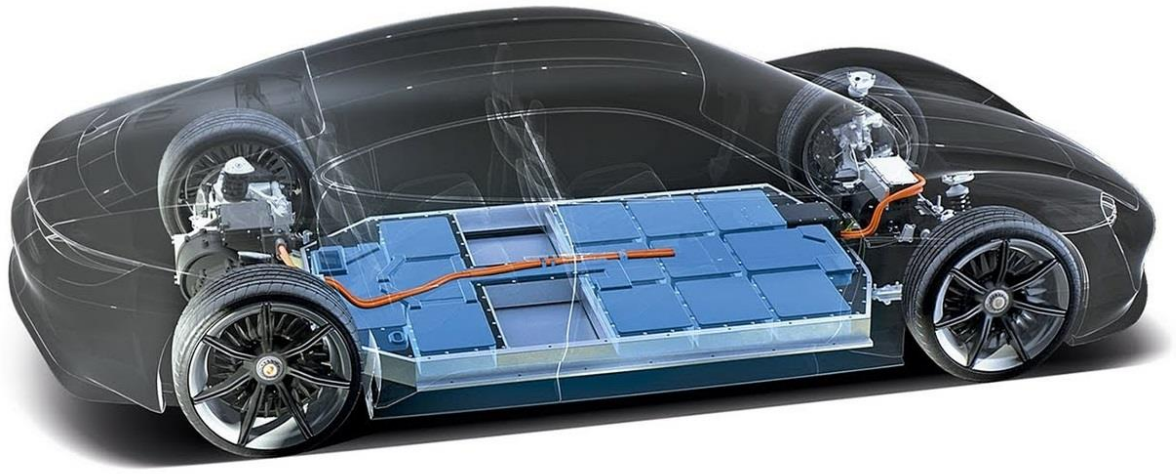
[77] *Id.* at 63.
[78] *Id.* at 68.
[79] *Id.* at 67-68.
[80] Viet Nguyen-Tien et al., *Green Growth and Electric Vehicles: The Role of Recycling,* LSE BUSINESS REVIEW (July 7, 2022), https://blogs.lse.ac.uk/businessreview/2022/07/07/green-growth-and-electric-vehicles-the-role-of-recycling/.
[81] A.M. Bernardes et al., *Recycling of Batteries: A Review of Current Processes and Technologies,* JOURNAL OF POWER SOURCES 291, 293 (Dec. 8, 2003), https://www.sciencedirect.com/science/article/abs/pii/S0378775303012230.
[82] *Id.* at 293.

polluting air and rainwater.[83] Undoubtedly, landfill disposure increases the chances of liquid exposure to precious metals, with any subsequent incineration spreading exposure over a wider area.[84]



[85]

By the 1980s, environmental and governmental agencies noticed the negative environmental impacts posed by improper battery disposal, especially with growing concentrations of lead in water supplies.[86] As a result, states, municipalities, and cities enacted regulations detailing proper lead-acid battery disposal, moving away from landfill disposal.[87] By siphoning batteries away from landfills, the risks involved with water contamination and incineration were minimized leading into the twenty-first century.[88] However, these regulations were lead-acid battery specific, meaning

[83] *Id.* Fly ash and stack gas mixes with cloud moisture, polluting groundwater sources with lead if not properly processed.
[84] *Id.*
[85] Stéphane Melancon, *Electric Vehicle Battery Cells Explained,* LASERAX (May 6, 2022), https://www.laserax.com/blog/ev-battery-cell-types.
[86] James Morton Turner, *An Envirotechnical Approach to Lead-Acid Batteries in the United States,* 20 ENVIRONMENTAL HISTORY 29, 30 (2015).
[87] *Id.*
[88] *Id.*

there existed minimal or no regulations for other forms of automotive batteries such as lithium-ion batteries. Although lithium-ion batteries existed by the 1980s, their limited market use and relative obscurity posed no immediate need for scrutiny.[89]

The emergence of lithium-ion and nickel-metal-hydride batteries to power electric vehicles is realigning the environmental microscope.[90] One contributing factor for the lack of recycling efforts is the minimal environmental impact of electric vehicle batteries on water and air pollution.[91] Before their emergence as electric vehicle batteries, lithium-ion batteries were mass produced for small electronic devices.[92] Likewise, lithium-ion batteries do not possess the same amount of potentially toxic metals as lead-acid batteries.[93] Thus, no recycling efforts were likely offered due to the minimal impact these batteries had on the environment compared to lead-acid batteries.

Likewise, recycling is not the first option given to electric vehicle batteries.[94] When an electric vehicle battery has reached the end of its productive life, it still comprises a significant portion of its original capacity potential.[95] At this point, the battery is not powerful enough to power a vehicle, but the battery can be repurposed and reused for services requiring lesser power, including stationary power storage for

[89] *See generally* Scrosati, *supra* note 67.
[90] *Id.*
[91] Bernardes et al., *supra* note 81, at 292.
[92] Scrosati, *supra* note 67.
[93] *Id.*
[94] Charles R. Standridge & Lindsay Corneal, *Remanufacturing, Repurposing, and Recycling of Post-Vehicle-Application Lithium-Ion Batteries,* MINETA NATIONAL TRANSIT RESEARCH CONSORTIUM 1-2 (June, 2014), https://transweb.sjsu.edu/sites/default/files/1137-post-vehicle-Li-Ion-recycling.pdf.
[95] *Id.*

household items.[96] But this is not an ideal or cost-effective process for manufacturers.[97] Attempting to repurpose an electric vehicle battery requires a detailed analysis of the particular battery's capacity, manpower to disassemble the cells, and refurbishing costs to transform the battery.[98] Nonetheless, even if a battery is repurposed, the battery is either faced with disposal or recycling.[99]

What has yet to be considered in electric vehicle battery recycling, however, is the sheer size and future volume of electric vehicle batteries. Because electric vehicle batteries power the entire engine, the batteries require significant power and storage capacity.[100] Due to this, lithium-ion and nickel-metal-hydride electric vehicle batteries occupy virtually the entire undercarriage of the vehicle. While electric vehicle batteries are not as toxic as lead-acid batteries, their growing number and size pose comparable environmental concerns to lead-acid batteries. Therefore, recycling is a necessary component of all types of battery life cycles.[101] Although recycling in general is a universal process regardless of the waste, lithium-ion batteries require a unique recycling process.[102]

There are three principal methods employed to recycle electric vehicle batteries with varying advantages and disadvantages: pyrometallurgy, hydrometallurgy, and

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[96] *Id.*
[97] *Id.*
[98] Mengyuan Chen et al., *Recycling End-of-life Electric Vehicle Lithium-ion Batteries,* JOULE 3, 2622, 2625 (2019), https://www.sciencedirect.com/science/article/pii/S254243511930474X.
[99] *Id.* at 2623.
[100] *Id.* at 2622.
[101] *Id.* at 2623.
[102] *Id.*

direct recycling.[103] Before any recycling, the batteries are shredded to separate the metals from the plastics and other adhesives.[104] Pyrometallurgy, or "smelting," uses heat to break down batteries into their purest elements and metal compounds.[105] Smelting batteries proves most efficient, as it quickly separates and condenses materials to "black mass," a mixture of valuable metals to be resold.[106] However, smelting raises several environmental concerns, including emissions from greenhouse gases used to power the process.[107]

In contrast, hydrometallurgy use aqueous solutions to "extract and separate metals from batteries."[108] By treating the batteries with organic acids, the metals can be concentrated to their true forms.[109] Hydrometallurgy proves more environmentally friendly than pyrometallurgy because it involves fewer greenhouse gas emissions.[110] Likewise, direct recycling is the process of recovering active metals from the batteries with limited pollution.[111] There, the batteries are moderately heated, sparking chemical breakdowns of the active materials.[112] The minerals are then purified into

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[103] Zachary J. Baum et al., *Lithium-ion Battery Recycling – Overview of Techniques and Trends,* ACS PUBLICATIONS 712, 713-716(Jan. 19, 2022), https://pubs.acs.org/doi/pdf/10.1021/acsenergylett.1c02602.
[104] *Id.* at 714.
[105] *Id.*
[106] Paul Lim, *Black Mass Value Will Increase as Recycling Tech Improves,* FASTMARKETS (Oct. 31, 2022), https://www.fastmarkets.com/insights/black-mass-value-will-increase-as-recycling-tech-improves.
[107] Joanna Kulczycka et al., *Environmental Impacts of Energy Efficient Pyrometallurgical Copper Smelting Technologies,* WILEY PERIODICALS, INC. 304, 305 (Mar., 2017), https://onlinelibrary.wiley.com/doi/pdf/10.1111/jiec.12369.
[108] Baum et al., *supra* note 103, at 714.
[109] *Id.*
[110] Chen et al., *supra* note 98, at 2630.
[111] *Id.* at 2636.
[112] *Id.* at 2635.

their original forms.[113] While direct recycling is the most environmentally friendly, it requires a great amount of manpower to manually dissemble the batteries in addition to complicated chemical issues.[114]

All these forms of recycling provide positive environmental and economic advantages for manufacturers; yet, in 2019 only 5 percent of electric vehicle batteries were recycled.[115] But as the popularity of electric vehicles continue to grow, the industry will confront an influx of batteries facing degradation and end of life management each year.[116] Under current recycling trends, "most of those [lithium-ion] batteries may end up in landfills."[117] The recycling industry will require economic growth to meet recycling demands, but there remains a gap in legislative authority.

Although legislation exists for lead-acid battery disposal, there has been no legislation passed concerning the disposal of electric vehicle batteries. Ergo, manufacturers or producers are free to address this issue as they see fit, whether that is recycling, disposal, or repurposing. Electric vehicle battery legislation has yet to rise to prominence simply because of scale. That is, electric vehicles are still a miniscule number of vehicles on the road today, with many yet to reach the end of their battery capacity. While the problems of electric vehicle battery disposal have yet to come to fruition, the mass-scale disposal of lithium-ion and nickel-metal-hydride batteries is an undeniable future of the electric vehicle industry. With no

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[113] *Id.* at 2636.
[114] *Id.*
[115] Mitch Jacoby, *It's Time to Get Serious About Recycling Lithium-ion Batteries,* 97 CHEMICAL AND ENGINEERING NEWS (July 14, 2019), https://cen.acs.org/materials/energy-storage/time-serious-recycling-lithium/97/i28.
[116] Chen et al., *supra* note 98, at 2622-2623.
[117] Jacoby, *supra* note 115.

recycling plan in place, environmental and economic detriments such as toxic metal pollution, continued over-reliance on mining operations, and waste of natural resources remain at the forefront of the industry's future.

III. SOLUTION

A. Regulations Enacting Change

Environmental regulations require compromise. On one hand, businesses free from the confines of environmental regulations can pursue their economic goals with limited oversight in an arguably already highly regulated sector.[118] On the other hand, environmental regulations have slowed the advancement of unprecedented environmental degradation, leaving an ineffable impact on a fragile ecosystem.[119] Both are true. Admittedly, environmental regulations impose significant costs on businesses.[120] However, to leave businesses to their own devices will inarguably place profits and competition ahead of the welfare of society and the protection of the environment.[121] Therefore, a balance must be struck between constructive environmental regulations and economic feasibility.[122]

Traditional environmental regulations focus on either the production or waste management of goods.[123] For example, the lead-acid battery disposal law in

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[118] *See generally* Juan J. Martinez Hernandez et al., *Business-Oriented Environmental Regulation: Measurement and Implications for Environmental Policy and Business Strategy from a Sustainable Development Perspective,* 30 Business Strategy and the Environment (2020).
[119] *Id.*
[120] *Id.*
[121] *Id.*
[122] *Id.*
[123] Johan Widheden & Emma Ringström, *Life Cycle Assessment,* 2 HANDBOOK FOR CLEANING/DECONTAMINATION OF SURFACES 695 (2007).

Pennsylvania does not regulate how lead-acid batteries are produced.[124] Instead, this law forbids any person, whether an individual or corporation alike, from disposing of lead-acid batteries in landfills.[125] Further, anyone tasked with lead-acid battery disposal must deliver the batteries to a recycling facility preapproved by the Environmental Protection Agency ("EPA").[126] The efficacy of recycling initiatives akin to Pennsylvania's have not been in vain. By implementing such regulations, the United States has witnessed a domestic lead-acid recycling rate of 99%; of which, the "U.S. produced nearly one million tons of recycled lead" in 2021, forwarding the recycled lead to new battery production.[127]

Due to this success, the belief that electric vehicle batteries' disposal should be regulated is growing less to be a question of if, but when.[128] In fact, U.S. Representative Carolyn B. Maloney introduced the Strategic EV Management Act (the "Act") "to streamline the process of recycling and reusing of vehicle batteries from the federal fleet of electric vehicles and move the United States closer to energy independence."[129] The Act does not offer explicit regulations on electric vehicle battery disposal but directs certain agencies to develop plans for future

[124] 53 Pa. Const. Stat. §4000.1510 (1988).
[125] *Id.*
[126] *Id.*
[127] *Recycling Lead-Acid Batteries is Easy. Why is Recycling Lithium-Ion Batteries Hard?,* CLEAN TECHNICA (July 24, 2022), https://cleantechnica.com/2022/07/24/recycling-lead-acid-batteries-is-easy-why-is-recycling-lithium-ion-batteries-hard/.
[128] Jacoby, *supra* note 115.
[129] *Chairwoman Maloney Introduces Legislation to Develop Strategic Plan for Federal Electric Vehicle Battery Management,* HOUSE COMMITTEE ON OVERSIGHT AND REFORM (Sept. 22, 2022), https://oversight.house.gov/news/press-releases/chairwoman-maloney-introduces-legislation-to-develop-strategic-plan-for-federal.

implementation.[130] Likewise, the plan is narrowly tailored to address requirements for federally owned electric vehicles.[131] Thus, the Act is merely a stepping stone to further regulation. Furthermore, the Act is emblematic of what this paper hopes to convey: the need and benefits of electric vehicle battery recycling.

B. Beneficial Effects

Electric vehicle manufacturing, on average, emits more greenhouse gases than conventional car production, chiefly due to electric vehicle batteries.[132] Nevertheless, electric vehicles over the course of their lives, from production to retirement, release significantly less greenhouse gas emissions compared to conventional vehicles.[133] Moreover, battery recycling will steadily lower the carbon footprint of electric vehicles.[134] For example, aluminum comprises approximately 16 percent of a battery cell mass.[135] Batteries composed of recycled aluminum "creates approximately 95 percent less greenhouse gas emissions compared to producing aluminum from natural resources."[136] Overall, recycling efforts can translate to a 7 to 17 percent net reduction in carbon emissions originating from batteries, with certain percentages depending on the metals involved.[137]

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[130] Strategic EV Management Act, S. 117-139, 117th Cong. §4057 (2022).
[131] *Id.*
[132] Dale Hall & Nic Lutsey, *Effects of Battery Manufacturing on Electric Vehicle Life-Cyle Greenhouse Gas Emissions,* THE INTERNATIONAL COUNCIL OF CLEAN TRANSPORTATION 1, 5 (Feb. 2018), https://theicct.org/sites/default/files/publications/EV-life-cycle-GHG_ICCT-Briefing_09022018_vF.pdf.
[133] *Id.*
[134] *Id.*
[135] *Id.* at 9.
[136] *Id.* at 8.
[137] *Id.* at 9.

Likewise, recycling will address rising demands for precious metals.[138] One study curated by the Lund University in Sweden proffered that by 2060, mined metals would need to increase by 87,000 percent to supply electric vehicle batteries alone.[139] And as of now, the United States houses no significant reserves or sources of these metals, relying on imports to meet current demands.[140] Recycling regulations will alleviate this supply-chain conundrum.[141] While not an infallible cure, recycling will capture close to 95 percent of nickel, cobalt, lithium, and copper, redirecting their course to further battery production or similar ventures.[142] This will minimize the United States's reliance on foreign mines to extract such metals.[143]

Additionally, recycling "has the potential to reduce primary demand by between approximately 25 percent and 55 percent of total demand in 2040 and can significantly reduce the demand for new mining."[144] By supplying battery production through recycling as opposed to extracting untouched materials, the need for mining will lessen.[145] Certain estimates have indicated that recycling will reduce mining demand for metals: "approximately 25% for lithium, 35% for cobalt and nickel, and 55% for copper."[146] This is not to say that mining will dissipate, but as metal sources

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[138] *Reducing New Mining for Electric Vehicle Battery Metals,* EARTHWORKS 1 (Apr. 27, 2021), https://earthworks.org/resources/recycle-dont-mine/.
[139] Manberger and Stenqvist, *supra* note 72, at 230.
[140] *Lithium-Ion EV Battery Recycling Policy Framework,* ALLIANCE FOR AUTOMOTIVE INNOVATION 1, 3 https://www.autosinnovate.org/posts/energy-environment/Lithium-Ion%20EV%20Battery%20Recycling%20Policy%20Framework.pdf (last visited Nov. 30, 2022).
[141] *Id.*
[142] Jim Motavalli, *Closing the Loop on EV Battery Recycling,* SAE INTERNATIONAL (Oct. 7, 2022), https://www.sae.org/news/2022/10/ev-battery-recycling.
[143] *Id.*
[144] *Reducing New Mining for Electric Vehicle Battery Metals*, *supra* note 138, at 28.
[145] *Id.*
[146] *Id.*

lessen and lessen, the need for sustainable metal sources will prove valuable over time. These considerations are dependent on making recycling a compulsory component of battery conservation.[147]

C. Tackling Critiques

i. Regulation as a Hindrance

Nevertheless, environmental regulations are not immune from scrutiny.[148] Numerous factors contribute to alleged, and often valid, shortcomings of environmental regulations, including ineffective implementation, economic degeneration, and unfair competition.[149] With particular attention on electric vehicles and their batteries, some offer that the industry will slip into these same shortcomings.[150] Indeed, recycling electric vehicle batteries will place significant financial burden on manufacturers.[151] Transportation alone may amount to 40 percent of the overall cost associated with these efforts.[152] Nevertheless, regulatory pitfalls are suspect at best.[153]

While regulations may be restrictive, if the decision to recycle is left solely to the discretion of manufacturers, then the potential environmental and economic

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[147] *Id.*
[148] Antoine Dechezlepêtre & Misato Sato, *The Impacts on Environmental Regulations on Competitiveness,* 11 Review of Environmental Economics and Policy (2017).
[149] *Id; see also* De Vann Sago, *The Difficulties of Enforcing Global Environmental Law,* GEORGETOWN ENVIRONMENTAL L. REV. (Feb. 1, 2019), https://www.law.georgetown.edu/environmental-law-review/blog/214/.
[150] Gregory Barber & Aarian Marshall, *Cars are going Electric. What Happens to the Used Batteries?,* WIRED (Nov. 2, 2021), https://www.wired.com/story/cars-going-electric-what-happens-used-batteries/.
[151] *Id.*
[152] *Id.*
[153] *Id.*

upsides of recycling will go unrealized.[154] In actuality, "many recyclers downcycle their material to a grade unable to be used for electric vehicle battery manufacturing."[155] Implementing a zero-exception policy in recycling will reverse such practices.[156] One need not look further than the effectiveness of lead-acid battery recycling.[157] Additionally, manufacturers and producers may be hit with short-term costs but profit from long-term gains.[158] Recycling addresses issues of "material insecurity and commodity price volatility," directing the market inward and reducing the need for further metal purchases.[159]

ii. Recycling Plant Pollutants

Recycling is often considered an unalloyed benefit.[160] An unforeseen side effect offered by some critics is contamination runoff from recycling plants, the very facilities burdened with avoiding pollution.[161] Some domestic manufacturers have circumnavigated government inspections by exporting batteries to foreign plants.[162] The result has been lead and other metal pollution in water sources, sickening the

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[154] Lauren Fricke, *The Long-Term Problem with Electric Vehicle Batteries: A Policy Recommendation to Encourage Advancement for Scalable Recycling Practices,* 12 SEATTLE J. OF TECH., ENVIRONMENTAL, AND INNOVATION LAW 27, 43 (2022).
[155] *Id.*
[156] *Id.*
[157] Lauren Neahaus, *The Electrifying Problem of Used Lithium Ion Batteries; Recommendations for Recycling and Disposal,* 42 ENVIRONS 65, 76 (2019).
[158] Viet Nguyen-Tien et al., *supra* note 77.
[159] *Id.*
[160] Fred Pearce, *Getting the Lead Out: Why Battery Recycling is a Global Health Hazard,* YALE ENVIRONMENT 360 (Nov. 2, 2020), https://e360.yale.edu/features/getting-the-lead-out-why-battery-recycling-is-a-global-health-hazard.
[161] *Id.*
[162] *Id.*

local residents.[163] While this issue has plagued foreign recyclers especially, the growing demand for battery recycling could retrospectively affect the U.S. as well.[164]

Largely, the U.S. holds its head above the rest for proper recycling efforts.[165] That does not mean though that the U.S. is immune to such devices. For regulation to prove successful, the onus must be placed on electric vehicle producers.[166] Producers should be responsible for "the collection, treatment, recycling, and disposal of batteries in proportion to their market share."[167] To comply with such regulations, the EPA should ensure that manufacturers and producers keep accurate records of their processes and send retired batteries to proper, licensed, and approved recycling plants.[168] There could also exist pecuniary incentives such as a buy-back option for recycled metals, allowing manufacturers to purchase recycled metals in proportion to the retired batteries shipped.

Additionally, transparency between the government, private sector, and consumers can prove paramount for corporate accountability.[169] Providing notice to residents within the vicinity of a treatment facility will promote greater public awareness.[170] Consumers have proved successful in holding recycling plants accountable in the past. In 2013, residents of Vernon, California, raised concerns about pollution stemming from a lead-acid recycling plant operated by Exide.[171] The

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[163] Pearce, *supra* note 160.
[164] *Id.*
[165] *Id.*
[166] Neahaus, *supra* note 157, at 85.
[167] *Id.*
[168] *Lithium-Ion EV Battery Recycling Policy Framework, supra* note 140, at 6-7.
[169] Neahaus, *supra* note 157, at 87.
[170] *Id.*
[171] *Id.* at 78-79.

South Coast Air Quality Management District investigations concluded that Exide pollutants from the Vernon plant threatened 110,000 residents.[172] There, the consumers and government working in tandem, exposed Exide for its lackluster pollution efforts and, as a result, obliged Exide to clean up toxic waste.[173]

IV. THE REGULATION

Electric vehicle battery regulation is not only likely but a necessary future for the United States.[174] The need for federal regulation is paramount for ensuring recycling produces positive environmental and economic results nationwide.[175] But for the purposes of this solution, the regulation should be eased into on a state level. While the need for federal regulation is inevitable, "states can be an important catalyst for federal action."[176] In doing so, Pennsylvania can become a trailblazer, taking the lead from states like California to initiate regulation.

Pennsylvania should enact a statewide electric vehicle battery law not so different than Pennsylvania's current lead acid battery regulation, 53 Pa. Stat. §4000.1510. However, Pennsylvania's regulation should be broader than the lead-acid battery law. That is, the Pennsylvania law should address the need for proper disposal and recycling of electric vehicle batteries in general and not simply limit its reach to lithium-ion batteries. The regulation should forbid the disposal of any

[172] *Id.*
[173] *Id.*
[174] Robert Bird et al., *The Regulatory Environment for Lithium Ion Battery Recycling,* 7 ACS ENERGY LETTERS 736, 737 (2022).
[175] *Id.*
[176] Neahaus, *supra* note 157, at 66.

electric vehicle battery, or component, in a landfill. Instead, electric vehicle batteries must be recycled in a preapproved recycling plant.

Additionally, the cost will be placed on the manufacturers, not consumers, to ensure electric vehicle batteries are recycled. To ensure compliance, automotive manufacturers will be charged with documenting these transactions, promptly notifying the Pennsylvania Department of Environmental Protection ("Pennsylvania DEP") of their efforts. Likewise, the Pennsylvania DEP will provide oversight on such efforts. Principally, the Pennsylvania DEP will inspect sites and premises governed by the proposed regulation. Furthermore, the Pennsylvania DEP will be empowered to sanction or cite those who fail to comply with these requirements. It should be noted, however, that this regulation serves as a starting point. Technological innovations, especially in the automotive industries, may prove difficult to legislate. Therefore, a Pennsylvania regulation will have to be crafted to conform with technological advances and economic incentives; more likely, the regulation would need to be a cooperative effort between the regulators and manufacturers to hold this regulation to its highest potential.

V. CONCLUSION

Simply put, the economic and environmental advantages of recycling outweigh the irrecoverable costs currently accepted by automotive manufacturers. Recycling regulation will not only reduce carbon emissions stemming from the transportation industry, but also preserve valuable metals and minerals within the United States, thereby avoiding over-reliance on foreign suppliers to meet current

and future demands.[177] Manufacturers, consumers, and the government can waste no time delaying this issue any further. The deficiency of electric vehicle battery recycling has no vast consequence as of now but will become more self-evident with time. Recycling's long-term advantages must be seriously considered to maximize its long-term gains. Now is the time for regulation.

[177] *Id.* at 74.

Case Note: *West Virginia v. Environmental Protection Agency*

John Silvester[1]

I. INTRODUCTION

The Constitution vests the legislative power of the government of the United States in the Congress of the United States, which consists of the Senate and the House of Representatives.[2] To become law, an act of Congress must typically be approved by both the House of Representatives and the Senate, and then approved by the President of the United States.[3] The United States Supreme Court regards bicameralism, which requires an act to pass both houses of Congress before becoming law; and presentment, which requires an act to be presented to the President for approval or veto; to be crucial parts of the government's lawmaking process.[4]

The drafters of the Constitution intentionally separated the lawmaking power from the executive branch of the government because they believed that concentrating both the legislative and the executive power in a single entity would threaten the liberty of the people.[5] Recognizing the drafters' intent, the Court has long adhered to the separation of powers doctrine, which prohibits the legislative,

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[2] U. S. Const. art. 1, § 1.

[3] U. S. CONST. art. 1, § 7. However, an Act passed by both houses of Congress may also become a law if the President fails to object within 10 days after it is presented to him, or if the President "vetoes" the act, but the House of Representatives and the Senate override the veto by a supermajority vote. *Id*.

[4] *See* Clinton v. City of New York, 524 U.S. 417, 449 (1998) (striking down the federal Line Item Veto Act because it conflicted with the bicameralism and presentment clauses).

[5] *See* THE FEDERALIST NO. 47 at 301 (James Madison) ("The accumulation of all powers, legislative, executive, and judiciary in the same hands . . . may justly be pronounced the very definition of tyranny.").

executive, or judiciary branches from discharging powers which the Constitution vests in a different governmental branch.[6]

However, many United States laws and regulations are enacted by the executive branch's administrative agencies, outside of the constitutional process of bicameralism and presentment.[7] Congress has created numerous administrative agencies, such as the Environmental Protection Agency ("EPA"), and endowed these agencies with the power to create rules within statutorily defined confines.[8] Some judicial scholars remain skeptical of such delegations of lawmaking authority, to the extent that that delegations of rule making power encroach upon the separation of powers. However, the Court holds delegations of lawmaking power to be permissible, so long as Congress provides sufficiently clear instructions and an "intelligible principle" to guide the agencies in their rule making.[9] The Administrative Procedure Act ("APA") of 1946 also proscribes procedural rules to which administrative agencies must adhere when they enact and amend rules.[10] But aside from the "intelligible principle" requirement and the APA's procedural rules, what additional constraints are there on agency rule making?

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[6] *See* Immigr. and Naturalization Serv. v. Chadha, 462 U.S. 919, 951 (1983) ("The Constitution sought to divide the delegated powers of the new federal government into three defined categories, legislative, executive and judicial, to assure, as nearly as possible, that each branch of government would confine itself to its assigned responsibility. The hydraulic pressure inherent within each of the separate branches to exceed the outer limits of its power, even to accomplish desirable objectives, must be resisted").
[7] *See* PHILIP HAMBURGER, IS ADMINISTRATIVE LAW UNLAWFUL? 1-2 (Univ. of Chicago Press 2015).
[8] *See* Legal Information Institute, *Administrative Law*, CORNELL.EDU (June 2022), https://www.law.cornell.edu/wex/administrative_law.
[9] J. W. Hampton, Jr. & Co. v. United States, 276 U.S. 394, 409 (1928) ("If Congress shall lay down by legislative act an intelligible principle to which the person or body authorized to fix such rates is directed to conform, such legislative action is not a forbidden delegation of legislative power").
[10] *See generally* 5 U.S.C. §§ 551-9 (formal agency rule making procedures are controlled by §§ 553, 556 and 557; informal rule making procedures are governed by 553).

In *West Virginia v. Environmental Protection Agency*, the Court recognized an important additional limitation on the lawmaking authority of administrative agencies.[11] The Clean Air Act authorizes the EPA to determine the "best system for emissions reduction" for power production facilities, and to proscribe emissions regulations based thereon.[12] In 2015, the EPA announced the new Clean Power Plan, which included a finding that the "best system" for reducing emissions from coal and natural gas power plants was to reduce the amount of energy produced in those types of plants, and require operators of such plants to subsidize energy production via cleaner energy sources.[13] For decades prior to 2015, the EPA had maintained that the "best system" for reducing pollution from fossil fuel fired plants involved using technologies and techniques to make power production more fuel-efficient and clean.[14] Never before had the EPA determined that the best system of emissions reductions for a fossil fuel plant involved reducing power production at that plant, or requiring producers to subsidize cleaner means of production.[15] After the EPA's actions were challenged, The Court held that the EPA acted unlawfully by making emissions rules based on its finding that the best system of emissions reduction for fossil fuel fired power plants was to reduce production at those plants, or require them to subsidize production at other plants, because the EPA's actions violated the major questions doctrine.[16]

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[11] West Virginia v. Env't Prot. Agency, 142 S. Ct. 2587, 2615 (2022).
[12] *Id.* at 2599.
[13] *Id.*
[14] *Id.*
[15] *Id.*
[16] *Id.* at 2616.

This case note explains why the *West Virginia* holding was a good decision, based on decades of precedent and the constitutional separation of powers doctrine. Section II sets forth the factual background and the elaborate procedural history which underlie the *West Virginia* case. Section III explains the Court's holding and rationale in detail. Section IV explains the history and development of related caselaw. Section V considers the landscape of the law concerning constitutional delegations of lawmaking power, post *West Virginia*, and explores alternate avenues by which the EPA's goals of reducing national carbon emissions may be achieved.

II. BACKGROUND: WEST VIRGINIA V. ENVIRONMENTAL PROTECTION AGENCY

A. Factual Background

On October 23, 2015, the EPA published a set of rules in the Federal Register, announcing its decision to start regulating carbon dioxide gas emissions from electric utility generating plants under the Clean Air Act's New Source Performance Standards program.[17] The EPA had determined that climate change constituted a threat that touched "nearly every aspect of public welfare," and that the United States, over the next few decades, would likely face serious risks of water and food shortage, along with extreme weather events such as heat waves, droughts, severe hurricanes, and flooding, and other negative consequences, as a result of climate change.[18] The EPA stated that carbon dioxide gas is a greenhouse gas which is known

[17] Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64510-64660 (Oct. 23, 2015) (amending 40 C.F.R. §§ 60, 70, 71, et al.).
[18] *Id.* at 64517.

to cause climate change, and is therefore an "air pollutant" that endangers "public health or welfare," making it subject to regulation under the Clean Air Act.[19]

In the substantive rule that followed, the EPA enacted two separate regulatory schemes to limit carbon dioxide emissions from power plants — one for new power plants and one for existing power plants.[20] For new power plants, the EPA determined that the "best system of emissions reduction" involved using a combination of high-efficiency energy production processes and carbon-capture exhaust filtration technologies; the EPA set emissions limits based on what was attainable by employing this "best system."[21] The regulatory scheme for new power plants is generally not at issue in this case. However, when creating the Clean Power Plan for existing fossil fuel power plants, the EPA took a more controversial approach, finding that the "best system" of emissions reduction included three "building blocks," and involved a concept called "generation shifting."[22]

The first building block involved using efficient technologies and processes to obtain "heat rate improvements" and improve the thermal efficiency of energy production at existing power plants.[23] However, the EPA noted that most fossil fuel fired power plants already operate at close to the optimal heat rate, so building block one would only result in "small emission reductions."[24] The EPA explained that, in

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[19] *Id.* at 64530.
[20] *Id.* at 64512, 64662.
[21] *Id.* at 64512.
[22] Carbon Pollution Emissions Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64661, 64667 (October 23, 2015) (amending 40 C.F.R. § 60).
[23] *Id.* at 64727.
[24] *Id.*

order to achieve the desired reduction in carbon dioxide emissions, existing power plants would also need to embrace building blocks two and three which involved "generation shifting from higher-emitting to lower-emitting" methods for producing electricity.[25] Building block two was to shift electricity production away from coal-fired power plants and towards natural-gas-fired plants, which the EPA noted would reduce carbon dioxide emissions, since natural gas plants produce "typically less than half" as much carbon dioxide per unit of electricity as coal plants.[26] The third building block was to shift from both coal- and gas-fired plants to plants with"low- or zero-carbon generating capacity," such as wind or solar plants.[27]

The standards of performance that the EPA established in the Clean Power Plan for existing power plants were based on its "best system" definition which included the three building blocks.[28] Notably, the two "generation shifting" building blocks accounted for the vast majority of the carbon dioxide emissions reductions, and the emissions standards for existing power plants ended up being more stringent than the emissions standards for new plants, due to the use of "generation shifting" in calculating the attainable emissions reductions for existing plants.[29]

The EPA explained that energy producers could comply with the new rules by reducing electrical production at their existing fossil fuel plants and building newer, more efficient power plants. Alternatively, producers could buy emission allowances

[25] *Id.* at 64728.
[26] *Id.*
[27] *Id.* at 64729.
[28] 80 Fed. Reg. 64661, 64729.
[29] *Id.* at 64728.

or credits in a "cap and trade" program, wherein producers of electricity who met the emissions standards could sell "emissions credits" to other producers.[30] The EPA noted that it could apply "a wide range of potential stringencies for the [best system of emissions reduction]," meaning that it could require only slight generation shifting, or aggressive generation shifting, and that it had selected standards that it regarded as "reasonable."[31] Overall, the EPA projected that by 2030, it's plan would reduce coal-based electricity generation by eleven percent and significantly increase production by renewable energy sources such as wind and solar.[32]

On the very same day that the EPA published these rules, numerous parties, including twenty-seven states, filed suit against the EPA, seeking to have the Clean Power Plan stayed and declared unconstitutional.[33] They argued that the term, "best system of emissions reduction" in the Clean Air Act referred to technological systems and techniques which make the production of energy cleaner, and that the EPA's use of "generation shifting" as a system for emissions reduction contradicted the historical and intended meaning of this term.[34]

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[30] *Id.* at 64731-32. The EPA created a sophisticated "cap-and trade" program, wherein power producers who meet their emissions goals can sell credit representing the value of that reduction to operators of power plants who cannot meet their emissions goals. *Id.* Thus, a power plant that fails to meet the carbon emissions cap set by the EPA may continue to operate by buying emissions credits from more environmentally friendly power producers. *Id.*
[31] *Id.* at 64797-64811.
[32] *Id.* at 64665.
[33] West Virginia v. Env't Prot. Agency, 142 S.Ct. 2587, 2604 (2022).
[34] *Id.*

B. Procedural History

The plaintiffs asked the D.C. Circuit Court of Appeals to stay the Clean Power Plan on October 23, 2015, the same day that EPA published its new rules.[35] The court declined to stay the rule, but the plaintiffs appealed to the United States Supreme Court, which granted a temporary stay, preventing the rule from taking effect until the EPA's new rules were subjected to further judicial review.[36]

The D.C. Circuit Court of Appeals heard arguments on the merits *en banc*. However, before a judgement was entered, the presidential administration changed over, in January 2017.[37] The new administration requested that litigation related to this issue be delayed, so that it could reconsider the Clean Power Plan.[38] The D.C. Circuit agreed, and later dismissed petitions for review as moot.[39]

In July 2019, the EPA repealed the Clean Power Plan, concluding that it had exceeded its own statutory authority under the Clean Air Act.[40] The EPA specifically noted that "generation shifting" should not have been considered as part of the "best system of emissions reduction," instead finding that the best system should only include systems that can be put into operation at a building, structure, facility or installation to limit emissions, such as add-on controls or more efficient practices.[41]

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[35] *Id*. Petitioners filed directly in the D.C. Circuit Court of Appeals pursuant to Federal Rule of Appellate Procedure 15, which provides that judicial review of an agency order is commenced by filing a petition for review in the appropriate Court of Appeals. Fed. R. App. P. 15.
[36] *Id.*
[37] *Id*.
[38] *Id*.
[39] *Id.*
[40] Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions From Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, 84 Fed. Reg. 32523 (July 8, 2019) (amending 40 C.F.R. § 60).
[41] *Id.* at 32523.

The EPA further concluded that the Clean Power Plan's generation shifting scheme fell under the "major question doctrine," which holds that administrative agencies cannot make changes to their regulatory schemes which would result in major economic or societal impacts without clear authorization from Congress.[42] The EPA then promulgated a replacement rule, the Affordable Clean Energy Rule, which was similar in substance to building block one of the Clean Power Plan, requiring equipment upgrades and operating practices that would improve electrical power plants' heat rates.[43]

A number of other states and private parties immediately filed petitions for review in the D.C. Circuit, challenging the EPA's 2019 repeal of the Clean Power Plan and the enactment of the Affordable Clean Energy Rule.[44] Other parties, including West Virginia, intervened to defend the EPA's actions.[45] The D.C. Circuit Court of Appeal consolidated all the petitions for review into a single case, and held, on January 19, 2021, that the EPA's repeal of the Clean Power Plan was based upon a mistaken reading of the Clean Air Act.[46] The court concluded that the statute could be reasonably read to allow for generation shifting as part of the best system for emissions reduction; it vacated the Affordable Clean Energy Rule and revived the Clean Power Plan, which the Affordable Clean Energy rule had replaced.[47]

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[42] *Id.* at 32529.
[43] *Id.* at 32522, 32537.
[44] *West Virginia*, 142 S.Ct. at 2605.
[45] *Id.*
[46] *Id.*
[47] *Id.* at 2606.

Soon after this holding, in January 2021, the presidential administration changed again, and the EPA asked the court to stay its holding so that the new administration could reconsider its stance on the Clean Power Plan.[48] The court agreed to temporarily stay the holding, but Petitioners, seeking to establish that the Clean Power Plan was unlawful, appealed to the United States Supreme Court, which granted certiorari and consolidated the cases into *West Virginia v. Environmental Protection Agency*.[49]

C. Issue and Holding

The central question that the United States Supreme Court addressed in *West Virginia v. Environmental Protection Agency* was whether the EPA exceeded its authority when it determined that the "best system of emissions reduction" for existing power plants required either the full or partial shut-down of those power plants, or the subsidization of cleaner energy plants.[50] The Court addressed this question through the lens of the "major questions doctrine," which provides that in "extraordinary cases" in which the agency's action exceeds the "historical breadth of the authority that [the agency] has asserted" and the matter involved has great "economic and political significance," then the agency's action is invalid, unless it can show "clear congressional authorization" to support its new assertion of authority.[51] Ultimately, the Court found the Clean Power Plan invalid because the authority the EPA asserted under the Clean Power Plan exceeded historical norms, the matter

[48] *Id.*
[49] *Id.*
[50] *West Virginia*, 142 S.Ct. at 2607.
[51] *Id.* at 2608.

involved was of great national importance, and the EPA failed to show "clear congressional authorization" to justify its actions.[52]

III. RATIONALE: WEST VIRGINIA V. ENVIRONMENTAL PROTECTION AGENCY

A. The Historical Breadth of the EPA's Authority

The Clean Air Act establishes three air-pollutant regulatory programs which are administered by the EPA: the National Ambient Air Quality Standards program, the New Source Performance Standards program, and the Hazardous Air Pollutants program.[53] Each of these regulatory programs addresses a particular type of harmful air pollution.[54]

At issue in the *West Virginia* was the New Source Performance Standards program, which primarily targets new and modified sources of pollution.[55] It directs the EPA to identify stationary sources which contribute significantly to "air pollution which may reasonably be anticipated to endanger public health or welfare."[56] After identifying such sources, the EPA promulgates "standards of performance" for new sources of pollution, which "reflect the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the [EPA] determines has

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[52] *Id.* at 2616.
[53] *See* 42 U.S.C. §§ 7408–7412 (sections 7408 to 7410 create the National Ambient Air Quality Standards Program; § 7411 creates the New Source Performance Standards program; and § 7412 creates the Hazardous Air Pollutant program).
[54] *West Virginia*, 142 S.Ct. at 2600.
[55] *See* 42 U.S.C. § 7411.
[56] 42 U.S.C. § 7411(b)(1)(A).

adequately been demonstrated."[57] After the EPA establishes standards for new sources, it must also address emissions of the same pollutants by preexisting sources of pollution, but only for chemicals which are not already regulated under the National Ambient Air Quality Standards or Hazardous Air Pollutant programs.[58] Thus, § 7411(d) "operates as a gap-filler," allowing the EPA to regulate emissions from existing sources which are not already regulated by the other two programs.[59] The EPA lacks authority to directly govern producers of pollutants under the New Source Performance Standards program.[60] Instead, the states must each submit plans to the EPA which explain the restrictions they will adopt to ensure that producers of pollution within their jurisdiction will meet the EPA's standards.[61]

Historically, the EPA used the powers granted to it under § 7411(d) in only a handful of instances.[62] In 1976, the EPA used § 7411(d) to place limits on acid mist being generated by sulfuric acid production plants.[63] In 1979, the agency again used § 7411(d) to limit sulfide gas pollution by Kraft pulp mills.[64] In 1996, the EPA used §

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[57] 42 U.S.C. § 7411(a)(1).
[58] 42 U.S.C. § 7411(d).
[59] *West Virginia*, 142 S.Ct. at 2601 (quoting *Am. Lung Ass'n v. Env't Prot. Agency*, 985 F.3d 914, 932 (CADC 2021)).
[60] *Id.*
[61] 42 U.S.C. § 7411(d)(1).
[62] *West Virginia*, 142 S.Ct. at 2602 ("Reflecting the ancillary nature of Section [7411(d)], EPA has used it only a handful of times since the enactment of the statute in 1970"); Carbon Pollution Emissions Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64703 ("Over the last fourty years, under [section 7411(d)], the [EPA] has regulated four pollutants from five source categories ").
[63] Standards of Performance for New Stationary Sources; Emission Guidelines for the Control of Sulfuric Acid Mist From Existing Sulfuric Acid Production Units, 41 Fed. Reg. 48706 (November 4, 1976) (amending 40 C.F.R. Part 60)).
[64] Kraft Pulp Mills; Final Guideline Document; Availability, 44 Fed. Reg 29829 (May 22, 1979) (amending 40 C.F.R. § 60).

7411(d) to limit the emission of various harmful gasses from municipal landfills.[65] Aside from these instances, the record of § 7411(d)'s use prior to 2015 is sparse.[66]

Carbon dioxide is not one of the specific chemicals that is controlled under the National Ambient Air Quality Standards or the Hazardous Air Pollutant programs, so the EPA lacks authority to regulate it under those programs.[67] Instead, the EPA sought to regulate carbon dioxide under the § 7411 New Source Performance Standards program.[68] For preexisting power plants, only the § 7411(d) "gap filler" provision could apply.[69] Thus, the EPA used the "obscure, never used" gap filler provision, § 7411(d), as the sole statutory basis to support the Clean Power Plan,

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[65] Standards of Performance for New Stationary Sources and Guidelines for Control of Existing Sources: Municipal Solid Waste Landfills, 61 Fed. Reg. 9907 (March 12, 1996) (amending 40 C.F.R. Parts 51, 52, and 60)).

[66] *West Virginia*, 142 S.Ct. at 2602 (quoting Hearings on S. 300 et al. before the Subcommittee on Environmental Protection of the Senate Committee on Environment and Public Works, 100th Long., 1st Sets., 13 (1987) (remarks of Sen. Durenberger) ([Section 7411(d)] is an "obscure, never used section of the law")).

[67] *West Virginia*, 142 S.Ct. at 2602. The National Ambient Air Quality Standards program targets pollutants which "may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7408(a)(1). The statute tasks the EPA to establish "ambient air quality standards" for each such pollutant which would be adequate "to protect the public health" from the harmful effects of those pollutants. 42 U.S.C. § 7409(b). Carbon dioxide is not one of the chemicals that the EPA regulates under the National Ambient Air Quality Standards program. *See Util. Air Regul. Grp. v. Env't Prot. Agency*, 573 U.S. 302, 308 (noting that National Ambient Air Quality Standards regulations only exist for six pollutants: "sulfur dioxide, particulate matter, nitrogen dioxide, carbon monoxide, ozone, and lead"). The Hazardous Air Pollutants program targets pollutants other than those already covered by the National Ambient Air Quality Standards program, which present "a threat of adverse human health effects," including "carcinogenic, mutagenic" and otherwise toxic substances. 42 U.S.C. § 7412(b)(2). The statute requires the EPA to promulgate emissions standards for such substances to achieve "the maximum degree of reduction in emissions . . . taking into consideration the cost of achieving such emission reduction" and other important factors." 42 U.S.C. § 7412(d)(2). The Clean Air Act lists 189 chemicals which Congress determined to be hazardous, and authorizes procedures by which the EPA to amend the list. 42 U.S.C. § 7412(b). Carbon dioxide is not one of the pollutants covered by the Hazardous Air Pollutants program. *See* 42 U.S.C. 7412(b)(1); *see also* United States Environmental Protection Agency, *Initial List of Hazardous Air Pollutants with Modifications*, EPA.GOV (December 19, 2022), https://www.epa.gov/haps/initial-list-hazardous-air-pollutants-modifications.

[68] *West Virginia*, 142 S.Ct. at 2602.

[69] *Id.*

which was intended to effectuate an "aggressive transformation in the domestic energy industry," away from fossil fuel and towards renewables, on a national scale.[70] Not only did the breadth of authority the EPA asserted under § 7411(d) exceed the historical norm; the manner in which the EPA set emissions limits in the Clean Power Plan also conflicted with historical precedent.[71] Prior to 2015, the EPA had never devised a "system" for emissions reductions that involved shutting down or reducing production at any particular type of power plant, or requiring the plant operator to subsidize other producers of electricity.[72] Instead the EPA previously based its "best systems of emissions reduction" on techniques, technologies and measures which could be deployed at existing power plants to increase efficiency and cleanliness of energy production.[73] For the foregoing reasons, the Court found that the breadth of the authority that the EPA asserted under § 7411(d) in the Clean Power Plan substantially exceeded the historical breadth of the authority that the EPA had asserted under that statute.[74]

B. Economic and Political Significance

Next, the Court considered the economic and political significance of the Clean Power Plan. The economic significance of the Clean Power Plan was hardly in dispute: The EPA acknowledged that its new rules would require plant operators to spend billions of dollars in compliance costs, and would result in the closure of numerous

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[70] *Id.* at 2603 (citing U.S. ENV'T PROT. AGENCY, *Fact Sheet: Overview of the Clean Power Plan; Cutting Carbon Pollution From Power Plants* 2, EPA.GOV (2015), https://archive.epa.gov/epa/cleanpowerplan/fact-sheet-overview-clean-power-plan.html#print.
[71] *West Virginia*, 142 S.Ct. at 2611.
[72] *Id.*
[73] *Id.*
[74] *Id.*

fossil fuel-fired power plants.[75] Additionally, the United States Energy Information Administration predicted that the adoption of the Clean Power Plan would cause persistent increases in electricity prices and would reduce gross domestic product by at least a trillion dollars by 2040.[76] The Court noted that the EPA's newly asserted powers under § 7411(d) "conveniently enabled it to enact a [cap-and-trade] program" under the Clean Air Act, although Congress "consistently rejected proposals to amend the Clean Air Act to create such a program."[77] Concluding that the topic of greenhouse gas regulation under the Clean Air Act would have significant economic effects, and was a hotly debated political topic, the Court found that the EPA's actions were covered by the "major questions doctrine" and would therefore be unlawful unless the EPA could show "clear congressional authorization."[78]

C. Clear Congressional Authorization

To determine whether there was clear congressional authorization, the Court looked to the text of the Clean Air Act.[79] Section 7411(d) authorizes the EPA to determine the best "system" of emissions reduction, and then to proscribe emissions caps attainable by applying that system.[80] The Court noted that, in some contexts,

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[75] U.S ENV'T PROT. AGENCY, *Regulatory Impact Analysis for the Clean Power Plan Final Rule* 3-22, 3-30, 3-33, 6-24, 6-25 EPA.GOV (August 2015), https://archive.epa.gov/epa/sites/production/files/2015-08/documents/cpp-final-rule-ria.pdf.
[76] United States Department of Energy, *Analysis of the Impacts of the Clean Power Plan* 21, 63-64 EIA.GOV (May 2015), https://www.eia.gov/analysis/requests/powerplants/cleanplan/pdf/powerplant.pdf.
[77] *West Virginia*, 142 S.Ct. at 2614 (citing American Clean Energy and Security Act of 2009, H. R. 2454, 111th Cong., 1st Sess.; Clean Energy Jobs and American Power Act, S. 1733, 111th Cong., 1st Sess. (2009)).
[78] *West Virginia*, 142 S.Ct. at 2614.
[79] *Id.*
[80] *Id.*

the term "system" can have a very broad, almost all-encompassing definition, such that a "generation shifting" regulatory scheme could be considered a system.[81] However, within the context of § 7411, the term "system" was intended to have a more narrow definition.[82]

The Court noted that the EPA had historically understood the term "system" as referring to technological systems or techniques.[83] Additionally, the Court remarked that the use of "generation shifting" as a part of a "system" conflicted with the statutory text requiring the EPA to proscribe caps at levels attainable by applying the "system," because the degree of emission limitation achievable through generation shifting depends on the degree generation shifting required.[84] Therefore, the Court found that Congress didn't clearly authorize the EPA to enact the type of system that was used in the 2015 Clean Power Plan.[85]

The Court also noted that, when Congress amended the Clean Air Act in 1990, emissions trading programs like the one created in the Clean Power Plan were a "novel and highly touted concept," and Congress specifically made amendments to the National Ambient Air Quality Standards program to authorize their use, and to proscribe clear "measures, means and techniques" that could be used in cap-and-trade programs.[86] Although Congress did alter § 7411 in the 1990 amendment to the Clean Air Act, Congress, notably, did not authorize the use of emissions trading programs

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[81] *Id.*
[82] *Id.* at 2615.
[83] *Id.*
[84] *Id.*
[85] *Id.*
[86] *Id.* (citing L. Heinzerling & R. Steinzor, *A Perfect Storm: Mercury and the Bush Administration*, 34 ENV. L. REP. 10297, 10309 (2004)).

under that section, suggesting that Congress did not intend for emissions trading programs to be created as a "system" for emissions reduction under § 7411.[87] For the foregoing reasons, the Court concluded that the EPA did not have "clear congressional authorization" to enact the Clean Power Plan, and struck down the plan as an invalid exercise of agency lawmaking.[88]

IV. HISTORICAL CONTEXT: THE RISE OF THE MAJOR QUESTIONS DOCTRINE

The holding in *West Virginia v. Environmental Protection Agency* is based on the application of the "major questions doctrine;" but what is the major questions doctrine? Where does it come from, and how should it be applied? To answer these questions, it's important to consider the history and judicial framework surrounding delegations of lawmaking power in the United States.

A. Constitutional Separation of Powers

The framers of the United States Constitution feared that vesting too much power into any governmental entity would eventually allow the holder of those powers to gain nearly unlimited power, like the despotic monarchs reigning in Europe at that time.[89] In an effort to constrain the tendency of the government towards autocracy, the framers separated the legislative, executive, and judicial powers into three distinct branches of government, and emplaced a system of checks and balances

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[87] *Id.*
[88] *Id.* at 2616.
[89] *See*, *e.g.*, THE FEDERALIST NO. 47 at 301 (James Madison) ("The accumulation of all powers, legislative, executive, and judiciary, in the same hands, whether of one, a few, or many . . . may justly be pronounced the very definition of tyranny); Thomas Jefferson, Notes on the State of Virginia (1787), *in* THE ESSENTIAL JEFFERSON 77, 99 (John Dewey ed., 2008) ("The concentrating [of legislative, executive and judicial powers] in the same hands is precisely the definition of despotic government").

through which each branch could act to counter the actions of the other branches.[90] The Constitution vests all legislative power in Congress, all executive power in the President, and all judicial power in the United States Supreme Court.[91] Indeed, the very structure of the Constitution, with Articles I through III each delegating the legislative, executive and judicial powers to the three branches of government, respectively, suggests that the framers of the Constitution considered the separation of powers doctrine to be of foundational importance.[92] As a result, the Court recognizes the separation of powers doctrine as a limit on the discharge of governmental powers by each branch, and has struck down numerous laws and regulations over the years for running afoul of that doctrine.[93]

However, as a practical matter, the separation of powers is not absolute — the executive branch is necessarily endowed with the power to interpret the statutes it administers, and make certain rules.[94] In the first half of the twentieth century, the Court addressed the issue of whether certain delegations of legislative power to the executive branch were consistent with the separation of powers.[95]

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[90] *See*, *e.g.*, Letter from John Adams to Richard Henry Lee (Nov. 15, 1775) ("A legislative, an executive and a judicial power comprehend the whole of what is meant and understood by government. It is by balancing each of these powers against the other two, that the efforts in human nature towards tyranny can alone be checked and restrained.").
[91] U.S. CONST. art. 1, § 1, cl. 1; U.S. CONST. art. 2, § 1, cl. 1; U. S. CONST. art. 3, § 1, cl. 1.
[92] Immigr. and Naturalization Serv. v. Chadha, 462 U.S. 919, 946 (1983) ("The very structure of the articles delegating and separating powers under Arts. I, II, and III exemplify the concept of separation of powers").
[93] *See*, *e.g.*, Morrison v. Olson, 487 U.S. 654, 693 (1988) (noting that the Court has repeatedly "reaffirmed the importance in our constitutional scheme of the separation of powers into the three coordinate branches.").
[94] *See*, *e.g.*, Mistretta v. United States, 488 U.S. 361, 416 (1989) (Scalia, J., dissenting) ("no statute can be entirely precise, and some judgements, even some judgements involving policy considerations, must be left to the officers executing the law").
[95] *See* I. Wurman, *Constitutional Administration*, 69 STAN. L. REV. 359, 375 (February 2017).

B. Constitutional Limits on Delegations of Lawmaking Authority

In *J.W. Hampton, Jr. & Co. v. United States*, the United States Supreme Court considered a challenge to the "flexible tariff provision" of the Tariff Act of September 21, 1922, which delegated to the President the traditionally Congressional power to amend the tariff schedule based on fluctuations to the "costs of production" for particular goods.[96] The Court decided that Congress could properly delegate this power to the President, so long as it laid down "an intelligible principle" to direct the executive in determining the tariff rate.[97] The Court explained that the flexible tariff provision did not involve an unlawful use of the legislative power to set tariffs by the executive, because the executive could only set the tariff pursuant to the directives which Congress had provided in the act.[98] Therefore, the executive only had discretion "to be exercised in the execution of the law" and not in the legislative practice of making of policy itself.[99]

Although the Court found that the flexible tariff provisions met constitutional muster, it struck down several delegations of legislative power as improper in 1935, because they lacked an adequately intelligible principle.[100] As part of the New Deal legislation, Congress passed the National Industrial Recovery Act ("NIRA"), which included provisions giving the President wide authority to create law to promote the rehabilitation and expansion of trade and industry in response to the great

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[96] J.W. Hampton, Jr. & Co. v. United States, 276 U.S. 394, 401 (1928).
[97] *Id.* at 352.
[98] *Id.*
[99] *Id.* (quoting *State ex rel. R.R. & Warehouse Comm'n v. Chi., Milwaukee & St. Paul Ry. Co.*, 37 N.W. 782, 788 (Minn. 1888), *rev'd*, 134 U.S. 418 (1890)).
[100] *See*, *e.g.*, A.L.A. Schechter Poultry Corp. v. United States, 295 U.S. 495, 541-2 (1935); *Panama Refining Co. v. Ryan*, 293 U.S. 388, 430 (1935).

depression.[101] In *Panama Refining Co. v. Ryan*, the Court struck down provisions of NIRA which gave the President authority to prohibit the transportation of petroleum products in interstate and foreign commerce, because the provisions lacked adequate guiding principles to direct the President in the execution of the law.[102] Similarly, in *A.L.A. Schechter Poultry Corp. v. United States*, the Court struck down additional NIRA provisions because, considering "the nature of the few restrictions that are imposed, the discretion of the President" in making policy decisions and rules was "virtually unfettered," therefore the law constituted an "unconstitutional delegation of legislative power."[103]

During World War II, the Court repeatedly upheld delegations of legislative power as permissible, reiterating the "intelligible principle" requirement articulated in *J. W. Hampton*.[104] The Court's trend of allowing delegations of legislative and judicial authority continued after World War II and through the remainder of the 20th century.[105] The nondelegation doctrine espoused in *Panama* and *Schechter* was never overturned, but it was never again used by the Court to strike down a federal

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[101] See *A.L.A. Schechter*, 295 U.S. at 521; *Panama*, 293 U.S. at 406.
[102] *Panama*, 293 U.S. at 430.
[103] *A.L.A. Schechter*, 295 U.S. at 542.
[104] *See*, *e.g.*, Am. Power & Light Co. v. Sec. Exch. Comm'n, 329 U.S. 90, 104 (upholding a delegation of authority which allowed the executive branch's Securities and Exchange Commission to prevent unfair or inequitable distribution of voting power among security holders); Yakus v. United States, 321 U.S. 414, 426 (1944) (upholding delegation allowing an executive "Price Administrator" to set commodity prices under the Emergency Price Control Act of 1942); Fed. Power Comm'n v. Hope Nat. Gas Co., 320 U.S. 591, 602 (1944) (upholding delegation allowing an executive agency to set "just and reasonable" rates for the cost of power); Nat'l Broad. Co. v. United States, 319 U.S. 190, 225-6 (1943) (upholding delegation to the executive branch's Federal Communications Commission to regulate broadcast licensing "as public interest, convenience, or necessity" require).
[105] *See*, *e.g.*, Lichter v. United States, 334 U.S. 742, 778 (upholding a delegation of legislative authority which allowed the executive to determine what constituted "excessive profits.").

statute.[106] Although seldom used, the decisions in *Panama* and *Schechter* remain valid law to this day, and the Court remains mindful of the separation of powers issue posed by delegation of legislative power.[107]

C. Judicial Deference to Administrative Agencies

In 1984, in the landmark case, *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.*, the Court addressed a question of statutory interpretation by an administrative agency.[108] In the Clean Air Act, Congress delegated to the EPA the authority to regulate "stationary sources [of pollution]," but Congress had not provided a definition for that term.[109] The EPA created and promulgated its own definition for the term, and its definition was challenged in court.[110] The Court established a two-step process for judicial review of agency interpretations of the statutes that the agency administers.[111] First, it looks to see if Congress has "directly spoken to the precise question at issue. If the intent of Congress is clear, that is the end of the matter; for the court."[112] Second, if Congress has not directly addressed the precise question at issue, the Court must accept the agency's interpretation of the

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[106] Mistretta v. United States, 488 U.S. 361, 373 (1989) ("After invalidating in 1935 two statutes as excessive delegations, see [*A.L.A. Schechter* and *Panama*] we have upheld, again without deviation, Congress' ability to delegate power under broad standards.").
[107] Gundy v. United States, 139 S.Ct. 2116, 2121 (2019) ("The nondelegation doctrine bars Congress from transferring its legislative power to another branch of Government."); *Gundy*, 139 S.Ct. at 2132 (Gorsuch, J., dissenting) (explaining that dissenters would have struck down certain provisions of the Sex Offender Registration and Notification Act under the nondelegation doctrine for lack of an intelligible principle).
[108] Chevron U.S.A., Inc. v. Nat. Res. Def. Council, Inc., 467 U.S. 837, 840 (1984).
[109] *Id.*
[110] *Id.*
[111] *Id.* at 842-4.
[112] *Id.* at 842-3.

statute, unless the agency's interpretation is unreasonable.[113] The Court explained that its decision rested upon the fact that Congress had implicitly delegated to EPA the power to reasonably interpret the Clean Air Act, for if the EPA was powerless to construct an understanding of its own statute, then the EPA would also be powerless to administer the program created by the statute.[114] In the case of *Auer v. Robbins*, the Court reaffirmed its *Chevron* holding, noting that, in step two of the *Chevron* test, a court must uphold "an agency's permissible interpretation of its regulation."[115]

D. Limitations on Deference and the Rise of the Major Questions Doctrine

The Court's holdings in *Chevron* and *Auer* became known as the *Chevron* deference or *Chevron-Auer* deference doctrine, and they are still binding precedent at the present time.[116] However, in the past few decades, the Court delivered a series of holdings which significantly limited the scope of *Chevron* deference.

For instance, ten years after *Chevron*, in 1994, the Court invalidated the Federal Communications Commission's ("FCC's") interpretation of a statutory provision which granted the FCC the authority to "modify" certain requirements under the Communications Act of 1934.[117] It held that the FCC was not entitled to

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[113] *Id.* at 844 ("a court may not substitute its own construction of a statutory provision for a reasonable interpretation made by the administrator of an agency").
[114] *Id.*
[115] Auer v. Robbins, 519 U.S. 452, 457 (1997).
[116] *See*, *e.g.*, West Virginia v. Env't Prot. Agency, 142 S.Ct. 2587, 2016 (although the Court did not apply the *Chevron* test under this case, the commentary implies that the *Chevron* test is still valid as of 2022).
[117] MCI Telecomm. Corp. v. Am. Tel. and Tel. Co., 512 U.S. 218, 229 (1994).

Chevron deference because its interpretation of the statute went "beyond the meaning that the statute [could] bear."[118]

In 2000, in the case of *Food and Drug Admin. v. Brown & Williamson Tobacco Corp.*, the Court again struck down regulations after the Food and Drug Administration ("FDA") stepped beyond the bounds of its statutory power.[119] In *Brown & Williamson Tobacco Corp.*, the FDA promulgated new regulations for tobacco advertisement, pursuant to its powers under the Food, Drugs and Cosmetics Act ("FDCA"), intending to reduce tobacco consumption among minors.[120] However, the Court struck down these regulations, finding that the FDA could not regulate tobacco marketing under the FDCA, because doing so conflicted with Congressional intent.[121] It noted that the FDA was not entitled to *Chevron* deference because Congress had already provided for the regulation of tobacco advertisement, under a regulatory scheme including the Federal Cigarette Labeling and Advertising Act, and other statutes.[122] The Court explained that it was important to view the statute at issue, in this case the FDCA, in context within the relevant regulatory framework and within history, in order to determine Congress's intent.[123] Further, the Court noted that, "in extraordinary cases . . . there may be reason to hesitate" before deferring to an agency's interpretation of its statute.[124]

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[118] *Id.*
[119] Food and Drug Admin. v. Brown & Williamson Tobacco Corp., 529 U.S. 120, 161 (2000).
[120] *Id.* at 127.
[121] *Id.* at 161.
[122] *Id.* at 137.
[123] *Id.* at 157.
[124] *Id. at 158.*

More recently, in 2014, the Court struck down a set of EPA regulations under the Clean Air Act which would have required permitting for certain producers of greenhouse gasses, in the case *Utility Air Regulatory Group v. Environmental Protection Agency*.[125] The EPA's regulations were premised on a definition of the term "any air pollutant" within the context of the Clean Air Act's Title V provision related to permitting.[126] The Court found that, when read within the statutory scheme, the term "any air pollutant" could only reasonably be constructed to apply to air pollutants regulated under the National Ambient Air Quality Standards program, which did not cover greenhouse gasses.[127] It held that the EPA's interpretation of the term was inconsistent with the statutory scheme, therefore the EPA was not entitled to *Chevron* Deference.[128] The Court further noted that if the EPA's interpretation of the statute were accepted, it would dramatically increase the administrative costs related to the Clean Air Act.[129] When "an agency claims to discover a long-extant statute an unheralded power to regulate a significant portion of the American economy, we typically greet its announcement with a measure of skepticism."[130]

In 2021, the Court again snubbed an agency's assertion of a new power in the case, *Alabama Association of Realtors v. Department of Health and Human*

[125] Util. Air Regul. Grp. v. Env't Prot. Agency, 573 U.S. 302, 333–34 (2014).
[126] *Id.* at 308.
[127] *Id.* at 320.
[128] *Id.* at 321.
[129] *Id.* at 322 (according to the EPA, "annual permit applications would jump from about 800 to nearly 82,000 [and] annual administrative costs would swell from $12 million to over $1.5 billion" if EPA's construction of the statute was not struck down).
[130] *Id.* (quoting *Food and Drug Admin. v. Brown & Williamson Tobacco Corp.,* 529 U.S. 120, 161 (2000)).

Services.[131] During the COVID-19 pandemic, the Centers for Disease Control ("CDC") imposed a moratorium on the eviction of tenants by landlords, "covering all residential properties nationwide and imposing criminal penalties on violators."[132] The CDC claimed authority for the moratorium under § 361(a) of the Public Health Service Act, which authorizes "[t]he Surgeon General . . . to make and enforce such regulations as in his judgement are necessary to prevent the introduction, transmission, or spread of communicable diseases."[133] The Court found that, reading the statutory language in context, the statute only gives the surgeon general discretion to undertake "direct targeting of disease" through measures such as "fumigation, disinfection, sanitation" or "pest extermination," whereas the CDC was claiming the broad power to impose a general eviction moratorium which would have only a remote, downstream effect on the spread of the pandemic.[134] Additionally, the Court noted that it expected Congress to "speak clearly" when authorizing an agency to exercise powers of "vast economic and political significance."[135] As such, the Court ended the eviction moratorium, finding that the CDC's reading of the statute would give the CDC "a breathtaking amount of authority" and noted: "Section 361(a) is a wafer-thin reed on which to rest such sweeping power."[136]

Less than a year later, in *National Federation of Independent Businesses v. Department of Labor Occupational Safety and Health Administration*, the Court

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[131] Alabama Ass'n of Realtors v. Dep't of Health and Hum. Servs., 141 S.Ct. 2485, 2490 (2021).
[132] *Id.* at 2486.
[133] *Id.* at 2487 (quoting 42 U.S.C. § 264(a)).
[134] *Alabama Ass'n of Realtors*, 141 S.Ct. at 2489.
[135] *Id.* (quoting *Util. Air Regul. Grp. v. Env't Prot. Agency*, 573 U.S. 302, 324 (2014)).
[136] *Alabama Ass'n of Realtors*, 141 S.Ct. at 2490.

stayed a mandate issued by the Occupational Safety and Health Administration which required all employers of 100 or more employees to either require all employees to receive vaccination against COVID 19, or wear masks and undergo weekly testing for the COVID-19 virus at their own expense.[137] The Court found that "this [was] no ordinary exercise of federal power," again repeating that it "expect[s] Congress to speak clearly when authorizing an agency to exercise powers of vast economic and political significance."[138] It held that the Occupational Safety and Health Act merely authorized OSHA to enforce "occupational" safety and health standards associated with "work-related dangers," whereas the vaccine mandate constituted a "general public health measure" associated with the "universal" risk posed by COVID-19.[139] Notably, the concurring opinion clearly embraced, for the first time in a United States Supreme Court opinion, the term "major questions doctrine" to describe the holding.[140]

V. ANALYSIS: THE UNITED STATES SUPREME COURT WAS RIGHT TO STRIKE DOWN THE EPA'S CLEAN POWER PLAN

A. The Roots of the Major Questions Doctrine

In *West Virginia v. Environmental Protection Agency*, the United States Supreme Court formally adopted the major questions doctrine, which holds that when an administrative agency makes a novel assertion of authority which has broad economic and political significance, and which exceeds the agency's historic breadth

[137] Nat'l Fed'n of Indep. Bus. v. Dep't of Lab. Occupational Safety and Health Admin., 142 S.Ct. 661, 666 (2022).
[138] *Id.* at 665.
[139] *Id.*
[140] *Id.* at 667 (Gorsuch, J., concurring).

of authority, the agency must show "clear congressional authorization" to support its new assertion of authority.[141] The primary purpose of the major questions doctrine is to ensure that Congress remains the governmental body that makes major national policy decisions, rather than administrative agencies under the executive branch.[142] The major questions doctrine bolsters the constitutional separation of powers, by preventing administrative agencies from exercising legislative policy-making power on important issues.[143]

While the major questions doctrine's name is new, a review of judicial precedent shows that the principles and policy behind the doctrine are not. The major questions doctrine is an outgrowth of the separation of powers — a foundationally important concept in constitutional law.[144] Almost a century ago, when the Court first considered the legality of delegations of congressional lawmaking power to the executive branch, it considered the separation of powers issue and imposed the "intelligible principle" restriction, drawing an important distinction between allowing the executive discretion in the execution of the law, and discretion in determining "what [the law] should be."[145] In 1935, the Court renewed its commitment to the separation of powers by striking down numerous provisions of the National Industrial

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[141] West Virginia v. Env't Prot. Agency, 142 S.Ct. 2587, 2616 (2022).
[142] *Nat'l Fed'n of Indep. Bus.*, 142 S.Ct. at 667 (Gorsuch, J., concurring) ("The central question we face today is: Who decides? . . . an administrative agency in Washington, . . . or . . . the people's elected representatives in Congress[?]").
[143] *West Virginia*, 142 S.Ct. at 2617 (Gorsuch, J., concurring) ("The major questions doctrine works . . . to protect the Constitution's separation of powers.").
[144] Immigr. and Naturalization Serv. v. Chadha, 462 U.S. 919, 946 (1983) ("The very structure of the articles delegating and separating powers under Arts. I, II, and III exemplify the concept of separation of powers").
[145] J. W. Hampton, Jr. & Co. v. United States, 276 U.S. 394, 401 (1928).

Recovery Act for failure to comply with the intelligible principle and discretionary requirements imposed in *J.W. Hampton*, giving rise to the nondelegation doctrine.[146]

The Court's *Chevron* holding in 1984 appears, at first glance, to weaken the nondelegation doctrine, to the extent that *Chevron* adopted a deferential policy allowing agencies to reasonably interpret their own powers. However, upon careful consideration, the *Chevron* holding and its progeny do not depart from the separation of powers, but instead reflect a judicial decision to respect the lawmaking power of Congress. If the Court had not held in *Chevron* that the EPA had the implicit authority to reasonably interpret the Clean Air Act, then the EPA would be unable to effectively administer the Clean Air Act, and Congress's intent in passing the Clean Air Act would be frustrated. Thus, *Chevron* deference is not a departure from the separation of powers: it is a common-sense policy intended to provide agencies with the basic discretionary authority that they need to carry out Congress's will with efficiency.

In the years that followed *Chevron*, the Court demonstrated that it remained skeptical of congressional delegations of power by pointing out numerous circumstances where agencies were not entitled to *Chevron* Deference.[147] In recent years, perhaps in an effort to avoid political gridlock in Congress, especially in response to the COVID-19 pandemic, federal agencies began to make bold new

[146] *See* A.L.A. Schechter Poultry Corp. v. United States, 295 U.S. 495, 541–42 (1935); Panama Refining Co. v. Ryan, 293 U.S. 388, 430 (1935).
[147] *See*, *e.g.*, MCI Telecomm. Corp. v. Am. Tel. and Tel. Co., 512 U.S. 218, 229 (1994); Food and Drug Admin. v. Brown & Williamson Tobacco Corp., 529 U.S. 120, 161 (2000); Util. Air Regul. Grp. v. Env't Prot. Agency, 573 U.S. 302, 333–34 (2014).

assertions of authority which required judicial intervention at an increasing rate.[148] It is likely that the Court decided to articulate the major questions doctrine clearly in *West Virginia*, at least in part, as a counter measure against this rising trend of administrative agencies making bold new forays into the policy domain.

In review, the major questions doctrine is a judicial policy intended to help the courts preserve the separation of powers. It is a countermeasure against a trend of increasing activity from the executive branch, acting through its administrative agencies, in the legislative domain of policy making. The major questions doctrine supplements, rather than supplants, *Chevron* deference. The Court will continue to find delegations of legislative power constitutional and give deference to reasonable agency decisions on most matters. Only in "extraordinary cases," when an agency asserts new authority that transcends its historical authority and pertains to an important national issue, will the major questions doctrine be invoked.

B. The Lay of the Law Following West Virginia

The major questions doctrine fits together with the related judicial doctrines of nondelegation and *Chevron* deference, to provide the courts with a flexible system for handling challenges to agency authority. Whenever an agency's authority to make a new rule or regulation is challenged, the adjudicating court must consider (1) whether the statute granting the agency authority violates the non-delegation

[148] *See*, *e.g.*, Nat'l Fed'n of Indep. Bus. v. Dep't of Lab. Occupational Safety and Health Admin., 142 S.Ct. 661, 666 (2022); West Virginia v. Env't Prot. Agency, 142 S.Ct. 2587, 2616 (2022); Alabama Ass'n of Realtors v. Dep't of Health and Hum. Servs., 141 S.Ct. 2485, 2486 (2021).

doctrine; (2) whether the action invokes the major question doctrine; and (3) whether the agency is otherwise entitled to deference.

When handling a challenge to a new agency rule, a court should first consider the non-delegation doctrine. The non-delegation doctrine prohibits broad and open-ended delegations of law-making power.[149] In order to survive a challenge under the non-delegation doctrine, the statute in which Congress granted the agency its asserted authority must provide the agency with sufficiently intelligible guidelines or principles to direct the agency in its rule-making, such that the agency is only given discretion in the execution of the law, and not in determining the policy underlying the law.[150] A trivial example of a law that would not survive the non-delegation test would be a law which reads "The EPA has plenary power to make any laws related to the climate which it sees fit." Such a law would certainly fail the non-delegation test because the law purports to give an agency unfettered power and discretion to create national policy and laws related to the climate. A law must provide an "intelligible principle," to guide agency rule making.[151] Most statutes have no trouble meeting this low bar, as is evidenced by the fact that no federal statute has been struck down for violating the non-delegation doctrine since 1935.[152] However, the Court clarified in the 2019 *Gundy* opinion that the non-delegation doctrine still could be used to invalidate a delegation of power, if it lacks an intelligible principle.[153]

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[149] *Panama*, 293 U.S. at 430 (invalidating a delegation of lawmaking authority because it provided the executive with "unfettered discretion" to make certain types of rules).
[150] *J.W. Hampton*, 293 U.S. at 430.
[151] *Id.*
[152] Gundy v. United States, 139 S.Ct. 2116, 2121 (2019).
[153] *Id.*

If the non-delegation doctrine does not apply, then courts should next consider the major questions doctrine, which is the newest test in administrative law. The major questions doctrine prevents administrative agencies from using ambiguous language in the decades-old statutes granting them authority as pretext for usurping the legislative power and effectuating policy objectives.[154] During a major questions analysis, the court will consider whether the new agency rule constitutes an assertion of new authority that departs from the historical breadth of authority that the agency asserted under the relevant statute.[155] If so, then courts must consider whether the challenged rule will have major economic or political consequences.[156] If this element is also present, then the major questions doctrine is triggered, and the challenged rule will be presumed invalid unless the agency can show "clear congressional authorization" for its actions.[157]

If the nondelegation doctrine and the major questions doctrine do not render an agency rule invalid, then courts should revert to the *Chevron* Deference doctrine. This doctrine consists of a two-part evaluation, wherein the court will first consider whether Congress has directly addressed the question presented.[158] If so, courts will accept Congress's determination of the matter; but if Congress has not addressed the issue, then courts will accept the agency's determination of the question, unless the

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[154] *See* Util. Air Regul. Grp. v. Env't Prot. Agency, 573 U.S. 302, 324 (2014) ("when an agency claims to discover a long-extant statute an unheralded power to regulate a significant portion of the American economy, we typically greet its announcement with a measure of skepticism.").
[155] *West Virginia*, 142 S.Ct at 2608.
[156] *Id.*
[157] *Id.* at 2616.
[158] Auer v. Robbins, 519 U.S. 452, 457 (1997); Chevron U.S.A., Inc. v. Nat. Res. Def. Council, Inc., 467 U.S. 837, 840 (1984).

court finds that the agency's interpretation is not "reasonable" or "permissible."[159] In the past, agency interpretations have been struck down as unreasonable when the agency's interpretation cuts against the clear intent of the written statute, or when the agency acts outside of its regular domain, in an area governed by other entities.[160] However, for an agency acting reasonably and within its regular scope of authority, the *Chevron* deference doctrine provides agencies significant discretionary autonomy, allowing the agency to fulfill its statutory duties efficiently.

In sum, both the non-delegation doctrine and the *Chevron* doctrine remain intact. Adding the major questions doctrine, a tripartite framework for dealing with challenges to agency authority emerges. First, when Congress delegates rule-making authority to an agency, Congress must provide sufficient intelligible principles to guide the agency's rule-making, otherwise the law will be struck down for violating constitutional separation of powers under the non-delegation doctrine.[161] Second, if an agency makes a decision or interprets a statute in a manner that causes the agency's purported authority to increase beyond its historical bounds, and the agency's decision has a major political and economic impact, then the court will apply the major questions doctrine.[162] Under this doctrine, courts will strike down the agency's decision or interpretation unless the agency can show "clear congressional authorization" for its actions.[163] Third, courts will defer and accept the agency's

[159] *Id.*
[160] *See, e.g.,* Util. Air Regul. Grp. v. Env't Prot. Agency, 573 U.S. 302, 333-4 (2014); Food and Drug Admin. v. Brown & Williamson Tobacco Corp., 529 U.S. 120, 161–62 (2000).
[161] *See Gundy*, 139 S.Ct. at 2132 (Gorsuch, J., dissenting).
[162] *See West Virginia*, 142 S.Ct. at 2616.
[163] *Id.*

reasonable statutory interpretations, under the *Chevron* doctrine, for matters that are not major questions.[164] This framework wisely preserves the *Chevron* doctrine, which allows agencies to operate efficiently and easily defeat frivolous judicial challenges, while adding additional safeguards against *ultra vires* agency actions. In this way, the Court found a clever way to preserve the separation of powers, without upsetting the status quo or losing the efficiency of valid administrative rule making.

C. Lawful pathways exist to regulate carbon dioxide emissions

In *West Virginia*, the Court applied the major questions doctrine to the EPA's 2015 Clean Power Plan and declared it invalid, because the EPA's actions constituted a departure from the EPAs historical authority with major economic and political impact, and the EPA failed to show "clear congressional authorization" for its actions.[165] This holding was controversial, because it touched the hotly debated topic of climate change. As the dissent points out, many scientists believe that climate change caused by greenhouse gas emissions, including carbon dioxide, will present difficult challenges for both our nation, and humanity as a whole in the coming decades.[166] The dissent lists receding shorelines, draught, more frequent and severe hurricanes, and disruptions in our agricultural systems and water supplies as a few examples of potential consequences of climate change.[167] U.S. Senate Majority Leader Schumer criticized the Court's decision on the day it was released, asserting that the ruling would "cause more needless deaths — in this instance because of more

[164] *See Chevron*, 467 U.S. at 866.
[165] *West Virginia,* 142 S.Ct. at 2616.
[166] *Id.* at 2626-2627 (Kagan, J., dissenting).
[167] *Id.*

pollution that will exacerbate the climate crisis and make our air and water less clean and safe."[168]

Despite the controversy, the Court was right to strike down the EPA's Clean Power Plan because the plan ran afoul of the Constitution's separation of powers. Before the EPA announced the Clean Power Plan, Congress had, on multiple occasions, debated amending the Clean Air Act and considered other potential measures such as enacting a "carbon tax" on businesses, yet Congress took no such action.[169] Nevertheless, in 2015, the EPA spontaneously decided that it didn't need Congress to amend the Clean Air Act or take any other action, finding that it had, in fact, always possessed the power to regulate carbon dioxide emissions, unbeknownst to Congress and in direct conflict with its own prior statements on the matter.[170] This strange turn of events suggests that the executive branch wanted to regulate carbon dioxide emissions due to concerns similar to those voiced by the Justice Kagan in the dissent. After becoming tired of waiting for Congress to take action, the executive decided to jump over Congress and take action itself. The Court was right to step in and stop this, because this type of unilateral executive action is exactly what the separation of powers precludes. Under the United States Constitution, the executive

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[168] Pete Williams & Dares Gregorian, *Supreme Court curbs EPA's power to limit greenhouse gas emissions*, NBC NEWS (June 30, 2022 at 11:38 a.m. E.D.T.), https://www.nbcnews.com/news/amp/rcna31904.
[169] *West Virginia*, 142 S.Ct. at 2614 (citing American Clean Energy and Security Act of 2009, H. R. 2454, 111th Cong., 1st Sess. (2009); Clean Energy Jobs and American Power Act, S. 1733, 111th Cong., 1st Sess. (2009); Climate Protection Act of 2013, S. 332, 113th Cong., 1st Sess.; Save our Climate Act of 2011, H. R. 3242, 112th Cong., 1st Sess.).
[170] *West Virginia*, 142 S.Ct. at 2614.

is not allowed to make major domestic policy decisions by writ and decree.[171] Instead, major policy decisions must be made by Congress, pursuant to the constitution's lawmaking procedure, which includes the important checks and balances, such as bicameralism and presentment.[172] The executive should act as a steward of the law, and remain faithful to Congress's intent, even when Congress fails to take action as quickly as the executive would like.

The fact that the stakes are high does not constitute a valid reason for the executive branch, acting through the EPA, to circumvent the regular legislative process.[173] Even assuming that the EPA's claims are all true; and that the United States faces drought, flooding, hurricane winds, and more as the result of climate change; the Court was still right to strike down the Clean Power Plan. If the Court failed to strike down the Clean Power Plan, its decision would have served as precedent to enable future presidential administrations to enact major policy shifts through the administrative agencies, vastly expanding the executive's power while diminishing Congress's. This state of affairs would weaken the separation of powers and thereby dismantle one of the most important institutional safeguards that our Constitution affords against governmental despotism. According to the EPA, the coming climate crisis will continue for decades if not centuries, and will affect nearly

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[171] *See* Clinton v. City of New York, 524 U.S. 417, 448 (1998) (discussing the importance of Congress's involvement in the lawmaking process).
[172] *Id.*
[173] Lichter v. United States, 334 U.S. 742, 779 (1948) (noting that "in peace or in war, it is essential that the Constitution be scrupulously obeyed," the Court shows that even in times of national emergency, the Court's duty is to uphold the Constitution).

every aspect of society.[174] Therefore, setting aside the Constitution's restrictions on executive power to allow the government to deal with climate change more efficiently is tantamount to setting aside those restrictions permanently. Rather than indulging in the temptation to take a shortcut in the lawmaking process to obtain an immediate policy victory on climate change via executive action, advocates of climate change reform should put their faith in Congress and the legislative process.

Political gridlock in Washington is not a valid reason for the executive branch to circumvent the regular legislative process. History shows that Congress can and will act when circumstances call for it. For example, the Clean Air Act itself was passed in a bipartisan effort to reduce air pollution from harmful chemicals such as lead and carbon monoxide.[175] Similarly, Congress responded in a bipartisan effort to curb damage to the ozone layer of the atmosphere, and came together to pass the 1990 amendment to the Clean Air Act.[176] More recently, after the Court issued its decision in *West Virginia*, Congress passed the Inflation Reduction Act of 2022, amending to the Clean Air Act to improve the EPA's ability to regulate greenhouse gas emissions.[177] The record shows that Congress, though it sometimes acts slowly,

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[174] Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64510, 64517 (Oct. 23, 2015) (amending 40 C.F.R. §§ 60, 70, 71, et al.).
[175] *See* United States Environmental Protection Agency, *Clean Air Act Requirements and History*, EPA.GOV (August 10, 2022), https://www.epa.gov/clean-air-act-overview/clean-air-act-requirements-and-history.
[176] *See* United States Environmental Protection Agency, *1990 Clean Air Act Amendment Summary*, EPA.GOV (December 8, 2021), https://www.epa.gov/clean-air-act-overview/1990-clean-air-act-amendment-summary.
[177] U.S. ENV'T PROT. AGENCY, *Delivering Cleaner Air*, EPA.GOV (February 15, 2023), https://www.epa.gov/inflation-reduction-act/delivering-cleaner-air.

is capable of providing the types of reform that advocates in favor of climate change reform desire.

Furthermore, an act of Congress is more durable than executive action, because executive actions can be terminated via the stroke of the President's pen in an executive order, but valid Congressional actions can only be amended or repealed by a subsequent act of Congress. For example, the Clean Power Plan, created under the Obama Administration, was repealed and replaced with the Affordable Clean Energy Plan by the Trump Administration, before it was ever implemented.[178] Four years later, the Biden Administration announced that it was contemplating a new set of regulations to replace the Affordable Clean Energy Rule. The fact that the past three presidential administrations each flip-flopped on this important issue illustrates that executive action can be too easily reversed or replaced each time the administration changes. Greenhouse gas emission regulations need to be consistently applied for a number of years to affect the global climate, and executive action lacks the durability to be consistently enforced over such a long time span. A better solution can be achieved through the legislative process, since the executive branch is obligated to faithfully execute the law, and no President can repeal or amend congressional law via executive order.[179] Congressional laws tend to remain in force

[178] *See* Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions From Existing Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, 84 Fed. Reg. 32523 (July 8, 2019) (amending 40 C.F.R. § 60) (repealing the Clean Power Plan).
[179] U.S. CONST. art. 2, § 3 ("[the President] shall Take Care that the Laws [of the United States] be faithfully executed"); U. S. CONST. art. 1, § 1 ("All legislative Powers heron granted shall be vested in a Congress of the United States").

for decades.[180] It follows that congressional law is far better suited to to combat climate change than unilateral executive action.

VI. CONCLUSION

In sum, the United States Supreme Court's holding in *West Virginia v. Environmental Protection Agency* was correct and helped to preserve the separation of powers, which is of foundational importance to our great republic. Although climate change may pose serious issues to our nation in the near- and long-term future, the government should only act to address it through legitimate legal processes, and the executive branch should not overstep Congress on policy decisions related to climate change. The political process can be slow, but history shows that it works, and that it creates much more robust and long-lasting solutions than those produced by executive action.

[180] *See*, *generally*, 42 U.S.C. §§ 7401-7675 (2022) (the Clean Air Act, for example, has remained in force for over 50 years, since its first revision was passed in 1970).

The Zaporizhzhia Nuclear Power Plant and *Jus in Bello*

Kate Sullivan[1]

I. INTRODUCTION: WHAT HAPPENED AT THE ZAPORIZHZHIA NUCLEAR POWER PLANT?

On the night of March 3, 2022, two tanks and a column of ten armored vehicles from the Russian Federation army approached the Zaporizhzhia Nuclear Power Plant ("ZNPP").[2] Fearing a takeover of ZNPP, Ukraine had assigned a military unit to the nuclear power plant and met the Russians with resistance. Nevertheless, by the next morning, the Russians had taken over the plant after heavy fighting.[3] None of the personnel of the power plant were killed or physically injured during the fight, but some required medical attention from stress.[4]

Russian occupation of the ZNPP has continued with Russian President Vladimir Putin asserting Russian government control over it in October of 2022.[5] Ever since then, the Western international community and the International Atomic Energy Agency ("IAEA") have called for the removal of Russian military occupation from the power plant. The violation of customary international humanitarian law and

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[2] Geof Brumfiel, *Video analysis reveals Russian attack on Ukrainian nuclear plant veered near disaster*, NPR (March 11, 2022, 5:12 AM), https://www.npr.org/2022/03/11/1085427380/ukraine-nuclear-power-plant-zaporizhzhia.

[3] *Id.*; *see also* State Nuclear Regulatory Inspectorate of Ukraine, *Updated information about Zaporizhzhia NPP (15:00)*, STATE SITES OF UKRAINE (March 4, 2022, 3:30 PM), https://snriu.gov.ua/en/news/updated-information-about-zaporizhzhia-npp-1500.

[4] *Id.*

[5] Russia still asserts control over ZNPP. Veronika Melkozerova, *Running Europe's largest nuclear power plant under the barrel of a Russian rifle*, POLITICO (April 11, 2023, 4:52 PM), https://www.politico.eu/article/running-europe-largest-nuclear-power-plant-russian-soldiers-zaporizhzhia/.

the potential for environmental disaster implicate the necessity of evolving the IAEA's role to adapt to modern military tactics. Moreover, the vulnerability of the Zaporizhzhia nuclear power plant illustrates the need for a multilateral treaty prohibiting the use of nuclear power plants as a battleground or target during war and armed conflict.

II. BACKGROUND

The ZNPP is Europe's largest nuclear power plant and provided one-fifth of Ukraine's electricity before the Russian takeover.[6] Through a livestream of the plant's security footage on YouTube,[7] it was revealed that the Russian troops concentrated their attack on the main administrative building which is situated in front of the nuclear reactors with continuous shelling and rocket-propelled grenades.[8]

[6] Lauren Frayer, *Russian forces in Ukraine attack and seize Europe's largest nuclear power plant*, NPR (March 4, 2022, 5:18 AM), https://www.npr.org/2022/03/03/1084414241/a-contested-ukrainian-nuclear-plant-is-under-attack-by-russian-forces.
[7] Brumfiel, *supra* note 2.
[8] *Id.*

Although the attack was aimed at the administrative building, rounds were fired occasionally towards the reactor buildings where the nuclear fission process takes place.[9] Out of the six reactor buildings: Unit 1 was no longer operable; Unit 2's energy was used to energize the whole nuclear power plant; Unit 3 was disconnected from the grid to begin the shutdown state; Unit 4 was still operable; and Unit 5 and Unit 6 were being cooled down.[10] The reactor building of Unit 1, the power transformer of Unit 6, and the spent fuel pad sustained damage, and two of the high-voltage lines outside of the plant were hit.[11] A Russian shell was found on the walkway next to the reactor building of Unit 2 and a building that holds radioactive waste.[12]

The safety systems that prevent the reactors from nuclear disaster were fortunately unscathed.[13] While the nuclear reactor buildings are reinforced for catastrophic events and contained in a thick steel vessel, the safety systems are not built to withstand a war zone, and neither is the building that holds radioactive waste.[14] The cooling systems, backup generators, electrical yards, and control rooms are all vulnerable and are required components of the plant to ensure its safety.[15] The Russian forces, however, irresponsibly continued their assault on ZNPP.

Even as a fire raged on in the training building, Russian troops refused to allow Ukrainian firefighters to enter the premises and extinguish the growing flames which

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[9] *Id.*
[10] *Updated information about Zaporizhzhia NPP (15:00)*, *supra* note 3.
[11] *Id.*
[12] Brumfiel, *supra* note 2.
[13] *Id.*
[14] *Id.*
[15] *Id.*

caused the training building to suffer extensive damage.[16] Fortunately, the fire did not spread to other portions of the plant. An unchecked fire in a nuclear power plant could be disastrous, as Ukrainian President Volodymyr Zelenskyy said it could have been so catastrophic as to lead to "the evacuation of Europe."[17]

Russian occupation of the plant also prevented the ZNPP personnel from immediately fixing the damage and continuing their daily responsibilities to maintain.[18] Moreover, operational personnel were held captive and forced to work more than twenty-four hours by Russian troops.[19] The Ukrainian nuclear inspectorate stated: "[w]e emphasize that incomplete and/or untimely implementation of maintenance measures for equipment important to safety can decrease its reliability and in turn lead to its failure and emergencies and accidents."[20] The attack caused a fear for potential environmental radioactive contamination and nuclear disaster.[21]

The IAEA, the agency formed under the United Nations responsible for fostering nuclear peace, initially unaware of the extent of damage to ZNPP made the statement that "the action took place away from the reactors."[22] After the ZNPP attack, the Director-General of the IAEA, Rafael Mariano Grossi, attempted to come

[16] *Id.*
[17] Frayer, *supra* note 6.
[18] Brumfiel, *supra* note 2.
[19] *Updated information about Zaporizhzhia NPP (15:00)*, *supra* note 3.
[20] Brumfiel, *supra* note 2.
[21] *Id.*
[22] *Id.*

to an agreement with Ukrainian and Russian officials in order to prevent further attacks on the other nuclear power plants in Ukraine, but these negotiations failed.[23]

A week later, Unit 2 and Unit 4 were the only operable reactors at ZNPP, and the two high-voltage lines were still disconnected from the grid.[24] The plant personnel were able to resume maintenance activities for Unit 1, but the scope of the maintenance had to be greatly reduced.[25] The parts necessary to maintain the plant were not able to be transported to the facility, as the surrounding territory was occupied by Russian troops.[26] Unit 6 was especially precarious. Unit 6 rose to the level of "emergency status" because the oil system of the transformer was destroyed, and it was unable to be fixed due to lack of necessary parts and specialized personnel being prevented from accessing ZNPP.[27] Equally incautious, the Russian Federation army began to store explosives and other incendiary devices on the premises which also posed significant risk to the safety of the plant.[28]

Nevertheless, the Ukrainian personnel at ZNPP have continued to work under pressure by the Russian Federation.[29] On April 3, 2022, Ukraine appealed to the IAEA for assistance in preventing a nuclear disaster in accordance with Article 2 of

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[23] *Id.*
[24] State Nuclear Regulatory Inspectorate of Ukraine, *Information on the Zaporizhzhia NPP as of 12.00 of 10 March 2022*, STATE SITES OF UKRAINE (March 10, 2022, 12:10 PM), https://snriu.gov.ua/en/news/information-zaporizhzhia-npp-1200-10-march-2022.
[25] *Id.*
[26] *Id.*
[27] *Id.*
[28] *Id.*
[29] State Nuclear Regulatory Inspectorate of Ukraine, *Joint Statement of IAEA Member-Countries of 12 August 2022 on the Situation at the Zaporizhzhia NPP*, STATE SITES OF UKRAINE (Aug. 14, 2022, 4:40 PM), https://snriu.gov.ua/en/news/joint-statement-iaea-member-countries-12-august-2022-situation-zaporizhzhia-npp.

the Convention on Early Notification of a Nuclear Accident.[30] Multiple countries including Canada, France, the United Kingdom, Germany, and the United States pledged to provide assistance, yet only the United States has sent portable spectrometers to monitor the levels of radioactive contamination at ZNPP.[31] The Ukraine nuclear inspectorate refused to allow officials from the IAEA to visit the site because it feared that it "could not guarantee the safety" of its inspectors.[32]

By June 2022, personnel at ZNPP feared that the supply of necessary parts for maintenance would be exhausted.[33] They also became concerned of the increased risk that the continuous power supply needed to keep the safety systems running and to continue the cooling of fuel would be cut off.[34] Confidence in relying on its own plant's power for electricity was called into question.[35] The stationed Russian troops did not heed these concerns. Instead, the Russian Federation army increased its stockpile of ammunition and explosives located at the plant and added fifty military vehicles at the site which further exasperated the situation and the fear of explosive damage to the reactors.[36]

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[30] State Nuclear Regulatory Inspectorate of Ukraine, *Appeal to the World Community of the Board of the State Nuclear Regulatory Inspectorate of Ukraine*, STATE SITES OF UKRAINE (April 5, 2022, 10:00 PM), https://snriu.gov.ua/en/news/appeal-world-community-board-state-nuclear-regulatory-inspectorate-ukraine.

[31] State Nuclear Regulatory Inspectorate of Ukraine, *Supply of Spare Parts to Zaporizhzhia Plant 'May Be Exhausted': Ukraine Regulatory*, STATE SITES OF UKRAINE (July 5, 2022, 9:05 AM), https://snriu.gov.ua/en/news/supply-spare-parts-zaporizhzhia-plant-may-be-exhausted-ukraine-regulator.

[32] *Id.*

[33] *Id.*

[34] *Id.*

[35] *Id.*

[36] *Id.*

The IAEA responded to this by stating that "the deployment of Russian military personnel and weapons at a nuclear facility is an unacceptable disregard for the safety and safeguards principles that all IAEA members have pledged to respect" and called for Russia to remove its troops from ZNPP.[37] In early September, a delegation from the United Nations visited the power plant. Dismayed by the poor conditions of the buildings, the delegation pushed the IAEA to begin calling for a de-militarized security zone around the plant.[38]

Disregarding this outcry, Russian President Vladimir Putin ordered the Russian military to seize total control of ZNPP on September 28, 2022, and to incorporate it as a Russian state-owned facility.[39] The situation escalated when Ihor Murashov, the Ukrainian director of ZNPP, was abducted from his car by Russian military agents.[40] He was responsible for leading nuclear and radiation safety at the power plant. On his way to oversee these duties at ZNPP, his automobile was stopped, he was blindfolded, and he was taken to an unknown destination.[41] Later that day, President Putin announced the annexation of four regions in Ukraine, including the Zaporizhzhia region.[42]

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[37] *Joint Statement of IAEA Member-Countries of 12 August 2022 on the Situation at the Zaporizhzhia NPP*, *supra* note 28.
[38] *Boss of Ukraine's Russian-occupied Zaporizhzhia Nuclear Power Plant released after "illegal detention,"* CBS NEWS (Oct. 3, 2022, 11:48 AM), https://www.cbsnews.com/news/ukraine-russia-zaporizhzhia-nuclear-plant-boss-free-after-illegal-detention/.
[39] Gareth Jones, *Putin asserts control over Ukraine nuclear plant, Kyiv disagrees*, REUTERS (Oct. 5, 2022, 2:55 PM), https://www.reuters.com/world/europe/zaporizhzhia-plant-operate-under-russian-supervision-after-annexation-ria-2022-10-05/.
[40] *Boss of Ukraine's Russian-occupied Zaporizhzhia Nuclear Power Plant released after "illegal detention," supra* note 38.
[41] *Id.*
[42] Russia does not have full control of any of the regions. Jones, *supra* note 39.

Condemned by Kyiv as an "illegal land grab," the annexation gave justification for Russia's state-owned nuclear power operator Rosenergoatom to take control over ZNPP, and it was designated as Russian federal property.[43] Russian Deputy Foreign Minister Sergei Vershinin stated that, "the Zaporizhzhia nuclear plant is now on the territory of the Russian Federation and, accordingly, should be operated under the supervision of our relevant agencies."[44] Rosenergoatom planned to transfer the Ukrainian employees and personnel into its existing company structure and to begin repairing the damage of ZNPP to produce energy for Russia.[45] Murashov was released on October 3, 2022 but did not return to his directorship at ZNPP.[46] Amongst the tension for control of the facility and Murashov's abduction, military shelling and strikes around the power plant restarted.[47]

Ukrainian personnel continue to be put under "immense stress and pressure" to run the power plant.[48] Stressed personnel could potentially lead to human error and decrease the plant's assurance of nuclear safety.[49] President Putin's decree transferring ZNPP from Energoatom, the Ukrainian state-owned nuclear operator, to Rosenergoatom has placed the staff in a precarious position.[50] Energoatom urged

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[43] Jones, *supra* note 39.
[44] *Id.*
[45] *Id.*
[46] *Boss of Ukraine's Russian-occupied Zaporizhzhia Nuclear Power Plant released after "illegal detention," supra* note 38.
[47] *Id.*
[48] Dame Barbara Woodward, Speech at the UN Security Council briefing on the Zaporizhzhia nuclear power plant (Sep. 6, 2022), https://www.gov.uk/government/speeches/russia-is-playing-roulette-with-nuclear-safety-uk-statement-at-un-security-council.
[49] C. Mandler, *What's at stake with Ukraine's Zaporizhzhia nuclear power plant, and how does it compare to Chernobyl?*, CBS NEWS (Sept. 14, 2022, 4:48 AM), https://www.cbsnews.com/news/ukraine-zaporizhzhia-nuclear-power-plant-risks-chernobyl-comparison/.
[50] Peleschuk, *supra* note 5.

staff to not sign any contracts presented to them from Rosenergoatom, as Russian forces warned the Ukrainian personnel that they would not be paid until they did so.[51] Energoatom reassured the personnel that if they stayed loyal to Ukraine, they would be paid more than their yearly salary.[52]

In November, explosions continued around ZNPP.[53] During one of the shellings, several buildings were damaged, but none were critical to ongoing safety measures.[54] Grossi, the director general of the IAEA, used this resurgence of shelling to renew calls for "urgent measures to help prevent a nuclear accident" by creating a de-militarized security zone around the plant and removing all military forces and materials from the site.[55] The IAEA hoped to have a security zone established before the start of 2023, but that hope has been suspended.[56]

Grossi stressed that the situation has become so entrenched that the IAEA's main goal is just to prevent a nuclear accident from occurring.[57] The IAEA has placed inspectors on site, but ZNPP personnel have been treated harshly by the Russian military.[58] Their movements are incredibly restricted by soldiers around the plant, and workers who were outspoken and refused to obey Russian control were sent to

[51] *Id.*
[52] *Id.*
[53] John Leicester, *Renewed shelling in Zaporizhzhia threatens key Ukrainian nuclear plant again*, PBS NEWS HOUR (Nov. 20, 2022, 3:41 PM), https://www.pbs.org/newshour/world/renewed-shelling-in-zaporizhzhia-threatens-key-ukrainian-nuclear-plant-again.
[54] *Id.*
[55] *Id.*
[56] Peleschuk, *supra* note 5.
[57] Louise Guillot, *UN watchdog ditches Ukrainian nuclear plant safety zone scheme*, POLITICO (March 29, 2023, 7:34 PM), https://www.politico.eu/article/un-watchdog-ditches-ukrainian-nuclear-plant-safety-zone-scheme/.
[58] Melkozerova, supra note 5.

torture chambers.[59] Out of the eleven thousand workers who worked at the plant before the war, only two thousand remain.[60] Fears still remain that ZNPP will be caught in the crossfire again without an established de-militarized zone, as ZNPP is on the frontline with Ukrainian forces only a few kilometers away.[61]

III. WHAT DO THE RULES OF WAR PROVIDE?

A. International Humanitarian Law

Rules of war have existed for centuries. Customary law in regards to limitations of warfare began to be supplemented by multilateral agreements in the seventeenth century starting with the Declaration of St. Petersburg of 1868.[62] This agreement focused on emphasizing that war should be conducted in a way that abides by the laws of humanity,[63] and it begins by stating, "the progress of civilization should have the effect of alleviating as much as possible the calamities of war."[64] It idealized the notion that belligerent parties should only target military forces and avoid attacks on civilians and wounded soldiers.[65] In doing so, the Declaration of St. Petersburg specifically forbid the use of a projectile that weighed below 400 grams and was of an incendiary nature because of the agonizing death it caused.[66] The

[59] *Id.*
[60] *Id.*
[61] *Id.*
[62] Jozef Goldblat, *The Laws of Armed Conflict: An Overview of the Restrictions and Limitations on the Methods and Means of Warfare*, 13 BULLETIN OF PEACE PROPOSALS 127, 127 (1982).
[63] *Id.* at 127.
[64] Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight, St. Petersburg, Dec. 11, 1868, 130 I.H.L. 6.
[65] Goldblat, *supra* note 62 at 127.
[66] *Id.*

Declaration of St. Petersburg began the prohibition of certain weapons in order to make the inhumane act of war more humane.[67]

In 1899, Western states came together for the first Hague Convention and passed declarations on permissible conduct during war.[68] Importantly, the fourth declaration prohibited the use of "dum-dum bullets" due to the serious wounds they caused from their capability to shift once entering the body.[69] In 1907, they reconvened again for the Second Hague Conference.[70] The Second Hague Conference committed to paper the customs of land warfare in Convention IV.[71] It focused on preventing unnecessary suffering and the "treacherous killing or wounding of individuals belonging to the hostile nation or army" by prohibiting certain arms and projectiles, including poisonous weapons.[72] For naval fighting, it prohibited the use of submarine mines and attacks on undefended ports and cities.[73] It espoused the underlying doctrine of international humanitarian law that "[t]he right of belligerents to adopt a means of injuring the enemy is not unlimited" in Article 22.[74]

World War I further underscored the need to articulate the laws of war, as the gruesome warfare exposed millions to horrors of unnecessary suffering.[75] The Allies uniformly signed a treaty to prevent the use of noxious gases.[76] They aimed to create

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[67] *Id*.
[68] *Id*.
[69] *Id*.
[70] Goldblat, *supra* note 62 at 127.
[71] *Id*.
[72] *Id*.
[73] *Id*. at 128.
[74] Convention (IV) respecting the Laws and Customs of War on Land and its annex: Regulations concerning the Laws and Customs of War on Land art. 22, the Hague, Oct. 18, 1907, 195 I.H.L. 19.
[75] Goldblat, *supra* note 62 at 128.
[76] *Id*.

more meaningful rules to protect the lives of non-combatants and neutrals.[77] With the conclusion of World War I, the prohibition of poisonous gases was reaffirmed in the 1925 Geneva Protocol along with the prohibition of biological and chemical methods of warfare.[78]

After World War II, the Geneva Conventions advanced the codification of protections for the civilian population during war.[79] Protocol I was passed in 1977 and it reiterated the basic Hague rules: "The right of the parties to an armed conflict to choose methods or means of warfare is not unlimited, and that it is prohibited to use weapons, projectiles and material and methods of warfare of a nature that causes superfluous injury or unnecessary suffering."[80] It forbade reprisals against civilians and attacks on undefended locations or demilitarized zones.[81] Energy-generating locations were also given special protection, specifically hydroelectric plants and nuclear power plants.[82] These marked the first examples of environmental concern in the rules of war,[83] mainly that the natural environment should be protected from long-term damage when it risks the health of the local population.[84]

These multilateral agreements supplement customary law regarding the conduct of warfare.[85] The laws of war have always provided protection to civilians

[77] *Id*.
[78] *Id*.
[79] *Id*. at 129.
[80] *Id*.
[81] Goldblat, *supra* note 62 at 130.
[82] *Id*.
[83] *Id*.
[84] *Id*. at 132
[85] *Id*.

and non-combatants from armed conflict.[86] Civilians should never be the target of a military attack, and care must be issued to distinguish combatants from non-combatants to ensure the protection of civilians.[87] Attacks should be kept to only military objectives that make "an effective contribution to military action and whose destruction, capture, or neutralization offers a definite military advantage" like capturing combatants or the enemy's supply of ammunition and weapons.[88] When force is used against combatants, the force should be proportional and not more than necessary to achieve a military objective.[89] Military objectives are distinct from civilian objectives. Civilian homes, hospitals, schools, orphanages, and businesses should never be directly attacked.[90]

This development of the laws of war codified in treaties and conventions reflects the first cardinal principle of international humanitarian law: "the protection of the civilian population and civilian objects" and "the distinction between combatants and non-combatants."[91] Military, in general, needs clear rules, especially regarding weapon prohibitions and the law of armed conflict. Clearly restricting the targeting of a nuclear power plant would provide all militaries a new law of armed conflict and protect the civilian personnel from being treated as combatants. It would also reinforce the cardinal principle underlying international humanitarian law.

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[86] *Russia, Ukraine & International Law: On Occupation, Armed Conflict and Human Rights*, HUMAN RIGHTS WATCH (Feb. 23, 2022, 5:25 PM), https://www.hrw.org/news/2022/02/23/russia-ukraine-international-law-occupation-armed-conflict-and-human-rights.
[87] *Id*.
[88] *Id*.
[89] Mary Ellen O'Connell, *Lawful Self-Defense to Terrorism*, 63 U. PITT. L. REV. 889, 902 (2001-2002).
[90] *Russia, Ukraine & International Law: On Occupation, Armed Conflict and Human Rights*, *supra* note 86.
[91] Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, 1996 I.C.J. 226 (July 8).

B. Environmental Protection

After the Vietnam War, environmental concerns during armed conflict increased because of the use of Agent Orange.[92] During the Vietnam War, or the American War as it is known in Vietnam, the United States sprayed over twenty million gallons of "herbicide defoliants," including Agent Orange.[93] When plants absorb the extremely toxic herbicide, their growth is accelerated and uncontrolled, which leads to their death.[94] President Kennedy approved these operations and rationalized that it did not violate the 1925 Geneva Protocol on Chemical and Biological Warfare because the 1925 Protocol referred to humans and not plants, although historically it was treated as all encompassing.[95]

In response, the United Nations General Assembly passed the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques in 1977. Article I states that "[e]ach State Party to this Convention undertakes not to engage in military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party."[96] An "environmental modification technique" is defined as "changing—through the deliberate manipulation of natural processes—the dynamics, composition or

[92] THE LAWS OF WAR, 69 (W. Michael Reisman & Chris T. Antoniou eds., 1994).
[93] Patricia Hynes, *The Legacy of Agent Orange in Vietnam*, 28 PEACE REVIEW 114, 115 (2016).
[94] *Id.* at 116.
[95] *Id.*
[96] Convention on the prohibition of military or any other hostile use of environmental techniques art. I, Oct. 5, 1978, 1108 U.N.T.S. 151.

structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere or of outer space."[97]

The Geneva Conventions were also amended to include Article 55 Protection of the Natural Environment in 1977.[98] It states that:

> Care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare which are intended or may be expected to cause such damage to the natural environment and thereby to prejudice the health or survival of the population.[99]

Both of these rules of warfare laid the foundation for prohibiting the use of nuclear power plants as battlegrounds. Nuclear disaster indicates widespread, long-term, and severe damage to the environment. An attack on a nuclear power plant could cause a nuclear disaster that would jeopardize the health of the neighboring population. A treaty which prohibits the targeting of nuclear power plants would be a natural evolution of international humanitarian law in environmental and human protection. It would also provide clear steps for power plant personnel, the IAEA, and the UN to follow when an attack occurs during war.

[97] *Id.*
[98] Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflict (Protocol I) art. 55, June 8, 1977, 470 A.P. 1.
[99] *Id.*

IV. WHY SHOULD THE ZAPORIZHZHIA NUCLEAR POWER PLANT OPERATE NORMALLY?

A. Nuclear Disasters

The Russian Federation began their invasion of Ukraine on February 24, 2022, through the Chornobyl[100] Exclusion Zone in the northern part of Ukraine which contained radioactive material from the Chornobyl disaster.[101] Russian troops seized the Chornobyl nuclear power plant and its facilities that housed nuclear fuel and radioactive waste on the same day.[102] The seizure of the Chornobyl nuclear power plant was followed by the takeover of ZNPP a week later. The attack on ZNPP was a carefully premeditated attack to further Russian takeover of Ukrainian territory and to disrupt Ukrainian infrastructure.[103] The invasion through Chornobyl and the fear of nuclear disaster at ZNPP reminded the Ukrainian people of the horrendous Chornobyl disaster.[104] President Zelenskyy emphasized that "an explosion at Zaporizhzhia would have equaled 'six Chornobyls.'"[105]

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[100] According to the Library of Congress, "Chernobyl is the Romanization of the Russian spelling of the town and is generally used in English to refer to the nuclear accident. Chornobyl is the Romanization of the Ukrainian spelling and is the current standard in English for the town itself." *Chernobyl Nuclear Accident, Chornobyl, Ukraine: A Resource Guide*, LIBRARY OF CONGRESS, https://guides.loc.gov/chernobyl-nuclear-accident#:~:text=Chernobyl%20is%20the%20Romanization%20of,English%20for%20the%20town%20itself. Thus, Chornobyl will be used for continuity throughout this Article.

[101] *Appeal to the World Community of the Board of the State Nuclear Regulatory Inspectorate of Ukraine*, *supra* note 30.

[102] *Id*.

[103] Brumfiel, *supra* note 2.

[104] Mandler, *supra* note 49.

[105] *Id*.

The nuclear disaster at Chornobyl provided incredible insight to the severe effects of nuclear disasters on the human body and on the local environment.[106] When radioactive materials and ionizing radiation are released during a disaster, humans can be exposed by breathing in contaminated dust particles or consuming contaminated water and food.[107] At lower exposure, humans can develop cardiovascular disease, cataracts, and multiple forms of cancer, most specifically thyroid cancer.[108] With higher exposure, there is immediate damage to the human body which leads to radiation sickness and death.[109] Similar effects occur to the surrounding wildlife, and radiation can remain for years in the soil, making nuclear disaster sites inhabitable for decades afterwards.[110]

At the Chornobyl Nuclear Power Plant, an experiment at one of the reactors went wrong which resulted in a power surge unable to be contained by the steel container housing the reactor.[111] The reactor was not adequately designed to prevent a meltdown, and the work culture of the power plant influenced mistakes to be covered up rather than raised.[112] Radioactive material escaped into the cloud coverage and killed thirty-two people within the first few days after the disaster.[113]

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[106] National Cancer Institute, *Accidents at Nuclear Power Plants and Cancer Risk*, NATIONAL INSTITUTE OF HEALTH (May 12, 2022), https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/nuclear-accidents-fact-sheet.
[107] *Id.*
[108] *Id.*
[109] *Id.*
[110] Marina Somma, *The Effects of Nuclear Radiation on the Environment*, SCIENCING (October 20, 2021), https://sciencing.com/environmental-effects-atomic-bomb-8203814.html.
[111] Jennie Cohen, *History's 5 Worst Nuclear Disasters*, HISTORY (Dec. 15, 2022), https://www.history.com/news/historys-worst-nuclear-disasters.
[112] *What are the effects of nuclear accidents?*, WORLD NUCLEAR ASSOCIATION, https://world-nuclear.org/nuclear-essentials/what-are-the-effects-of-nuclear-accidents.aspx.
[113] Cohen, *supra* note 111.

Up to seventy thousand people may have experienced severe poisoning from the radioactive contamination,[114] and two-hundred-thousand people were displaced.[115] The effects were lasting on the population with the Chornobyl Childhood Illness Program finding that children born around or after the disaster had an "increased prevalence of thyroid cancer, thyroid tumors, depression, and suicide ideation."[116] The National Research Centre for Radiation Medicine in Ukraine also found that the Ukrainian workers who helped clean-up the disaster had extreme health defects and only 5.5% were considered *healthy* in 2014.[117]

Chornobyl is not the only significant nuclear disaster; in fact, there was a concerning nuclear disaster near Harrisburg, Pennsylvania known as the Three Mile Island disaster.[118] Although it was created with the most technologically advanced equipment at the time, a nuclear disaster occurred when a pressure valve failed to close in 1979.[119] Cooling water from the reactor seeped out with radiation into the neighboring buildings.[120] The operators were so ill-equipped and under-experienced to deal with such an error that the core of the faulty reactor heated well-above what could be contained.[121] Radioactive steam escaped the plant and spread into the surrounding counties.[122] Thankfully, no injuries or deaths resulted from the accident,

[114] *Id.*
[115] Mandler, *supra* note 49.
[116] *Id.*
[117] *Id.*
[118] Cohen, *supra* note 111.
[119] *Id.*
[120] *Id.*
[121] *Id.*
[122] *Id.*

and no health defects were found within the local population due to the radiation exposure from the accident.[123]

Another nuclear disaster occurred in 1979 in Japan at the Fukushima Daiichi nuclear power plant.[124] A 9.1 magnitude earthquake off the coast of Japan triggered a deadly tsunami.[125] The reactors at the nuclear power plant were manually shutdown to prevent a nuclear disaster, but the backup generators were destroyed by the tsunami.[126] Without the backup generators pumping water to cool the reactors, fuel rods in the reactors were partially melted and three cores melted and caused several hydrogen explosions.[127] The nuclear accident did not cause any immediate radiation sickness, but one-hundred-thousand people were evacuated and relocated from their homes.[128] However, around two-thousand people suffered "disaster-related deaths" from the evacuation and four-hundred-fifty people were exposed to radiation from the contaminated ground.[129] Three employees were also killed by the tsunami while they were working to prevent a nuclear disaster at the plant.[130]

A nuclear disaster at ZNPP would be devastating for the local community, causing it to be exposed to radiation poisoning immediately.[131] In August of 2022,

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[123] *Lessons From the 1979 Accident at Three Mile Island*, NUCLEAR ENERGY INSTITUTE, https://www.nei.org/resources/fact-sheets/lessons-from-1979-accident-at-three-mile-island#:~:text=The%20TMI%202%20accident%20caused,the%20vicinity%20of%20the%20plant.
[124] *What are the effects of nuclear accidents?*, *supra* note 112.
[125] *Id.*
[126] *Id.*
[127] *Id.*
[128] *Fukushima Daiichi Accident*, WORLD NUCLEAR ASSOCIATION (May 2022), https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-daiichi-accident.aspx.
[129] *Id.*
[130] *Id.*
[131] Mandler, *supra* note 49.

residents living within thirty-five miles of ZNPP began receiving potassium iodine pills from the European Union because iodine strengthens the thyroid, the most vulnerable part of the body during radiation exposure.[132] Four hundred thousand people received them in a preventative health measure, reflecting the seriousness of the ZNPP takeover and potential disaster.[133] Millions in the region would be exposed to the danger of a nuclear disaster, and most of Eastern Europe would be affected.[134] By invading ZNPP, Russian forces exposed and continuously expose the region to the potential of nuclear disaster and the health consequences that follow.

The potential for a nuclear disaster and the deleterious consequences illustrates the need for a treaty prohibiting the use of nuclear power plants as battlegrounds during armed conflict. Preventing a takeover of a nuclear power plant and implementing immediate remedial measures when a takeover occurs would preclude a situation like this from happening.

B. The Importance of Energy

The takeover of ZNPP is part of Russia's military strategy to destroy Ukrainian infrastructure.[135] Destroying the energy infrastructure has left Ukrainians in sweeping blackouts, leaving Ukrainians with no access to heat during winter blackouts which posed serious health concerns for the population.[136] Zaporizhzhia is a key stronghold in withholding electricity from Ukrainians because it provides one-

[132] *Id.*
[133] *Id.*
[134] *Id.*
[135] Leceister, *supra* note 53.
[136] *Id.*

fifth of the country's energy. Without its energy production, Ukrainians do not have access to the amount of energy that they had before the war.[137]

Russia has also used energy as leverage in the war in Ukraine and against Ukrainian allies.[138] Sanctions against Russia are heavily relied on as a non-violent method to support Ukraine; however, European countries became dependent on Russian natural gas in their energy infrastructures which presented them with a hard choice to make when the war began.[139] The choices were to either use Russian natural gas to maintain fuel levels, or sanction Russian natural gas to weaken Russia and pressure it to withdraw its troops from Ukraine.[140] This challenge stresses the necessity of diversification of a country's energy infrastructure to clean and renewable energy.[141]

As a result of Russia's aggression against Ukraine, European countries have had to source liquified natural gas from outside of Europe, begin burning more coal, and reverse nuclear phaseout steps to accommodate this challenge to become less dependent on Russian natural gas.[142] The Russia-Ukraine war has propelled Europe to change its energy infrastructure from fossil fuels to renewable energy.[143] Across Europe, energy efficiency has also played a key role in lowering energy consumption,

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[137] *Id*.
[138] Johann David Wadephul, *The War against Ukraine and the World Order,* 21 HORIZONS: J. INT'L RELATIONS AND SUSTAINABLE DEV. 106, 113 (2022).
[139] Marc Ozama, *The Russia-Ukraine war and the European energy crisis*, NATO DEFENSE COLLEGE 41, 49 (Thierry Tardy ed. 2022).
[140] *Id*.
[141] Wadephul, *supra* note 138.
[142] Ozama, *supra* note 138.
[143] Rebecca Leber, *What Europe showed the world about renewable energy*, VOX (Feb. 21, 2023, 8:00 AM), https://www.vox.com/climate/2023/2/21/23594544/europe-electricity-natural-gas-renewable-energy-russia.

specifically by switching to electric heat pumps and setting thermostats a couple degrees below normal.[144] On February 5, 2023 almost a year after Russia invaded Ukraine, the European Union placed a ban on purchases of Russian gasoline, diesel fuel, and other refined petroleum products which solidifies their commitment to retiring their reliance on Russia for energy.[145]

How Europe was forced to change its energy infrastructure emphasizes how much leverage Russia had prior to the war and the importance of energy to international humanitarian law. Energy is integral to society and should be considered a necessity to mankind. Throughout the history of war, treaties and conventions have provided protections for the foundations of society to be able to continue during war.[146] In Article 23 of the Treaty of 1785 between the United States and Prussia, a provision provided that:

> [I]f war should arise between the contracting parties, 'all women and children, scholars of every faculty, cultivators of the earth, artisans, manufacturers and fishermen, unarmed and inhabiting unfortified towns, villages or places, and in general all others whose occupations are for the common subsistence and benefit of mankind, shall be allowed to continue their respective employments.

Article 23 articulates the necessity of allowing non-combatants to continue their professions during wartime.[147] Non-combatants being able to continue with their

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[144] *Id.*
[145] Richard Martin, *Sanctions against Russia – a timeline*, S&P GLOBAL (April 13, 2023), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/sanctions-against-russia-8211-a-timeline-69602559. On March 8, 2022, the United States banned all imports of Russian oil, gas, and other energy. Other sanctions placed on Russia include sanctions on Kremlin elites, oligarchs, Russian banks, platinum, jewelry, gold, technology industry, etc. *Id.*
[146] The Paquete Habana, 175 U.S. 677 (1900).
[147] *Id.*

daily pre-war lives harks back to the basis of international humanitarian law that civilians should not suffer unnecessarily during war.[148]

The structure of society depends on consistent energy use, such that allowing war to interfere with energy infrastructure may violate international humanitarian law. Additionally, forcing civilian nuclear power plant personnel to work under military rule certainly violates international humanitarian law and customary international law. A treaty that prohibits the takeover of nuclear power plants by militaries would further support the energy infrastructure and protect civilians from the calamities of war and unnecessary suffering. Codifying this treaty would illustrate the progression of international humanitarian law's adaptation to the ever-changing energy infrastructure and development of nuclear technology.

V. THE INTERNATIONAL ATOMIC ENERGY AGENCY

The United Nations has codified customary rules of war to prevent unnecessary suffering.[149] The formation of the International Atomic Energy Agency ("IAEA") is one example of these formal codifications. In 1957, the United Nations orchestrated the creation of the IAEA to aid in its goal of preventing unnecessary suffering.[150] The development of nuclear technology, while innovative, created a deep fear in the general population, and the IAEA was created to implement safety

[148] Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight, *supra* note 64.
[149] *Russia, Ukraine & International Law: On Occupation, Armed Conflict and Human Rights*, *supra* note 86.
[150] *History*, INTERNATIONAL ATOMIC ENERGY AGENCY, https://www.iaea.org/about/overview/history#:~:text=The%20IAEA%20was%20created%20in,Nations%20on%208%20December%201953.

precautions and regulations to help stifle these fears.[151] Article II of IAEA's Charter states that:

> The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.[152]

While the IAEA wanted its standards to be legally binding, its standards has never been agreed upon.[153] What has given the IAEA the most international sway is its response in aiding the mitigation of severe nuclear disasters such as Three Mile Island and the Chornobyl disasters.[154]

The IAEA is generally criticized for not having legally binding standards and for not being progressive enough to deal with modern problems.[155] A "[p]rohibition of armed attack or threat of attack against nuclear installations, during operation or under construction" has been raised before the IAEA before in 2009.[156] At the IAEA General Conference's Eleventh Meeting of the Fifty-third Regular Session held at its headquarters in Vienna, the Islamic Republic of Iran requested that the prohibition be included in the agenda.[157] Iran's motion was supported by Egypt and the Republic of Syria.[158]

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[151] *Id.*
[152] *Id.*
[153] *Id.*
[154] *Id.*
[155] Int'l Atomic Energy Agency [IAEA], Record of the Eleventh Meeting, IAEA Doc. GC(53)/OR.11 (Sept. 18, 2009).
[156] *Id.*
[157] *Id.*
[158] *Id.*

Iranian representative Soltanieh rationalized that "sustainable development and nuclear energy applications were highly dependent on the safe and secure management of nuclear energy."[159] Passing a resolution that prohibited an armed attack or threat of attack would help encourage the public perception of support for developing the peaceful use of nuclear energy because accidents and military attacks have in the past deteriorated that perception.[160] Soltanieh also said that the accident in Chornobyl illustrates that radioactive material is not constrained by international boundaries and any release of radioactive material has serious consequences.[161] He also stressed that it is the IAEA's duty to be responsible for promoting "the peaceful and safe use of nuclear energy."[162] Explaining why the resolution for the prohibition would not be passed, the IAEA president cited that the political environment prevents action leading to the creation of a legally binding instrument as an

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[159] *Id*.
[160] IAEA, *supra* note 155.
[161] *Id*.
[162] The proposal contained multiple provisions that create a resolution aimed to secure nuclear power plants during war or armed conflict:

> "[Iran] proposed that the General Conference should: a) Deplore any threat of attack or attack against any nuclear installation and enact appropriate collective punitive measures vis-à-vis possible violators, in accordance with the Statute of the Agency and the United Nations Charter; b) Request the Director General to study the feasibility of starting negotiations, under the auspices of the Agency, with a view to concluding a legally binding international instrument to prevent the attack or threat of attack against nuclear installations; c) Request the Director General to explore the possibility of using the texts of two post-Chernobyl conventions, the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, as a model for early notification and mutual assistance in case of an armed attack against nuclear facilities and, in that context, request the Director General to establish an emergency assistance mechanism at the Agency's Headquarters in Vienna similar to that which exists for nuclear accidents, to render technical assistance to Member States that have been attacked, upon request, inter alia radiation protection assistance; d) Encourage all Member States to render, upon request, immediate technical and humanitarian assistance to any Member States whose nuclear installations have been subjected to an armed attack; and e) Request the Director General to include the item under discussion in the agenda for the 54th regular session of the General Conference . . ." *Id.*

international preventative measure for military attacks against nuclear installations.[163] The resolution was tabled for a time in the future.[164]

While in 2009, the main countries concerned with prohibiting attacks on nuclear facilities were located in the Middle East;[165] today, however, countries around the world should be concerned about protecting their nuclear facilities because Russia showed how easily its military forces seized ZNPP and threatened its stability.[166] As the Iranian representative Soltanieh emphasized before, nuclear disasters are not constrained by international borders.[167] After witnessing the takeover of ZNPP, more countries should support a multilateral treaty prohibiting the use of a nuclear power plant as a battleground during an armed conflict.

VI. RECOMMENDATION: A MULTILATERAL TREATY SHOULD BE ADOPTED

Article 38(1) of the Statute of the International Court of Justice states the widely accepted sources of international law: international conventions, customary international law, general principles of law, and previous judicial decisions for that particular court.[168] International conventions, or treaties, are like contracts holding signatory parties accountable to express duties.[169] In the modern era, treaties are the most extensively used in international law because they clearly articulate the legal

[163] *Id*.
[164] *Id*.
[165] *Id*.
[166] Brumfiel, *supra* note 2.
[167] IAEA, *supra* note 155.
[168] Statute of the International Court of Justice art. 38, April 18, 1946, 33 U.N.T.S. 993.
[169] Mark Weston Janis, John E. Noyes, & Leila Nayda Sadat, *International Law*, AMERICAN CASEBOOK SERIES, 31 (6th ed. 2020).

rule and are subject to acceptance by states which makes the terms and acceptance of the treaty unambiguous.[170]

Military rules need to be clear for them to be easily followed, so the clear articulation of treaty terms would be best to create a new military rule. Treaties should also clearly show the acceptance of signatory parties to create less ambiguity, especially in a time sensitive matter like the takeover of a nuclear power plant. As demonstrated above in the careful listing of customary international law and general principles, the takeover of ZNPP violates multiple conventions, international humanitarian law, and the general principle of proportionality. A multilateral treaty would clearly articulate the terms to prohibit the takeover of a nuclear power plant during war and the terms of the parties in response to a takeover of a nuclear power plant during war.

While some states have been urging for the adoption of a treaty that would prohibit the attack of nuclear power plants during armed conflict and the historical record has shown the necessity of such a multilateral treaty, the Russian takeover of the ZNPP solidifies this need.[171] The treaty should encompass the deterrence of such an attack, the response by signatory parties if a nuclear facility is attacked, how it would be implemented, what role the United Nations would play, what role the IAEA would play, and the execution of the treaty itself.

[170] *Id.*
[171] IAEA, *supra* note 155.

A treaty that prohibits takeover of a nuclear power plant would need to be implemented much stronger than how the IAEA enforces its policies currently.[172] Real consequences would have to be immediate and implemented by the signatory states to ensure the treaty is enforceable. A strategy proffered by the IAEA in response to the takeover of ZNPP is turning a nuclear facility into a demilitarized zone with a neutral party providing protection to the facility and its civilian employees.[173]

The United Nations peacekeeping services have the potential to be used to fend off any further attack or imminent attack. The hypothetical nuclear facility would have to be turned into a demilitarized zone in accordance with international law. As the IAEA currently provides assistance in monitoring nuclear facilities across the globe, it would be easiest for Agency members to contribute to maintenance and repairs to the facility because it would prevent the terroristic attacks on civilian employees by the belligerent party.[174]

Proposed language for a treaty would be:

> *Any armed attack on and threat against nuclear facilities devoted to peaceful purposes constitutes a violation of the principles of the United Nations Charter, international law and the Statute of the International Atomic Energy Agency. Any such attack requires the immediate stop of violence and deployment of United Nations peacekeeping services to the nuclear facility. The International Atomic Energy Agency will provide assistance to the facility in any way necessary, including but not limited to, continued maintenance of the facility, replacement of damaged parts, and protection of the reactors from overheating. Any actor of an attack*

[172] *Id.*
[173] *Boss of Ukraine's Russian-occupied Zaporizhzhia Nuclear Power Plant released after "illegal detention," supra* note 38.
[174] *History*, *supra* note 150.

> *will be provided a full prosecution by the International Criminal Court for violating this treaty and the principles of the United Nations Charter, international law, and the Statute of the International Atomic Energy Agency.*

States should ratify a multilateral treaty, particularly in light of this current political climate and the heightened stress of the war in Ukraine. The Russian takeover of ZNPP shows the necessity of a treaty to provide reassurance to civilian nuclear power plant employees.[175] In addition to the civilian lives at stake when a nuclear power plant is taken over, it would also prevent catastrophic events from occurring.[176] As shown by the reactions of experts and politicians to bullets barely missing the nuclear reactors during the Russian takeover of the ZNPP, nuclear facilities are fragile. Shooting and launching military weapons towards reactors can cause meltdowns if a reactor gets hit or if a safety mechanism is destroyed.[177]

Although there are many reasons to create and enforce a treaty prohibiting attacks on nuclear power plants, there is a strong military rationale against such treaty. Destroying a source of energy is detrimental to a country and its population which would accelerate and pressure surrender.[178] Countries can be easily overtaken when targeting energy infrastructure.[179] However, the potential effects of a nuclear disaster outweigh any military strategy to takeover a nuclear power plant. Rules of war are maintained to prevent unnecessary suffering and military strategy can be restricted to protect non-combatants.

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[175] Mandler, *supra* note 49.
[176] *Id.*
[177] Brumfiel, *supra* note 2.
[178] Leceister, *supra* note 53.
[179] *Id.*

Having a designated treaty to deter attacks on nuclear facilities and a method in place for when an attack occurs would help prevent another takeover like the one at ZNPP from occurring. As the IAEA calls for Russia and Ukraine to agree on a de-militarized zone and withdrawal of military forces, a treaty in place would have automatically established a de-militarized zone once the ZNPP was attacked.[180] The Ukrainian personnel at ZNPP would not be subject to harsh treatment by Russian forces, their loyalty would not be questioned, and they would not be placed under such stressful conditions that could lead to human error and a nuclear disaster.[181] The Zaporizhzhia region, Ukraine, and Eastern Europe, as a whole, would be less worried for nuclear disaster, environmental damage, radiation poisoning, and the unavailability of energy.[182] A treaty prohibiting attacks on nuclear facilities and articulating what to do in case of an attack would have alleviated the situation at the ZNPP.

VII. CONCLUSION

Ukranians are still fearful of another Chornobyl Nuclear disaster.[183] When Russian forces invaded Ukraine through the Chornobyl region and took over the ZNPP a week later, Ukrainians were yet again reminded of the vulnerability of their nuclear power plants.[184] The Chornobyl nuclear disaster, the Three Mile Island nuclear disaster, and the Fukushima Daiichi nuclear disaster all emphasize the

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[180] *Boss of Ukraine's Russian-occupied Zaporizhzhia Nuclear Power Plant released after "illegal detention," supra* note 38.
[181] Woodward, *supra* note 48.
[182] Mandler, *supra* note 49.
[183] *Appeal to the World Community of the Board of the State Nuclear Regulatory Inspectorate of Ukraine*, *supra* note 30.
[184] *Id.*

consequences of a nuclear disaster to the human population surrounding the facilities and to the environment. Those consequences are lasting, and a multilateral treaty would help prevent a nuclear disaster from occurring during times of war.

Moreover, the violence that the non-combatant civilian personnel experienced during the ZNPP takeover and the shelling that the ZNPP facilities experienced both show the costly outcome of preventing attacks on a nuclear facility.[185] International humanitarian law provides for the protection of civilians from the calamities and sufferings of war.[186] The evolution of prohibiting certain weapons and military tactics to protecting the environment during war illustrates the possibility for development further in protecting nuclear facilities during armed conflict. It also provides the foundation for justification for such a treaty.[187] Further support for a multilateral treaty lies in the protection of the energy infrastructure.[188] Energy is vital to societal infrastructure and should not be disturbed during wartime. The IAEA has been approached by multiple countries before about prohibiting attacks on nuclear facilities, but the political environment was not right at the time.[189]

With the Russian takeover of ZNPP, the time has come for action. A treaty prohibiting the use of nuclear facilities as battleground would be instrumental in furthering the IAEA's goal of using atomic energy to garner peace. A multilateral treaty prohibiting military takeover of nuclear power plants is necessary to prevent

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[185] *Updated information about Zaporizhzhia NPP (15:00)*, *supra* note 3.
[186] Goldblat, *supra* note 62.
[187] *Russia, Ukraine & International Law: On Occupation, Armed Conflict and Human Rights*, *supra* note 86.
[188] Ozama, *supra* note 139.
[189] IAEA, *supra* note 155.

the suffering of civilians and potential environmental disaster. The treaty should establish nuclear facilities as de-militarized zones, deploy United Nations peacekeeping forces, use IAEA agents to monitor the safety and regulation of the nuclear facilities, and maintain the nuclear facilities to prevent nuclear disaster.