PERFORMING FISSION ON THE NUCLEAR STIGMA: AN ANALYSIS OF NUCLEAR ENERGY'S REGULATORY FUTURE

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I. INTRODUCTION

During World War II, nuclear sciences were first developed in an effort to create weapons of war.[2] After the war, the United States made a push to utilize these sciences for energy production purposes.[3] At its core, nuclear energy is created from the splitting of uranium atoms; this reaction is referred to as nuclear fission.[4] In a controlled environment, a chain reaction where atoms continue to split creates high levels of energy and heat.[5] Similar to natural resources power plants, like coal, oil, or gas, nuclear power plants create electricity by heating water and using its steam to turn electricity-generating turbines.[6] While coal, oil, and gas power plants heat the water by burning these resources, nuclear power utilizes the heat produced from the fission reaction.[7]

In 1946, the United States Congress created the Atomic Energy Commission ("AEC") to regulate the development of nuclear energy.[8] The AEC was later replaced by the Nuclear Regulatory Commission ("NRC"), which is still active today.[9] In December of 1951, electricity was generated from a nuclear reactor for the first time in the United States.[10] Throughout the 1950s and 1960s, the United States made a push to further develop nuclear energy and its use for commercial energy purposes grew in popularity.[11]

Developments that brought nuclear energy into the commercial market slowed in the 1970s and 1980s as safety and environmental issues arose, especially after the infamous Three Mile Island incident.[12] On March 28, 1979, the Three Mile Island

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[2] Office of Nuclear Energy, Science, and Technology, *The History of Nuclear Energy*, U.S. DEP'T OF ENERGY, at 7.
[3] *Id.* at 8.
[4] *Id.* at ii-iii.
[5] *Id.*
[6] *Id.* at iii.
[7] Office of Nuclear Energy, Science and Technology, *supra* note 2, at iii.
[8] *Id.* at 8.
[9] *History*, U.S. NUCLEAR REGULATORY COMM'N (Sept. 10, 2021), https://www.nrc.gov/about-nrc/history.html#aec-to-nrc.
[10] Office of Nuclear Energy, Science, and Technology, *supra* note 2, at 8.
[11] *Id.* at 9.
[12] Office of Nuclear Energy, Science, and Technology, *supra* note 2, at 9; U.S. NUCLEAR REGULATORY COMM'N, *supra* note 9.

Nuclear Power Plant in Londonderry Township, Pennsylvania, failed.[13] This failure resulted in the reactor's inability to cool, causing an increase in pressure within the boiler.[14] To relieve this pressure, the workers opened a relief valve, which was supposed to close once the pressure was released.[15] However, the valve malfunctioned and did not close, resulting in the releasing of the cooling water from the valve.[16] By the time the workers were able to get the situation under control, the incident had already resulted in increased levels of radiation inside the reactor.[17] Luckily, those living around the reactor were only exposed to about one millirem of radiation in excess of the regular background dose of radiation that we are exposed to every day.[18]

The Three Mile Island incident is essential for understanding the basis of today's nuclear regulations. Nuclear energy still faces regulatory obstacles today in part as a response to the Three Mile Island incident. Nonetheless, emerging technologies may result in a new era of nuclear energy.[19]

Pennsylvania, in particular, has a very storied history within nuclear energy and the energy sector as a whole.[20] In 1957, the first commercial nuclear power plant in the United States opened in Beaver County, and Pennsylvania currently has multiple nuclear power plants.[21] Pennsylvania is home to a very big energy industry

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[13] *Backgrounder on the Three Mile Island* Accident, U.S. NUCLEAR REGULATORY COMM'N (Mar. 28, 2024), https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html#top.
[14] *Id.*
[15] *Id.*
[16] *Id.*
[17] *Id.*
[18] U.S. NUCLEAR REGULATORY COMM'N, *supra* note 9; *Doses in Our Daily Lives*, U.S. NUCLEAR REGULATORY COMM'N (Apr. 26, 2022), https://www.nrc.gov/about-nrc/radiation/around-us/doses-daily-lives.html (A millirem is the standard unit of measurement for radiation exposure. For reference, during the average chest x-ray, a patient is exposed to about 10 millirems of radiation).
[19] Mary Carpenter, *Advanced Nuclear Technologies*, NUCLEAR ENERGY INSTITUTE (Sept. 30, 2021), https://www.nei.org/news/2021/advancing-nuclear-technologies.
[20] *Pennsylvania's Nuclear Power Plants*, PA. DEP'T OF ENV'T PROT. (last visited Mar. 30, 2025), https://www.dep.pa.gov/Business/RadiationProtection/NuclearSafety/Pages/Pennsylvania's-Nuclear-Power-Plants.aspx; *Pennsylvania State Energy Profile*, U.S. ENERGY INFO. ADMIN. (last visited Mar. 30, 2025), https://www.eia.gov/state/print.php?sid=PA.
[21] *History*, NUCLEAR POWERS PENNSYLVANIA (last visited Mar. 30, 2025), https://nuclearpowerspennsylvania.com/issue/history/#:~:text=Pennsylvania%20has%20a%20rich%20nuclear%20energy%20history.%20Pennsylvania,commercial%20nuclear%20power%20plant%20in%20the%20United%20States; PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION, *supra* note 20.

and is still a top producer of energy within the United States.[22] In 2022, Pennsylvania ranked second nationally in energy production, second in natural gas production, third in coal production, third in electricity production, and second in electricity generation from nuclear power.[23] Pennsylvania is also home to the first commercial oil well in the United States which opened in 1859.[24] In 2022, Pennsylvanians consumed most of their energy from natural gas sources followed by nuclear electric power, motor gasoline (used to power cars), and coal.[25]

In recent years, concerns about the impact that traditional energy sources have on the climate and environment have led to a push for more clean energy options.[26] The increase in popularity of renewable energy comes with concerns about its reliability.[27] For example, two of the most popular renewable energy sources, solar and wind, are among the least reliable sources of energy, and in 2023 neither reached more than 35% of their total output potential.[28] Comparatively, in 2023, nuclear energy reached 93.1% of its output potential.[29]

This article outlines the current regulatory obstacles that nuclear energy faces by analyzing the federal nuclear regulations and the effects that these regulations have on the energy sector within the state of Pennsylvania. This article further touches upon emerging technologies, such as small modular reactors and AI, and the role these technologies play in the future of nuclear energy. Finally, this article addresses how these regulations can adapt to promote further developments in nuclear power. Nuclear energy faces challenges from regulatory agencies focused on development, environmental impact, and national security, as well as challenges from the public which must be overcome to allow nuclear energy to reach its

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[22] PA. DEP'T OF ENV'T PROT., *supra* note 20.
[23] *Id.*
[24] *Id.*
[25] *Id.*
[26] *Climate Change Impacts on Energy*, U.S. ENV'T PROT. AGENCY (Oct. 2, 2024), https://www.epa.gov/climateimpacts/climate-change-impacts-energy.
[27] *Electric Power Monthly*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_b (last visited Mar. 30, 2025).
[28] *Id.*
[29] *Id.*

maximum potential. These challenges may be overcome by new investments in nuclear energy and its emerging technologies, rolling back regulations to make nuclear energy development easier, and the introduction of incentive programs for energy companies.

II. BACKGROUND

i. Regulatory Agencies

When signed into law in 1946, the Atomic Energy Act ("AEA") created the AEC, the first regulatory body focused solely on nuclear energy.[30] The AEA outlined the Atomic Energy Commission's purpose, stating that:

> Atomic energy is capable of application for peaceful as well as military purposes. It is therefore declared to be the policy of the United States that:
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> (a) the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security; and
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> (b) the development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise.[31]

The AEA provided funds for the research and development of, among other things, the use of atomic energy for the generation of usable commercial energy.[32] This established the United States' commitment to investments in the use of nuclear energy for commercial purposes.[33] The AEA focused heavily on the licensure and ownership rights of nuclear material used in the production of nuclear generated power.[34] At the time, there were serious national security concerns surrounding

[30] Office of Nuclear Energy, Science, and Technology, *supra* note 2, at 8.
[31] Atomic Energy Act, 42 USC § 2011.
[32] *Id.*
[33] *Id.*
[34] *See* 42 USC § 2092.

nuclear energy in part due to the fact that, up until that point, the main use of nuclear energy was for weapons of mass destruction.[35]

In 1974, Congress passed the Energy Reorganization Act ("ERA"), which abolished the AEC and replaced it with the NRC.[36] The newly founded NRC absorbed the powers granted to the AEC outlined in the AEA.[37] The NRC is comprised of five members appointed by the president and confirmed by the senate, one of whom the president appoints as chair.[38] Similar to the AEC, the ERA gave the NRC the right to oversee the licensing rights of nuclear power plants and the exclusive right to regulate nuclear energy in the United States.[39]

Through its authority as the exclusive regulator of nuclear energy, the NRC has issued many regulations on nuclear energy production and its development.[40] Notably, the NRC has regulated reactor sites and reactor licensing, both of which directly affect the development of nuclear power plants.[41] In evaluating a potential reactor site, the NRC considers the factors outlined in § 100.20 of NRC Regulations Title 10 of the Code of Federal Regulations.[42] Following these factors, the NRC considers 1) the surrounding population, 2) the site's proximity to other major infrastructure sites, and 3) the actual physical characteristics of the site.[43]

First, when assessing the surrounding populus, the NRC looks to the social impact that a potential reactor accident would have on this populus in an effort to mitigate the risk of greater harm in the instance of a reactor accident.[44] For this

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[35] Office of Nuclear Energy, Science, and Technology, *supra* note 2.
[36] Energy Reorganization Act of 1974, 42 USC § 5814; 42 USC § 5841.
[37] *Id.*
[38] U.S. NUCLEAR REGUL. COMM'N, *The Commission* (Nov. 2023), https://www.nrc.gov/about-nrc/organization/commfuncdesc.html (noting that the chair is in charge of administrative, organizational, long-term planning, and personnel matters, while the remaining four commissioners, along with the chair, collectively formulate policies and regulations governing nuclear energy, including reactor and safety guidelines, issue licenses, and adjudicate legal issues).
[39] 42 USC § 5841.
[40] *NRC Regulations by Subject Matter*, U.S. NUCLEAR REGUL. COMM'N (Oct. 7, 2024), https://www.nrc.gov/about-nrc/regulatory/rulemaking/access-regs.html.
[41] *Id.*
[42] NRC, 10 CFR § 100.20 (1996).
[43] *Id.*
[44] *Id.*

reason, it is unlikely that a nuclear reactor site would be approved in a highly densely populated area.[45]

Second, the NRC also evaluates the surrounding infrastructure which includes airports, dams, transportation routes, military facilities, and chemical facilities.[46] This evaluation is done to evaluate whether the plant design can "accommodate commonly occurring hazards."[47] This implies that a plant design must comply with the structural requirements of the area which the plant is to be developed.[48]

Finally, the NRC evaluates the physical characteristics of the site itself, which includes the seismology, meteorology, geology, and hydrology characteristics of the site.[49] Geologic and seismic factors help determine whether the site is suitable to build the proposed plant design.[50] Meteorological factors are used to determine the effect, if any, that weather conditions in the area may have on the plant as it was proposed.[51] The hydrology of the site is measured to determine radionuclide transport factors, which are imperative to site safety determinations.[52] If the NRC determines that a site is suitable for the proposed plant, the developers will still have to go through the licensing process.[53]

To develop, build, and operate a nuclear power plant, the NRC requires the submission of an application of which the NRC holds exclusive decision-making power over.[54] After submitting an application for a new nuclear power plant, there are a series of considerations that the NRC takes into account followed by hearings conducted by the NRC.[55] Specifically, the NRC reviews safety, financial, and environmental standards when evaluating whether to give a license to a new nuclear

[45] *Id.*
[46] *Id.*
[47] *Id.*
[48] U.S. NUCLEAR REGUL. COMM'N, *supra* note 43.
[49] *Id.*
[50] *Id.*
[51] *Id.*
[52] *Id.* (noting that radionuclide transport factors focus on the probability of nuclear matter escaping and leaching into the surrounding environment).
[53] 42 U.S.C § 5842.
[54] Patrick White & Brittany Lutz, *Nuclear Reactor Licensing 101*, 1 (2024).
[55] *Id.* at 6.

power plant.[56] With the licensing application, developers are required to submit construction permit applications, as well as, operator's license applications.[57] Throughout the application process, the NRC conducts several hearings and reviews relating to the categories discussed above.[58] During this time, the NRC allows the public to contest the development of the power plant through a series of additional hearings, which are open to public comment.[59] It is only after this lengthy process that the NRC votes on whether to allow the development of a new nuclear power plant.[60]

ii. State Cooperation

While the federal government through the NRC is the exclusive regulator of nuclear energy, § 2021 of the AEA provides the states with the right to regulate certain aspects of nuclear energy through cooperation with the NRC.[61] 42 U.S.C. § 2021 specifically gives the NRC the right to enter into agreements with governors of states to provide states with the right to regulate byproduct materials, source materials, and special nuclear materials in quantities not sufficient to form a critical mass.[62] According to § 2104 of the AEA, the states are given the opportunity to regulate radioactive materials and byproduct waste produced by the generation of nuclear energy.[63] As states have begun utilizing their right to enter into these

[56] *Id.* at 7 (noting that nuclear developers must be able to show that the reactor abides by the NRC's safety standards, the financial stability of the project and the finished reactor, and that the project and finished reactor will not detrimentally impact the surrounding environment and populus).
[57] White & Lutz, *supra* note 55*,* at 14; 42 U.S.C. § 2137.
[58] White & Lutz, *supra* note 55, at 11-12.
[59] *Id.* at 12.
[60] *Id.* at 13.
[61] 42 U.S.C § 2021.
[62] 42 U.S.C § 2021(B); Statista Research Department, *Licensing timeframe for nuclear power plants in the United States as of 2023, by license type*, Statista (Dec. 10, 2024), https://www.statista.com/statistics/1450533/nuclear-power-plants-licensing-duration-us/ (noting that for reference, to get an operating license it can take up to three and a half years); A critical mass is used to define a large amount of nuclear matter sufficient for nuclear fission.
[63] 42 USC § 2104.

agreements, issues began to arise revolving around the scope of the states' new-found power and the remaining preemptive power of the NRC.[64]

In *Pacific Gas and Electric Company v. State Energy Resources Conservation & Development Commission*, the United States Supreme Court explained the role that the states play in the regulation of nuclear energy by outlining specifically the state's power.[65] The Court stated, "the Federal Government maintains complete control of the safety and "nuclear" aspects of energy generation, whereas the States exercise their traditional authority over economic questions such as the need for additional generating capacity, the type of generating facilities to be licensed, land use, and ratemaking."[66] This case is clear—the federal government is the *sole* regulator of the actual generation of nuclear energy.[67] However, the federal government does not preempt state laws, which fall within the jurisdiction granted to them by the AEA.[68] *Pacific Gas and Electric Company* opened new avenues for states to pass laws which may have an effect on nuclear energy.

In *Virginia Uranium, Inc. v. Warren*, a Virginia-based mining company brought suit challenging state law prohibiting the mining of uranium within the state of Virginia.[69] In its claim, Virginia Uranium, Inc. contended that the NRC, through the power granted to it in the Atomic Energy Act (AEA), had the exclusive right to regulate the mining of materials used for the generation of nuclear energy, therefore preempting Virginia law.[70] The United States Supreme Court rejected this claim.[71] In the opinion of the Court, Justice Gorsuch explained that in writing the AEA, Congress specifically chose to leave the power to regulate mining as a right reserved to the states.[72] He went on to explain that § 2092 of the AEA expressly places the

[64] Va. Uranium, Inc. v. Warren, 139 S.Ct. 1894, 1897 (2019); Pac. Gas & Elec. Co. v. State Energy Res. Conservation & Dev. Comm'n, 103 S.Ct. 1713, 1716 (1983).
[65] Pac. Gas & Elec. Co., 103 S.Ct. at 1716.
[66] *Id.*
[67] *Id.*
[68] *Id.*
[69] *Id.*
[70] *Id.*
[71] *Id.* at 1909.
[72] *Id.* at 1900.

mining of uranium outside of the jurisdiction of the NRC.[73] 42 U.S.C. § 2092 specifically states that the NRC's power to regulate uranium only arises "after removal from its place of deposit in nature."[74]

The aforementioned cases give valuable insight into the actual scope of the NRC's power.[75] States are protected from federal preemptions when it comes to the rights that they inherently possess.[76] States have never, and do not currently, hold any power when it comes to the direct regulation of nuclear power.[77] However, as seen above, states do have the ability to affect some things relating to nuclear power within the state.[78] Therefore, state regulatory bodies can influence the development of nuclear power facilities. One of the primary ways in which states affect not only nuclear power but power in general, is through the enactment of environmental protection policies.

iii. Environmental Policies

Environmental policies can have a direct effect on the energy sector and energy development plans.[79] As stated above, when developing a new nuclear power plant, an environmental impact report will be conducted.[80] However, environmental impact reports are not the only environmental restrictions placed on nuclear power plant development.[81] At the federal level, environmental policies are made by the Environmental Protection Agency ("EPA").[82] The primary federal law governing

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[73] *Id*. at 1902.
[74] *Va. Uranium, Inc.*, 139 S.Ct. at 1902.
[75] *Id.*
[76] *Id.*
[77] *Id.*
[78] *Id.*
[79] *Electric Power Generation, Transmission and Distribution (NAAICS 2211)*, U.S. ENV'T PROT. AGENCY (Jul. 2, 2024), https://www.epa.gov/regulatory-information-sector/electric-power-generation-transmission-and-distribution-naics-2211.
[80] White & Lutz, *supra* note 55, at 7 (listing factors including site inspection and state environmental rights; noting that an environmental impact report may include the power plant's impact on local waterways).
[81] U.S. ENV'T PROT. AGENCY, *supra* note 79.
[82] *The Origins of EPA*, U.S. ENV'T PROT. AGENCY (May 31, 2024), https://www.epa.gov/history/origins-epa.

environmental policy is the National Environmental Policy Act ("NEPA").[83] In 1971, the NEPA was signed into law and requires federal agencies to conduct an assessment of the impact that their proposed actions would have on the environment.[84] In addition, Title I § 102 of NEPA requires federal agencies to prepare a statement assessing alternatives to actions that may significantly affect the environment.[85] The courts has explored the requirements of NEPA.[86]

In *Susquehanna Valley Alliance v. Three Mile Island Nuclear Reactor,* the Susquehanna Valley Alliance brought suit seeking injunctive relief preventing the Three Mile Island Nuclear Reactor from releasing partially decontaminated water into the Susquehanna River.[87] The Susquehanna Valley Alliance is an environmental group with residents from Lebanon County, York County, and Lancaster County in Pennsylvania.[88] The group alleged that following the Three Mile Island Nuclear Power Plant incident of March 28, 1979, a combined 850,000 gallons of contaminated water had built up across different locations in the reactor.[89] The plaintiffs claimed that the defendants planned to partially decontaminate the water and then release it into the Susquehanna River.[90] The plaintiffs claimed that such a release would contaminate the river, resulting in a tainted water system for the municipalities, as well as, a polluted habitat for the fish and other wildlife that live in and around the river.[91] At the trial court level, the matter was dismissed for a lack of subject matter jurisdiction and the plaintiffs appealed.[92] The Third Circuit Court of Appeals ruled that the issues raised by the Susquehanna Valley Alliance fell within the subject

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[83] *What is the National Environmental Policy Act?*, U.S. ENV'T PROT. AGENCY (Sept. 4, 2024), https://www.epa.gov/nepa/what-national-environmental-policy-act.
[84] *Id.*
[85] *Id.*
[86] *See generally* Susquehanna Valley Alliance v. Three Mile Island Nuclear Reactor, 619 F.2d 231, 234 (3d Cir. 1980); Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc., 98 S.Ct. 1197, 1197 (1978).
[87] Susquehanna Valley Alliance v. Three Mile Island Nuclear Reactor, 619 F.2d 231, 234 (3d Cir. 1980).
[88] *Id.*
[89] *Id.*
[90] *Id.*
[91] *Id.*
[92] *Id.*

matter jurisdiction of the district court.[93] The Third Circuit Court found that the district court had jurisdiction to make rulings concerning NEPA.[94] *Susquehanna Valley Alliance* is important to note because it further shows that private parties can bring suit to enforce the NEPA or challenge actions of the NRC for environmental reasons.[95]

In *Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.*, the Natural Resources Defense Council brought suit to compel the AEC to consider energy conservation alternatives when giving its environmental impact report.[96] In this case, the court considered the requirements of an environmental impact report as established in the Administrative Procedure Act and NEPA.[97] The United States Supreme Court ruled that it would not expand the scope of environmental impact reports as defined in NEPA by compelling the AEC to consider energy conservation alternatives.[98]

One of the increasingly substantive issues with nuclear power and the environment is the handling of nuclear waste.[99] Nuclear waste is the radioactive material left over following a nuclear fission reaction.[100] In *Westinghouse Electric Corporation v. U.S. Nuclear Regulatory Commission*, the Third Circuit Court of Appeals upheld the NRC's order to regarding the recycling of nuclear waste.[101] As a result of this decision, the court affirmed the commissions policy on burying rather than recycling nuclear waste.[102] The Nuclear Waste Policy Act established federal regulations dictating how nuclear waste is discarded.[103] Under the Nuclear Waste

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[93] *Susquehanna Valley Alliance*, 619 F.2d at 241.
[94] *Id.*
[95] *Id.*
[96] Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc., 98 S.Ct. 1197, 1197 (1978).
[97] *Id*. at 1201-02.
[98] *Id*. at 1214.
[99] Tom Westgate, *Dealing with Nuclear Waste*, ROYAL SOC'Y OF CHEMISTRY (Feb. 28, 2007), https://edu.rsc.org/feature/dealing-with-nuclear-waste/2020123.article.
[100] *Id.*
[101] Westinghouse Electric Corp. v. U.S. Nuclear Regul. Comm'n, 555 F.2d 82, 96 (3d Cir. 1977).
[102] *Id.*
[103] *Summary of the Nuclear Waste Policy Act*, U.S. ENV'T PROT. AGENCY (Jun. 12, 2024), https://www.epa.gov/laws-regulations/summary-nuclear-waste-policy-act.

Policy Act, nuclear waste in the United States is discarded in "deep geologic repositories."[104] Simply stated, the policy in the United States is to burry nuclear waste in containment repositories deep underground.[105] This form of discarding nuclear waste has given rise to challenges from those who do not want nuclear waste stored near where they live.[106]

In *Nuclear Energy Institute, Inc. v. Environmental Protection Agency*, Nevada challenged congressional legislation regarding nuclear waste.[107] Prior to this case, Congress passed a joint resolution which provided federal lands in Yucca Mountain, Nevada for the disposal of nuclear waste.[108] Under the joint resolution, nuclear waste was to be buried in repositories deep underneath the ground of these federal lands.[109] This case is focused on the EPA's power under § 197 of the Yucca Mountain, NV Public Health and Environmental Radiation Protection Standards.[110]

In 1992, Congress required the EPA to "establish site-specific standards for a repository at Yucca Mountain."[111] Following the authority given to it by Congress the EPA promulgated 40 C.F.R § 197 which created the "individual-protection standard", the "human intrusion standard", and the "ground-water-protection standard".[112] First, the "individual-protection standard" required the Energy Department to show that a hypothetical individual living directly next to the site will be protected from radiation.[113] As applied to the Yucca Mountain site, this protection was required to last for the next 10,000 years.[114] Second, the "human intrusion standard" requires that this theoretical person will receive no more than a predetermined amount of radiation for the next 10,000 years.[115] Finally, the "ground-water-protection

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[104] *Id.*
[105] *Id.*
[106] Nuclear Energy Institute, Inc., v. Env't Prot. Agency, 373 F.3d 1251, 1262 (D.C. Cir. 2004).
[107] *Id.*
[108] *Id.* at 1258.
[109] *Id.* at 1302.
[110] *Id.* at 1262.
[111] *Id.*
[112] *Id.* at 1262-63.
[113] *Nuclear Energy Institute, Inc.*, 373 F.3d at 1262.
[114] *Id.*
[115] *Id.* at 1263.

standard" requires that the facility contains sufficient protection for ground water against radiation.[116] The Third Circuit Court of Appeals found that, while the EPA has the authority to enforce these standards, the 10,000 years minimum requirement was unreasonable.[117]

At the state level, there are additional regulations placed on the development of nuclear power plants by way of environmental regulations.[118] Regulations concerning the environment have become one of the primary ways that states have been able to regulate nuclear energy.[119] In Pennsylvania, the Pennsylvania Department of Environmental Protection ("DEP") is the agency focused on the protection of the environment; the Nuclear Safety Division of the DEP focusses on nuclear energy.[120] When the Pennsylvania Radiation Protection Act was passed in 1984, it gave the DEP the authority to "establish and maintain a program of radiation protection."[121] Within the per views of nuclear safety, the Radiation Protection Act provides the DEP with the ability to:

> • Perform an independent nuclear safety oversight review of Pennsylvania NPP sites by conducting routine site visits and interacting with NRC inspectors.
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> • Participate in joint inspections with the NRC inspectors.
>
> • Review and evaluate all proposed license amendments and provide input into the NRC review process.
>
> • Participate in Federal Emergency Management Agency (FEMA) evaluated and non-evaluated emergency preparedness drills and exercises for Pennsylvania NPPs.
>
> • Provide technical support and assistance to FEMA during a nuclear event or incident.

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[116] *Id.*
[117] *Id.* at 1273.
[118] *Nuclear Safety Division*, PA. DEP'T OF ENV'T PROT. (2024), https://www.dep.pa.gov/Business/RadiationProtection/NuclearSafety/Pages/default.aspx.
[119] *Id.*
[120] *Id.*
[121] PA. DEP'T OF ENV'T PROT. BUREAU OF RADIATION PROT., *Commonwealth of Pennsylvania Radiation Protection Act Report to the General Assembly Pursuant to Act 31 of 2007*, at 1 (Sept. 28, 2023).

> • Act as on-site representatives for the Commonwealth during emergencies.
>
> • Attend meetings and conferences and review NRC and industry documents and correspondence.
>
> • Review license renewal-related correspondence and documents.
>
> • Review new application-related documents and correspondence.
>
> • Participate in plume and ingestion phase and Hostile Action Based (HAB) emergency tabletops, drills and exercises including preparation and training.
>
> • Monitor post-Fukushima industry actions and the NRC regulatory initiatives.[122]

While it may seem that the Radiation Protection Act gives the DEP an abundance of power concerning nuclear energy and nuclear power plants, most of the DEP's capabilities under this act require the DEP to continue to work with the federal government.[123]

iv. National Security Concerns

When the United States first embraced nuclear energy as an option for commercial use, one of the earliest concerns was focused around national security implications.[124] At the time, the world was just coming out of World War II and nuclear fission in United States had only been used for weapon creation.[125] Similar national security concerns surrounding nuclear energy reemerged in the early twenty first century following the 9/11 terrorist attacks.[126] Within the environmental impact review, national security concerns are taken into account.[127] Specifically, reviewers

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[122] *Id.*at 4.
[123] *Id.* (explaining that many of the powers granted by the Act require the state to collaborate with the NRC rather than acting independently, as seen in points one, two, seven, and eleven; and requiring coordination with FEMA, a federal agency, in points four and five).
[124] Office of Nuclear Energy, Science, and Technology, *supra* note 2.
[125] *Id.*
[126] *See generally* New Jersey Dep't of Env't Prot. v. U.S. Nuclear Regul. Comm'n, 561 F.3d 132 (3d Cir. 2009); San Luis Obispo Mothers for Peace v. U.S. Nuclear Regul. Comm'n, 449 F.3d 1016 (9th Cir. 2005).
[127] *New Jersey Dep't of Envtl. Prot.*, 561 F.3d at 135; *San Luis Obispo Mothers for Peace*, 449 F.3d at 1019-20.

may look to the effect that a potential attack on a nuclear power plant may have on the environment, as seen in the following cases.[128]

In *New Jersey Department of Environmental Protection v. Nuclear Regulatory Commission*, the New Jersey Department of Environmental Protection asked the court to compel the NRC to consider the threats of potential airborne terrorist attacks when conducting its environmental impact review at the Oyster Creek Nuclear Generation Station.[129] The New Jersey Department of Environmental Protection previously sent a request to the NRC asking permission to intervene in the environmental impact assessment, allowing the New Jersey Department of Environmental Protection to assess the impact of airborne terrorist attacks.[130] The NRC already determined that a terrorist attack would not differ notably from environmental effects of an adverse event borne outside of the act of terrorism.[131] The Third Circuit Court of Appeals found that the NRC satisfied its duty in considering terrorist attacks when conducting its environmental impact report.[132]

Additionally, in *San Luis Obispo Mothers for Peace v. United States Nuclear Regulatory Commission*, the San Luis Obispo Mothers for Peace asked the Ninth Circuit Court of Appeals to remove the NRC's approval of a nuclear waste storage site in Diablo Canyon, California.[133] The San Luis Obispo Mothers for Peace claimed that the NRC breached its duty when conducting its environmental impact report by failing to consider the potential of terrorist attacks on the waste storage site.[134] The NRC claimed that the idea of a terrorist attack being carried out at the site was too far removed to warrant its inclusion in the environmental impact report.[135] The court found that it was reasonable to consider potential terrorist attacks when conducting the environmental impact report and that by failing to do so, the NRC breached its

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[128] *New Jersey Dep't of Envtl. Prot.*, 561 F.3d at 135; *San Luis Obispo Mothers for Peace*, 449 F.3d at 1019-20.
[129] *New Jersy Department of Environmental Protection*, 561 F.3d at 135.
[130] *Id.*
[131] *Id.*
[132] *Id.* at 144.
[133] *San Luis Obispo Mothers for Peace*, 449 F.3d at 1019-20.
[134] *Id.*
[135] *Id.* at 1022.

duty.[136] *San Luis Obispo Mothers for Peace* highlights that the courts may be inclined to require nuclear power facility developers to consider the national security risks associated with the facility and the effect that a potential attack may have.[137]

v. Public Sentiment

Nuclear energy can be a hot button issue in the United States and all over the world.[138] The primary driver of the skepticism surrounding nuclear energy is a fear over the safety of the practice and the effects of possible radiation exposure.[139] Globally, accidents like Chernobyl in Ukraine and Fukushima in Japan further drove these fears.[140] The Fukushima accident, being the most recent of the two, brought these fears to the twenty-first century.[141] The Three Mile Island incident brought fears and skepticism about nuclear energy to the United States and—more specifically—Pennsylvania.[142] This fear was expressed in two previously discussed cases.[143] *San Luis Obispo Mothers for Peace v. United States Nuclear Regulatory Commission* and *Nuclear Energy Institute, Inc. v. Environmental Protection Agency* arose because of the public's disinterest and apprehension in the development of new nuclear waste containment facilities.[144] To further advance the development of nuclear energy production in the United States, it is important to tackle some of these public concerns especially while considering hearings for public concern which occur during the application process.

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[136] *Id.* at 1030 (decided in 2006, in the aftermath of 9/11, when concerns about terrorist attacks were more heightened than they may be today).
[137] *Id.* at 1030.
[138] Jon Kelly, *The Fear of Nuclear*, BBC NEWS (Mar. 15, 2011), https://www.bbc.com/news/magazine-12746129.
[139] *Id.*
[140] *Id.*
[141] *Id.*
[142] *Backgrounder on the Three Mile Island Accident*, U.S. NUCLEAR REGUL. COMM'N (Mar. 28, 2024), https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html#top.
[143] San Luis Obispo Mothers for Peace v. U.S. Nuclear Regul. Comm'n, 449 F.3d 1016, 1019-20 (9th Cir. 2005); Nuclear Energy Institute, Inc., v. Env't Prot. Agency, 373 F.3d 1251, 1262 (D.C. Cir. 2004).
[144] *Id.*

III. ANALYSIS

i. The Case in Favor of Nuclear Energy

Regulating nuclear energy is now and will continue to be a necessary practice. Any type of energy generation has the potential to be dangerous and when it comes to nuclear energy that may be more so.[145] There is a reason why the federal government gave so much attention to the safety and national security risks of nuclear energy.[146] However, the energy sector is currently at a crossroads where it must decide how to continue. There is an ever-growing public and political desire to make the shift from traditional energy sources such as oil, gas, or coal to cleaner energy sources.[147] However, there are still some major issues when it comes to some of the more popular renewable energy sources.

As addressed in the Introduction, wind and solar energy are significantly less reliable than more traditional sources of energy like oil, gas, or coal.[148] To reiterate, in 2023, solar energy had only a capacity factor of 23.2% and wind energy had a limited capacity factor of 33.2%.[149] A capacity factor is the amount of energy that a source produces compared to the theoretical maximum output of that source of energy.[150] Therefore, solar only produces 23.2% of the amount of the energy that it should and wind only produces 33.2% of the energy that it should. Comparatively, in 2023 natural gas, one of America's largest sources of energy, had a capacity factor of 56.6%.[151] While a 56.6% capacity factor may seem low, it is still considerably higher

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[145] *See, e.g.*, *History*, U.S. NUCLEAR REGULATORY COMM'N (Sept. 10, 2021), https://www.nrc.gov/about-nrc/history.html#aec-to-nrc.
[146] *See generally*, Office of Nuclear Energy, Science, and Technology, *The History of Nuclear Energy*, U.S. DEP'T OF ENERGY, at 7.
[147] Brian Kennedy et al., *Majorities of Americans Prioritize Renewable Energy, Back Steps to Address Climate Change*, PEW RESEARCH CENTER (Jun. 28, 2023), https://www.pewresearch.org/science/2023/06/28/majorities-of-americans-prioritize-renewable-energy-back-steps-to-address-climate-change/.
[148] *Electric Power Monthly*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_b (last visited Mar. 30, 2025).
[149] *Id.*
[150] Michael McHugh, *What is Capacity Factor? A Beginner's Guide*, SOLIS RENEWABLES (last visited Mar. 30, 2025), https://www.solisrenewables.com/blog/what-is-capacity-factor.
[151] U.S. ENERGY INFORMATION ADMINISTRATION, *supra* note 148.

than wind or solar energy.[152] This may be because wind and solar energy rely heavily on uncontrolled external factors such as sunlight and wind.[153] Because of these external requirements, solar panels and wind turbines are only able to generate electricity when the weather permits.[154]

Gas on the other hand is able to be burned continually and may produce electricity twenty-four hours a day.[155] Evidently, some of the traditional energy sources are more reliable than the renewable energy sources but the renewable energy sources are more desirable because of their cleanliness.[156] This begs the question: what is more important, clean energy or reliable energy? With nuclear energy, that decision does not need to be made. In 2023, nuclear energy had a capacity factor of 93%, meaning that this energy source only lost 7% of its theoretical maximum.[157] This means that nuclear energy is very reliable. Not only is nuclear energy very reliable, but in 2023, nuclear energy was the most reliable energy source in the United States.[158]

Nuclear energy is also very powerful.[159] In 2022, nuclear power plants produced enough electricity to power over 72 million American homes across only 94 reactors.[160] Further, nuclear energy is very clean and produces nearly half of the clean energy in the United States.[161] Unlike coal, gas, or oil, nuclear energy does not burn any material and produce carbon footprint, a common concern among climate activists.[162] Instead nuclear energy produces nuclear waste. The United States

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[152] *Id.*
[153] *See generally,* Ben Jervey & Ensia, *Wind and Solar Are Better Together*, SCIENTIFIC AMERICAN (Nov. 7, 2016), https://www.scientificamerican.com/article/wind-and-solar-are-better-together/.
[154] Id.
[155] Office of Nuclear Energy, Science and Technology, *supra* note 2.
[156] Kennedy et al., *supra* note 147; U.S. ENERGY INFO. ADMIN., *supra* note 148.
[157] U.S. ENERGY INFO. ADMIN., *supra* note 148.
[158] *Id.*
[159] Office of Nuclear Energy, *The Ultimate Fast Facts Guide to Nuclear Energy,* 2.
[160] *Id.*
[161] *Id.*
[162] Brian Kennedy et al., *Majorities of Americans Prioritize Renewable Energy, Back Steps to Address Climate Change*, PEW RESEARCH CENTER (Jun. 28, 2023), https://www.pewresearch.org/science/2023/06/28/majorities-of-americans-prioritize-renewable-energy-back-steps-to-address-climate-change/.

generates about 2,000 metric tons of nuclear waste each year and has generate 90,000 metric tons of waste since the 1950s.[163] While 90,000 metric tons may seem like a lot, if one were to stack all of this nuclear waste together, it would only fill about ten yards of a football field.[164] However, the fact that the total volume of nuclear waste is relatively small is not enough to ease some concerns that people may have about the storage of nuclear waste, as seen in the cases above. One possible solution to the issue of burying nuclear waste may be to recycle it instead.

ii. Proposal to Allow for the Recycling of Nuclear Waste

To understand the value and some of the hurdles of recycling nuclear fuel, France's nuclear grid will be evaluated. France is a nation with an advanced nuclear grid, with 65% of the nation's electricity being generated by nuclear energy across 56 nuclear power plants in 2023.[165] France has operated nuclear recycling facilities for decades, and will continue to recycle nuclear waste as it is expected to reduce its amount of nuclear waste by 75% by 2040.[166]

Recycling spent nuclear fuel is a very highly technical and difficult process.[167] This process includes recovering plutonium, a byproduct of uranium used in nuclear fission.[168] That recovered plutonium is then used as nuclear fuel itself.[169] While recycling spent nuclear fuel may be difficult, discarding spent nuclear fuel results is wasting around 95% of the fuel's potential to generate electricity.[170] Such waste implies that, by discarding spent nuclear fuel, the United States is missing out on a

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[163] Office of Nuclear Energy, *5 Fast Facts about Spent Nuclear Fuel,* Energy.gov, U.S. DEP'T OF ENERGY (Oct. 3, 2022), https://www.energy.gov/ne/articles/5-fast-facts-about-spent-nuclear-fuel.
[164] *Id.*
[165] IAEA Country Nuclear Power Profiles, *France 2024*, INT'L ATOMIC ENERGY AGENCY, https://cnpp.iaea.org/public/countries/FR/profile/preview (last visited Mar. 30, 2025); *Efficiency in the Nuclear Fuel Cycle: What Can 'Oui' Learn?*, INT'L ATOMIC ENERGY AGENCY (Sept. 4, 2019), https://www.iaea.org/newscenter/news/frances-efficiency-in-the-nuclear-fuel-cycle-what-can-oui-learn.
[166] *Id.*
[167] Kelsey Adkisson, *Recycling Goves New Purpose to Spent Nuclear Fuel*, PACIFIC NORTHWEST NAT'L LABORATORY (May 12, 2021), https://www.pnnl.gov/news-media/recycling-gives-new-purpose-spent-nuclear-fuel.
[168] *Id.*
[169] *Id.*
[170] *Id.*

considerable amount fuel that could be used to produce electricity. The United States generated about 2,000 metric tons of nuclear waste each year.[171] This means that the United States is also burying about 2,000 metric tons of this nuclear waste each year.[172] If the United States begins recycling nuclear fuel like France does, this amount of waste can be considerably decreased, potentially easing concerns surrounding its storage and environmental impact.

Environmentally, France has been able to decrease its need of natural uranium by 17%, allowing for less disruption during the mining process.[173] To accommodate the recycling of spent nuclear fuel, the United States will need to invest in the development of recycling plants and advanced reactors that can run on recycled nuclear fuel.[174] Currently, the average age of nuclear reactors in the United States is 39 years old.[175] If the United States wants to advance the nuclear power grid, there will need to be a commitment to invest in new technologies in nuclear energy.

iii. New Technologies to Consider for the Future of Nuclear Energy

Nuclear energy has become a more widely discussed topic because of its use in powering technological developments.[176] Microsoft, Meta, and Amazon, for example, have all invested heavily in nuclear energy to power their computing demand.[177] Artificial intelligence (and large language models), being a recent major technological

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[171] Office of Nuclear Energy*, supra* note 2.
[172] *Id*.
[173]Alfie Shaw, *France to Continue Recycling Nuclear Fuel Beyond 2024,* POWER TECHNOLOGY (Mar. 11, 2024), https://www.power-technology.com/news/france-will-continue-its-programme-to-recycle-nuclear-materials-beyond-2040/.
[174] *Id.*
[175] Martin McKown, *Nuclear Regulation*, DUQUESNE UNIVERSITY, https://duq.instructure.com/courses/46862/pages/video-nuclear-regulation (last visited Mar. 30, 2025).
[176] Jordan Valinsky, *Three Mile Island is reopening and selling its power to Microsoft*, CNN BUSINESS (Sept. 20, 2024), https://www.cnn.com/2024/09/20/energy/three-mile-island-microsoft-ai/index.html; Ryan Browne, *Why Big Tech is turning to nuclear to power its energy-intensive AI ambitions*, CNBC (Oct. 16, 2024), https://www.cnbc.com/2024/10/15/big-tech-turns-to-nuclear-energy-to-fuel-power-intensive-ai-ambitions.html?msockid=259e776c998c6d49141a6435989e6cff; Diana Olick, *Amazon goes nuclear; plans to invest more than &500 million to develop small modular reactors*, NBC NEWS (Oct. 16, 2024), https://www.nbcnews.com/business/energy/amazon-goes-nuclear-plans-invest-500-million-develop-small-modular-rea-rcna175673?os=osdf&ref=app.
[177] *See, e.g.*, Valinsky, *supra* note 173.; Browne, *supra* note 173.; Olick, *supra* note 173.

advancement, has been at the forefront of these discussions.[178] In Pennsylvania, Microsoft has invested in nuclear energy by utilizing the Three Mile Island Nuclear Power Plant to power its artificial intelligence computing.[179] Similarly, Meta and Google announced recently that they would be looking to nuclear power to source their artificial intelligence computing.[180] Amazon recently shared that it planned to invest heavily in small modular reactors ("SMRs"), investing more than $500 million to help power its data centers.[181] With the increasing development of technology and artificial intelligence, the appeal of nuclear power's strong generation capabilities is becoming more and more apparent. The investment in nuclear energy from these tech industry giants may be a sign that the government should invest as well. These big tech investments show that nuclear energy can be used efficiently to power industry and innovation. However, these technological advancements not only place more demand on nuclear energy, but they also provide new sources of nuclear energy.

One of the primary new technologies in nuclear energy is SMRs.[182] SMRs are small nuclear reactors with an electric output of no more than 300 megawatts.[183] SMRs also tend to have passive safety systems that do not need to be operated by machines, making them safer than conventional power plants.[184] Because of their compact size, there are more options available for their deployment.[185] SMRs can be utilized as single units or clustered together, this allows more flexibility to meet the needs of the community.[186] SMRs also require less fuel and may only require refueling every 3 to 7 years as compared to conventional nuclear plants which require refueling every 1 to 2 years.[187] Because of their ability to run longer on less fuel, SMRs also

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[178] *See*, *e.g.*, Valinsky, *supra* note 173.; Browne, *supra* note 173.; Olick, *supra* note 173.
[179] Valinsky, *supra* note 173.
[180] Browne, *supra* note 173.
[181] Olick, *supra* note 173.
[182] *SMR regulatory compliance*, SMALL MODULAR REACTORS, https://small-modular-reactors.org/smr-regulatory-compliance/ (last visited Mar. 30, 2025).
[183] *Id*.
[184] *Id*.
[185] *Id*.
[186] *Id*.
[187] Joanne Liou, *What are Small Modular Reactors (SMRs)?*, INT'L ATOMIC ENERGY AGENCY (Sept. 13, 2023), https://www.iaea.org/newscenter/news/what-are-small-modular-reactors-smrs.

produce less waste each year.[188] These increasing technological advances require adaptation from regulatory bodies. Current nuclear regulations focus on large-scale, conventional power plants which are not appropriate for SMRs and future technologies.[189] With the increase in safer nuclear technology must also come the adaptation of the regulatory bodies to allow for more innovation. Smaller, safer, and less powerful reactors will not require the same amount of regulatory scrutiny as the larger conventional reactors and because of this, deregulation may allow for more advances in nuclear power.

iv. Proposal to Deregulate the Nuclear Power Plant Application Process to Encourage Growth

The process of developing nuclear power plants can be a lengthy and expensive process.[190] While this may in part be because of the technical hurdles of construction, this is also in part because of present regulations. As previously stated, the regulatory procedures that were developed for conventional reactors may not be appropriate for SMRs and other future reactor technologies.[191] However, there are also advancements that can be made regarding the regulations of conventional reactors that may be able to advance nuclear energy. As stated above, there are many regulatory hurdles that may be holding nuclear energy back including environmental and licensing requirements.[192] In order to expand the nuclear power system of the United States more effectively, it may be necessary to roll back these regulations. While it is important to advocate for the protection of the environment and the safety of citizens, it is equally important to allow for a more robust nuclear framework to encourage a more multifaceted energy grid. By rolling back some of these regulations, states like Pennsylvania may be able to advance their nuclear power grid.

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[188] *Id*.
[189] Small Modular Reactors, *supra* note 179.
[190] Statista Research Department, *Licensing timeframe for nuclear power plants in the United States as of 2023, by license type*, STATISTA (Dec. 10, 2024) (noting that, to get an operating license, it can take up to three and a half years).
[191] Small Modular Reactors, *supra* note 179.
[192] U.S. NUCLEAR REGUL. COMM'N, *supra note 40*.

v. Pennsylvania's Potential Role in the Future of Nuclear Energy

Pennsylvania has an opportunity to take advantage of the growing nuclear power industry. In 2019, the Three Mile Island Nuclear Power Plant closed to commercial use, resulting in a reduction in Pennsylvania's nuclear power output of about 8%.[193] However, in 2024, the Pennsylvania legislature announced that it will be relaunching the Nuclear Energy Caucus.[194] Members the caucus stated, "We are relaunching the bipartisan, bicameral Pennsylvania Nuclear Energy Caucus to ensure we keep this tried-and-true clean energy contributing to our baseload power for generations to come."[195] As previously touched on, SMRs are a new and exciting technology in nuclear power. The Pennsylvania commission has vowed to prepare Pennsylvania for this new technology and incorporate it into the nuclear grid of Pennsylvania.[196]

When creating SMR legislation, the Pennsylvania commission can look to Illinois. Illinois is the largest producer of nuclear energy amoung the states and nearly half of its power comes from nuclear energy.[197] In 1987, Illinois placed a moratorium on the construction of new nuclear energy plants.[198] Although, in December of 2023, the governor of Illinois lifted the moratorium to allow new developments.[199] In the same year, the Illinois legislature passed a bill approving the development of SMRs.[200] By 2026, the Illinois Emergency Management Agency will begin regulate these reactors within the bounds of the state's power.[201] If the

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[193] Rep. Robert Matzie, *PA legislators announced relaunch of bipartisan, bicameral Nuclear Energy Caucus*, PA. HOUSE DEMOCRATS (Jul. 2, 2024), https://www.pahouse.com/InTheNews/NewsRelease/?id=134720.
[194] *Id*.
[195] *Id*.
[196] *Id*.
[197] *Leading nuclear power producing states in the United States in 2023*, STATISTA (Jun. 28, 2024), https://www.statista.com/statistics/614164/us-nuclear-power-electricity-generation-by-state/.
[198] Andrew Adams, *Illinois lawmakers approve plan to allow small-scale nuclear development*, NPR ILLINOIS (Nov. 9, 2023), https://www.nprillinois.org/illinois/2023-11-09/illinois-lawmakers-approve-plan-to-allow-small-scale-nuclear-development.
[199] *Pritzker signs law lifting moratorium on nuclear reactors*, AP NEWS (Dec. 8, 2023), https://apnews.com/article/illinois-nuclear-moratorium-modular-reactors-solar-wind-225d14cefb03793e08f0802745df4e02.
[200] Adams, *supra* note 195.
[201] *Id*.

Pennsylvania legislature wants to advance nuclear power in the state, it will need to be able to provide support for new forms of nuclear power and provide incentive structures for the development of nuclear power plants in the state.

vi. Incentive Structures to Advance Nuclear Power

To advance nuclear power in Pennsylvania and the United States as a whole, there must be incentive structures for the incumbent energy providers to make the transition to nuclear energy. In addition to making it easier to open new power plants through regulatory restructuring, state and national governments will need to make investments in nuclear energy. Other incentives including tax credits, government partnership programs, and deregulations to reduce cost may all aid in incentivizing the incumbent energy providers to make the shift to nuclear. It is not uncommon for governments to offer incentives to large projects such as these. In 2022, the federal government offered tax credits for electric vehicles under the Inflation Reduction Act.[202] Further, the Residential Clean Energy Credit provides a tax credit to households who invest in renewable energy.[203] While these two examples apply primarily to customers, they also have an effect on the manufacturers and producers as well by creating incentives to expand the market. In addition, providing nuclear power developers with more incentives directly will likely result in an uptick in new developments. Allowing more nuclear power plants and new technologies to be built is insufficient. Regulatory and legislative bodies must also give energy companies reasons to want to make the shift to nuclear.

IV. CONCLUSION

America's nuclear regulatory landscape can be difficult and time consuming to traverse. Whether it be the extensive licensing process or the environmental

[202] *Credits for new clean vehicles purchased in 2023 or after*, U.S. INTERNAL REVENUE SERVICE (Aug. 8, 2024), https://www.irs.gov/credits-deductions/credits-for-new-clean-vehicles-purchased-in-2023-or-after.

[203] *Residential Clean Energy Credit*, U.S. INTERNAL REVENUE SERVICE (Nov. 13, 2024), https://www.irs.gov/credits-deductions/residential-clean-energy-credit (The Residential Clean Energy Credit applies to energy sources including solar, wind, geothermal as well as investments in fuel cells or battery storage. Including nuclear energy in this credit may make the energy source more appealing to customers and thus create a larger market for nuclear energy).

restrictions, there are clear barriers to the development of nuclear power. While nuclear regulations are important to protect the safety of the people and the environment, it is equally important to provide pathways for more developments in nuclear energy. Perhaps it is time to examine the regulations that are in place and ask whether they are still appropriate today. Some questions may arise as to whether new technologies should be subject to the same regulations as incumbent nuclear reactors or what kind of a role nuclear power should hold in the future of the American energy grid. With the rise of newer technologies such as SMRs, it may be necessary to reexamine whether the regulations in place still make sense for a safer and more efficient type of reactor. Further, it may be beneficial to take the approach championed by France when it comes to spent nuclear fuel. Allowing for the recycling of spent nuclear fuel in America would lessen the amount of nuclear waste produced and tap into the full energy production potential of the already existing uranium.

In order to advance the nuclear grid in America, some of these regulations will need to be reevaluated and nuclear power developers and utility companies will need more incentives to develop more nuclear power plants. Being a clean and effective energy source, nuclear power is a great resource that can help fix some of the incumbent problems within the electrical grid. It is time that the regulatory landscape understands that fact and encourages the continued growth of nuclear energy.