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Abstract

The last half-century has seen a push towards renewable energy development, due to geopolitics, economics, and a growing concern over the effects of climate change. The 1940s heralded the age of nuclear power development. Regulators were quick to subsidize the new industry, and to ensure the oversight was given to a single federal agency—the Nuclear Regulatory Commission (NRC). Nuclear power was poised to provide abundant, carbon-free electricity, but the industry has struggled in the last few decades due to the stigma of nuclear accidents, cumbersome bureaucracy, exorbitant expenses, and cheap energy alternatives like natural gas. The race for a grid powered by nuclear energy has waned while the renewable revolution is coming to full fruition. Specifically, the development of offshore wind (OSW) power has seen a massive surge around the world in the last decade. The U.S. is lagging behind other countries in its quest for large commercial-scale OSW energy. The Bureau of Ocean Energy Management (BOEM) is the federal regulatory body responsible for OSW development in federal waters, but does not have the level of authority of its nuclear counterpart, the NRC. In the current climate, OSW has the advantage of being a relatively popular and potentially viable large-scale electricity source. However, OSW faces significant local opposition, and notable delays in the licensing process. Cost, regulatory delays, and public opposition have dealt blows to both the nuclear and wind energy industries. Nuclear power has the benefit of time and lessons learned, and relatively centralized federal control, which have helped in streamlining its licensing process—although the last two-and-a-half decades have seen the addition of only two new reactors to the U.S. commercial industry. OSW, a relatively new sector in the power industry, also has the benefit of nuclear power's lessons learned. OSW can potentially avoid nuclear power's pitfalls by utilizing strong public engagement programs addressing local concerns early in the process. Furthermore, if Congress modelled BOEM's regulatory structure after the

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NRC, giving BOEM more centralized power, and addressed significant delays attributable to OSW's environmental review process, coordination between federal, state, and local entities could be improved, stabilizing and expediting the leasing and permitting process. These measures could ease the path for OSW development, boosting an important industry in the fight against climate change. Renewable energy, OSW in particular, is part of the solution to the climate crisis, and it requires public support, favorable policy, and a clear regulatory path.

I. INTRODUCTION

In an era where state and local governments are attempting to hold companies responsible for their role in climate change, the setting is ripe for alternative, more sustainable energy resources to rise and meet the challenge of providing for the increasing energy demands of the world.[1] Climate change is driven by the emission of greenhouse gases (GHGs), mainly carbon dioxide.[2] The presence of GHGs creates a "greenhouse effect," trapping solar radiation in the earth's atmosphere and causing global warming.[3] The resulting effects of global warming are complex and varied, challenging humans and ecosystems to adapt as temperatures rise on land and in the sea, weather patterns shift, and the frequency of extreme weather events increases.[4] Energy use is the largest global and domestic contributor to GHG emissions.[5] Specifically, fossil fuel combustion, mainly coal and natural gas, is the largest source of GHG emissions.[6]

This means that effectively combating global climate change necessarily involves addressing energy sector emissions, and more pointedly, developing economically viable alternatives to burning fossil fuels. Renewable and sustainable energy sources such as wind, solar, hydroelectric, tidal, biofuels, and nuclear, have much fewer (to zero) associated GHG emissions. They remain cost prohibitive when compared

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[1] Ellen M. Gilmer, *Can Climate 'Test Cases' Move Forward? It's Up to Supreme Court*, BLOOMBERG L. (Oct. 18, 2019), https://news.bloomberglaw.com/environment-and-energy/can-climate-test-cases-move-forward-its-up-to-supreme-court?context=search&index=27 [https://perma.cc/Q7T7-WFD5].

[2] DANIEL A. FARBER & CINNAMON CARLARNE, CLIMATE CHANGE LAW 3-4 (Foundation Press 1st ed. 2018).

[3] *Id.*

[4] *Id.* at 4-6.

[5] (Approximately seventy percent of GHG emissions are due to electricity generation, transportation, industry, or on-site heating and cooking fuels). *Id.* at 34.

[6] *Id.* at 35.

to relatively cheap electricity sources that are created through fossil fuels. In an effort to make renewable energy competitive with fossil fuels, and because of the threat that climate change poses to local economies and public health, states have taken the lead in promoting renewable sources for electricity generation.

Many states have created Renewable Portfolio Standards (RPSs) that require utility companies to purchase a certain percentage of electricity from renewable sources. Recently, the Second and Seventh Circuits upheld New York's and Illinois' Zero-Emission Credit (ZEC) programs that require utilities to purchase ZECs generated by in-state nuclear power facilities (zero-carbon emitters) at a price tied to the value of the carbon dioxide-emissions reduction they provide.[7]

Nuclear power, although controversial and not without risk and environmental impacts, was one of the first large-scale energy sources which provided emissions-free electricity. The development of the self-sustaining nuclear reaction during the 1940s ushered in the nuclear age.[8] While nuclear fission is most notably associated with the development of atomic weapons, the U.S. (among other countries) understood the vast, untapped energy potential in the nucleus of fissionable material.[9] In response, Congress enacted the Atomic Energy Act of 1946 (the "AEA") (amended in 1954), allowing for the continued development of nuclear energy for peaceful purposes.[10] In declaring that 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," Congress was acknowledging not only the great potential of nuclear fission, but also the need for comprehensive regulation of this potentially devastating power.[11] The Atomic Energy Commission (AEC), created by the AEA, was the original regulatory body charged with promoting and controlling the development of nuclear energy and material for peaceful civilian purposes.[12] In the 1970s, the AEC was divided into two separate bodies with separate regulatory functions: the Energy Research and Development Administration (ERDA), and the

[7] *See* Coal. for Competitive Elec. v. Zibelman, 906 F.3d 41(2nd Cir. 2018); Elec. Power Supply Ass'n v. Star, 904 F.3d 518 (7th Cir. 2018).
[8] U.S. DEP'T OF ENERGY, OFF. OF NUCLEAR ENERGY, SCI. & TECH., THE HISTORY OF NUCLEAR ENERGY 7, https://www.energy.gov/sites/prod/files/The%20History%20of%20Nuclear%20Energy_0.pdf [https://perma.cc/LYA8-MVR4].
[9] *Id.* at 1.
[10] *Id.* at 7-8.
[11] Atomic Energy Act, 42 U.S.C. § 2011(b) (1954).
[12] U.S. DEP'T OF ENERGY, *supra* note 8, at 8.

Nuclear Regulatory Commission (NRC), responsible for the regulation of nuclear power facilities.[13]

Since its inception, nuclear energy has faced many obstacles, including the ongoing issue of waste disposal, public fear and opposition, and the high costs associated with construction, operation, and decommissioning. Nuclear power has excelled in the areas of research and development and helping to shape environmental law in the United States.[14] One of the biggest appeals of nuclear energy is that it produces no GHGs, and at the time of this article nuclear power provided approximately twenty percent of the U.S. electricity demand (with slightly over sixty percent provided by fossil fuels, with the balance by renewables).[15]

In contrast, while wind is a newer source of electric power generation, wind power has long been harnessed to assist in tasks like pumping water and grinding grain.[16] Wind power technology spread around the world over the centuries, eventually being employed to generate electricity in the late nineteenth and early twentieth centuries.[17] In response to the energy crisis

of the 1970s, which put the spotlight on the U.S. dependency on fossil fuels (specifically imported oil), Congress enacted the Public Utility Regulatory Policies Act of 1978 (PURPA). Among other provisions, PURPA encouraged the development, research, and support of renewable energy sources.[18] Over the next few decades, wind technology, including turbine design, efficiency measures, and environmental impact analysis, was developed—with the first large-scale wind farm installed and operated in California.[19] One of the chief challenges that wind energy faces today is the need to develop the technology and methods for power generation that will allow it to economically compete with other power generators. In 2011, the U.S. Department of Energy (DOE), in partnership with the U.S. Department of the Interior (DOI), proposed a National

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[13] *Id.*
[14] David A. Repka & Tyson R. Smith, *A Dose of History: Nuclear Energy Cases That Shaped Environmental Law*, 25 NAT. RES. & ENV'T 28, 28 (2010).
[15] Nat'l Conf. of State Legislatures & S. States Energy Bd., *Nuclear Waste: A Guide to Understanding Where We've Been and Where We're Going*, https://www.ncsl.org/documents/environ/NCSLNuclearWaste.pdf.
[16] U.S. DEP'T OF ENERGY, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, HISTORY OF U.S. WIND ENERGY, https://www.energy.gov/eere/wind/history-us-wind-energy (last visited Mar. 11, 2020) [https://perma.cc/5NTX-W2QZ].
[17] *Id.*
[18] *Id.*
[19] *Id.*

Offshore Wind Strategy, allocating over $160 million dollars to pilot projects.[20] Currently, all renewable energy sources collectively produce approximately seventeen percent of U.S. energy (with wind energy making up about seven percent of the total).[21] While it is projected that offshore wind could have a generation capacity of 177 gigawatts per year by 2030 (from a 2018 capacity of approximately twenty-two gigawatts), the current uncertainty in the regulatory framework for delivering renewable energy to consumers has caused investors to hesitate.[22]

Part II of this article explores the history of nuclear energy, the mechanisms of control employed by the NRC, the struggles the industry has faced in the last few decades, and what, if any, future there is for nuclear power to play a role in meeting the rising global energy demand in an era of rapid human-induced climate change. In part III of this article, OSW development is surveyed, focusing on current economic, environmental, and social concerns that OSW must address if it is to be a viable electricity generator in the next few decades. In parts IV and V, these two vastly different energy sources are compared, looking at what lessons can be learned by the OSW energy sector from nuclear power's short but turbulent history. Because, while nuclear power and offshore wind energy are different beasts altogether, the traits they share (as zero-carbon emitters) may be more important than those they do not. This article argues that the development of both nuclear power and offshore wind power is critical to addressing the climate change crisis. Nuclear power may be a long-term solution to reducing GHGs, but it cannot be the short-term solution because of the expense and long timeline for constructing new nuclear reactors and power plants. Offshore wind, on the other hand, could potentially be both a short and long-term solution, if the industry can quickly address and correct the areas posing significant delays in its employment.

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[20] *Id.*

[21] *What is U.S. Electricity Generation by Energy Source?*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/tools/faqs/faq.php?id=427&t=3 (last visited Nov. 30, 2019) [https://perma.cc/5VQM-6J9A].

[22] William Mathis & Jeremy Hodges, *Renewables Investor Embrace 'Enormous Game' of Offshore Wind*, BLOOMBERG L. (Oct. 3, 2019), https://news.bloomberglaw.com/environment-and-energy/renewables-investor-embraces-enormous-game-of-offshore-wind [https://perma.cc/UN4G-LPBJ].

II. THE DEVELOPMENT OF NUCLEAR POWER IN THE U.S.

A. The History of Nuclear Power Production

The end of the Second World War saw the beginning of the nuclear age. The world, and specifically the U.S., saw the energy potential of the atom, and sought to harness that power in electrical energy production. The generation of nuclear power involves a controlled chain reaction in which the atoms of fuel (uranium) are split, releasing energy (heat) and radiation (subatomic particles). That heat can be harnessed to boil water, create steam, and power turbine generators, producing electricity. The nuclear power process can generally be broken down into four stages: (1) mining and fuel enrichment for use in power generation; (2) design and construction of the nuclear power plant; (3) operation; and (4) the storage and disposal of the spent nuclear fuel (decommissioning). Spent nuclear fuel (SNF) is the state of the nuclear material when it has reached the end of its usable life.[23] At this stage, the fuel is still radioactive—although not usable to generate enough heat to power an electricity production plant—and requires special methods to store and contain the residual radiation while the material continues to decay to levels not harmful to humans over the next hundreds-of-thousands of years.[24]

A brief history of uranium mining for use as nuclear fuel can be traced back to Colorado, where by the 1950s about 800 uranium mines were in operation.[25] Uranium mining operations have been largely curtailed, and it is currently done on a small scale in only a few western states.[26] Uranium is extracted using various methods including stripping away the surface of the earth (referred to as open pit mining), traditional underground mining, and a process called in-situ leaching (where water and a gaseous compound are pumped into the bedrock, dissolving the uranium in the solution).[27] The enrichment process (necessary for fuel viability) removes impurities in the ore, leaving behind toxic, radioactive impurities that must be safely disposed of.[28]

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[23] Nat'l Conf. of State Legislatures & S. States Energy Bd., *supra* note 15.
[24] *Id.*
[25] William Jenney, *Having Your Yellow Cake and Eating it Too: The Environmental and Health Impacts of Uranium Mining on the Colorado Plateau*, 7 ARIZ. J. ENVTL. L. & POL'Y 27, 29 (2016).
[26] *U.S. Uranium Mining and Exploration*, WORLD NUCLEAR ASS'N., https://www.world-nuclear.org/information-library/country-profiles/countries-t-z/us-uranium-mining.aspx (last visited Dec. 21, 2019) [https://perma.cc/ZY8A-KW9C].
[27] *Id.*
[28] *Id.*

The NRC is involved at every stage of the permitting and licensing of a commercial nuclear reactor. The ultimate design and construction of a power reactor may vary with advances in technology, the proposed site, and electricity generation requirements, but there are only two types of commercial reactors used in the United States—the Boiling Water Reactor (BWR) and Pressurized Water Reactor (PWR).[29] Under its regulatory requirements (contained in Chapter I of Title 10 of the *Code of Federal Regulations*) and guidance, the NRC conducts extensive reviews of a proposed power reactor including conducting an Environmental Impact Statement (EIS), siting and safety reviews, construction permits, and operator licensing.[30] Similarly, the NRC's oversight does not end at the completion of construction, but continues throughout the life of the reactor through operator licensing, inspections and auditing, and adjudication.[31]

The safe disposal and storage of SNF and other high-level waste (to be distinguished from low-level waste generated through medical and other industrial uses) generated in the operation of a nuclear power plant requires significant attention from states and the federal government.[32] The federal government is ultimately responsible for the development of a long-term management strategy for SNF.[33] Currently there is no national repository for SNF after Yucca Mountain—the long-term storage solution designated by the DOE in 2002—lost support and funding.[34]

The Atomic Energy Act (AEA) gave the original AEC the duty of encouraging the development of commercial nuclear energy, as well as its regulation.[35] The AEC, attempting to implement regulations that rigorously protected the health and safety of the public without hampering

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[29] Nat'l Conf. of State Legislatures & S. States Energy Bd., *Supra* note 15.

[30] *Regulations, Guidance, and Communications for New Reactors*, NUCLEAR REGUL. COMM'N, https://www.nrc.gov/reactors/new-reactors/regs-guides-comm.html#erp (last visited Oct. 25, 2019) [https://perma.cc/28ST-NJ4B].

[31] *See How We Regulate*, NUCLEAR REGUL. COMM'N, https://www.nrc.gov/about-nrc/regulatory.html (last visited Oct. 28, 2019) [https://perma.cc/7KEH-6G3P].

[32] *See The Future of Nuclear Power: Hearing Before the Subcomm. On Energy and Water Development, Comm. On Appropriations*, 114th Cong. 4-5 [hereinafter *Hearing*] (statement of Sen. Dianne Feinstein); 42 USCS § 10222 (2012).

[33] 42 U.S.C. § 10131(4).

[34] *Hearing*, *supra* note 32, at 4 (Sen. Feinstein also highlighted the problem facing states, discussing how California alone has "nearly 8,000 highly radioactive spent-fuel assemblies stored in pools and dry cask across four sites, all of which are now shut down or are planning to shut down, leaving behind just the waste."); Nat'l Conf. of State Legislatures & S. States Energy Bd., *Supra* note 15.

[35] *History*, NUCLEAR REGUL. COMM'N, https://www.nrc.gov/about-nrc/history.html (last visited Oct. 29, 2020) [https://perma.cc/AX4J-GYDM].

the development of the new nuclear power industry, initially met with much public criticism.[36] Critics challenged that the regulations did not adequately address "radiation protection standards, reactor safety, plant siting, and environmental protection."[37] As a result of the harsh commentary, the Energy Reorganization Act of 1974 reconstituted the AEC into the ERDA and NRC, with the NRC continuing only the licensing and related regulatory functions of the AEC.[38]

It is important to note that the dangers involved in producing nuclear power (including using nuclear materials for other industrial and medical purposes) relate to its potential radiative effects on humans. Nuclear fission releases subatomic particles that, if not properly contained and controlled, can pose a hazard to human health by interacting with and damaging, or even killing, human cells. While humans are exposed to various types of low-level radiation on a daily basis, the threat of the improper release of radiation from nuclear material is the public's exposure to "hazardous levels" of radiation.[39]

The primary focus of this article is the NRC's function as the regulatory body for civilian nuclear power plants (the NRC also performs various other functions, including preventing nuclear material theft by hostile groups). The NRC is involved at every stage of a power reactor's lifespan by developing standards, licensing, certifying, inspecting, assessing, investigating and adjudicating, and decommissioning.[40] The NRC's primary goal is to eliminate the threat of public exposure to hazardous radiation from nuclear power generation by imposing effective reactor safety requirements for civilian-run nuclear power plants. In furtherance of this goal, the NRC was given latitude to implement extensive "reactor safety oversight and reactor license renewal of existing plants . . . and waste management of . . . high-level waste . . . ."[41] Currently, the NRC is reviewing license applications for new nuclear reactor plants throughout the U.S.[42]

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[36] *Id.*
[37] *Id.*
[38] *Id.*; 10 C.F.R. § 1.1 (2015).
[39] NUCLEAR REGUL. COMM'N, *supra* note 35.
[40] NUCLEAR REGUL. COMM'N, *supra* note 31.
[41] NUCLEAR REGUL. COMM'N, *supra* note 35.
[42] *Locations of New Nuclear Power Reactor Applications,* NUCLEAR REGUL. COMM'N, https://www.nrc.gov/reactors/new-reactors/col/new-reactor-map.html (last visited Nov. 18, 2020) [https://perma.cc/U7LT-E77T].

B. The Nuclear Regulatory Commission

The five NRC Commissioners are appointed by the President, confirmed by the Senate, and serve for a five-year term.[43] The NRC is given broad discretion in the means used to carry out their regulatory functions including, "standards setting and rulemaking; technical reviews and studies; public hearings; issuance of authorizations, permits, and licenses; inspection, investigation, and enforcement; evaluation of operating experience; and confirmatory research."[44] However, the NRC's heavy regulatory hand does not diminish the role of other organizations and governmental agencies in consulting with and advising the Commission on issues such as public health and environmental protection.[45]

From initial plant siting to end-of-life fuel storage, the NRC's reach into the commercial use of nuclear energy is extensive.[46] Additionally, the NRC issues guidance to nuclear facility licensees to aid in their compliance with federal regulations.[47]

Certain nuclear power activities within the NRC's authority require Environmental Impact Statements (EISs).[48] EISs are conducted in accordance with the National Environmental Policy Act (NEPA).[49] The EIS contains a concise and detailed analysis, using environmental and social sciences, of the impact of a proposal on the environment and public, including investigating possible alternatives to minimize that impact.[50]

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[43] 10 C.F.R. § 1.11(a).
[44] *Id.* § 1.11(b) (also as mandated by the Nuclear Nonproliferation Act of 1978, and in accordance with the National Environmental Policy Act of 1969, as amended, as well as other relevant statutes.).
[45] *Federal, State, and Tribal Liaison Programs*, NUCLEAR REGUL. COMM'N, https://www.nrc.gov/about-nrc/state-tribal/fst-liaison.html#:~:text=The%20NRC%20works%20cooperatively%20with,and%20efficiency%20in%20Federal%20services (last visited Nov. 18, 2020) [https://perma.cc/7BNR-X8XL]. The NRC cooperates and communicates with other federal agencies, state governments, and Native American Tribal governments. *Id.*
[46] NUCLEAR REGUL. COMM'N, *supra* note 31.
[47] *Id.*
[48] 10 C.F.R. § 51.20(b).
[49] NEPA is a comprehensive piece of environmental legislation requiring all federal agencies to assess the impact of their proposed projects on the environment—including social, economic, and security concerns. 40 C.F.R. § 1500.1 (2015).
[50] *Id.* § 1502.1 ("[the EIS] shall provide full and fair discussion of significant environmental impacts and shall inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment.").

Federal agencies, in order to comply with NEPA requirements, have adopted tailored procedures for conducting EISs and Environmental Assessments (EAs).[51] The NRC requires an EIS (or a supplement to an existing EIS) be prepared as part of a Combined License (COL) Application, or early site permit application, for a commercial nuclear power plant—a less intensive EA is required for a design certification application.[52] An approved COL Application authorizes the applicant to construct and operate a nuclear reactor at a designated site, and is valid for forty years with a possible renewal of up to twenty years.[53] In the case of an application for a "limited work authorization, construction permit, early site permit, or [COL]" of a nuclear facility, a notice of hearing is published in the FEDERAL REGISTER.[54] Additionally, the NRC publishes a notice of intent in the FEDERAL REGISTER stating that an EIS will be prepared.[55] Once the EIS is complete, a notice of availability is published stating "that copies of the final statement or any supplement to the final statement are available for public inspection . . . ."[56] The final environmental review and safety review become part of the hearings mandated by the AEA prior to issuing a new permit.[57]

C. Areas of Federal and State Authority

The basic structure of the nuclear power industry is built upon the heavy oversight of the federal government in the commercial development, construction, and operation of nuclear power reactors. State

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[51] The Environmental Assessment is a concise report on the "environmental impacts of a proposed action and alternatives," and assists in an agency's compliance with NEPA, helps to determine whether an EIS is required (or in the alternative a finding of no significant impact), and aids in the preparation of an EIS should it be required. 40 C.F.R. § 1508.9. The NRC utilizes NUREG-1555, "Environmental Standard Review Plan" (ESRP), and NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs" to conduct its environmental reviews. NUCLEAR REGUL. COMM'N, *supra* note 30.

[52] 10 C.F.R. § 51.20(b); NUCLEAR REGUL. COMM'N, *supra* note 30.

[53] 10 C.F.R. §§ 51.104, 54.31.

[54] *Id.* § 2.104.

[55] *Id.* § 51.116.

[56] *Id.* § 51.118. During this drafting period, the NRC reviews, comments on, and "make[s] appropriate changes to the EIS." *NRC's Environmental Review Process*, NUCLEAR REGUL. COMM'N, https://www.nrc.gov/reactors/new-reactors/regs-guides-comm/erp.html (last visited Nov. 20, 2020) [https://perma.cc/5WVQ-GJ5N].

[57] Repka & Smith, *supra* note 14, at 29; *NRC Licensing Process,* NUCLEAR REGUL. COMM'N, https://www.nrc.gov/reactors/new-reactors/new-licensing-files/new-rx-license-process.pdf. (last visited Nov. 23, 2020) [https://perma.cc/X448-PKKV].

authority to regulate and control the "the generation, sale or transmission of electric power [generated by nuclear power plants] licensed by the [NRC]" is authorized *to the extent* that those activities do not impinge upon the NRC's broad authority in regulating nuclear matters for the protection and security of the public from radiation hazards.[58] In other words, the ultimate responsibility of protecting the public from radiation hazards resides with the NRC (some authority may, by agreement, be delegated to states); however the NRC's authority does not affect states' ability to regulate "activities for purposes other than the protection against radiation hazards."[59] But, if the NRC enters into an agreement with a State for one of the allowed purposes under 42 U.S.C. § 2021(b), the State then *does have* the authority to regulate "for the protection of the public health and safety from radiation hazards."[60]

The long-term storage and disposal of SNF from decommissioned reactors remains a complex issue for the NRC, states, and the federal government.[61] The AEA specifically confers a duty upon any "person, agency, or other entity" proposing a site or method for disposing or storing SNF to notify the NRC as soon as possible after planning begins.[62] In turn, the NRC has the duty to notify the relevant State's Governor and legislature of such a proposal.[63] Furthermore, the NRC is "directed to prepare a report on means for improving the opportunities for State participation" in the nuclear lifecycle, including planning SNF storage and disposal facilities.[64] Moreover, the NRC is the licensing body for independent spent fuel storage installations (ISFSIs)—interim storage

[58] 42 U.S.C. § 2018. The NRC's "authority and responsibility" for regulating "the construction and operation of any production or utilization facility or any uranium enrichment facility" is absolute and cannot be transferred to any state. *Id.* § 2021.
[59] *Id.* §§ 2021(a)-(c), (k).
[60] *Id.* § 2021(b).
[61] Spent fuel rods are initially moved to on-site Spent Fuel Pools, or to Dry Cask Storage systems located on-site or at Consolidate Interim Storage Facilities (CISF). *Storage of Spent Nuclear Fuel*, NUCLEAR REGUL. COMM'N, https://www.nrc.gov/waste/spent-fuel-storage.html (last visited Oct. 30. 2020) [https://perma.cc/KJF3-ULPY]. SNF can be safely stored using these systems, but due to the extremely long half-life of the spent fuel's radioactive isotopes, and the lack of permanent federal repository, operating nuclear plants are reaching their on-site capacity for storage. Nat'l Conf. of State Legislatures & S. States Energy Bd., *supra* note 15. The accumulation of nuclear waste at reactor plants and the lack of an effective federal solution has created a "national problem." 42 U.S.C. at § 10131.
[62] 42 U.S.C. § 2021a(a).
[63] *Id.*
[64] *Id.*

complexes for SNF and related radioactive waste.[65] The federal government is responsible "to provide for the permanent disposal of high-level radioactive waste and [SNF]."[66] Nuclear waste generators—such as power plants—are responsible to pay the cost of, and plan for, the interim storage of such waste.[67] But, state and local government involvement in the "planning and development of repositories" is seen as "essential [in promoting] public confidence in the safety and disposal of such waste and spent fuel."[68]

The DOE's Office of Civilian Radioactive Waste Management was given the mission of developing and managing a federal program for the permanent storage and disposal of SNF and other high-level waste.[69] Yucca Mountain, located in Nevada, was proposed as a potential site for a permanent federal repository in 2002, but the license application was ultimately suspended in 2010, leaving the future of a federal repository in limbo.[70] Currently, there are over 100 storage sites for SNF in thirty-nine states; furthermore, various private entities and state and local governments are in the process of filing applications with the NRC for interim storage facilities located within their territory.[71] Spent fuel from decommissioned reactors remains an important consideration in the current state of nuclear power, and to its future potential.[72]

Separate, but related to the issue of nuclear waste disposal authority, is the delegation of authority regarding the development—and regulation—of the nuclear power industry in the context of a state's electricity industry. The Supreme Court case, *Pacific Gas & Elec. Co. v. State Energy Res. Conservation & Dev. Comm'n*, held that states have

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[65] 10 C.F.R. § 72.3.

[66] 42 U.S.C. § 10131.

[67] *Id.* §§ 10131(a)(4)-(5). The AEA also established a Nuclear Waste Fund, financed through mandatory fees imposed on generators and owners of nuclear waste, to ensure that "the costs of carrying out activities relating to the disposal of such waste and spent fuel will be borne by the persons responsible for generating such waste and spent fuel." *Id.* § 10131(b)(4).

[68] *Id.* § 10131(a)(6).

[69] Nat'l Conf. of State Legislatures & S. States Energy Bd., *supra* note 15.

[70] *Id.* At the time of this article, Yucca Mountain is being re-evaluated as a potential storage and disposal facility. MARK HOLT, CONG. RSCH. SERV., RL33461, CIVILIAN NUCLEAR WASTE DISPOSAL 1 (2018). The NRC Safety Evaluation Report and EIS were completed in 2016, with funding proposed for licensing Yucca Mountain and interim repositories. *Id.*

[71] *Id.* at 35-36; Nat'l Conf. of State Legislatures & S. States Energy Bd., *supra* note 15.

[72] 42 U.S.C. § 10131 (finding that "a national problem has been created by the accumulation of [SNF]," and that "high-level radioactive waste and [SNF] have become major subjects of public concern.").

some latitude in controlling the development of nuclear power within their borders through laws addressing economic (vice radiological safety) concerns.[73] In that case, a California statute conditioned the construction of nuclear power plants within the state on the State Energy Resources Conservation and Development Commission (Energy Commission) finding "that adequate storage facilities and means of disposal [were] available for nuclear waste . . . ."[74] The two statute provisions at issue were: (1) a prohibition on the construction of new reactor plants until the Energy Commission determined "on a case-by-case basis that there will be 'adequate capacity' for storage of a plant's [SNF]" at the time such storage is required, and that the generator had the capacity to store the full reactor core on-site—i.e., the interim storage of SNF; and (2) an overall "moratorium on the certification of new nuclear plants" until a permanent federal repository was designated and approved—i.e., the long-term storage of SNF.[75] The petitioners (various electric power companies and the United States) argued that the statute provisions were preempted by the AEA because the provisions attempted to regulate the construction of nuclear power plants and "is allegedly predicated on safety concerns" (areas reserved to the NRC's authority).[76] In other words, the petitioners' argument was that the statute regulated the construction of power reactors, which conflicted with Congressional and NRC decisions about the handling of SNF, and interfered with the AEA's purpose of developing nuclear energy technology and use. The Supreme Court affirmed the Ninth Circuit's holding that the first provision—regarding interim SNF storage—was not ripe for review because the courts could not determine whether the case-by-case determination of the Energy Commission would ever find a facility's storage capacity inadequate.[77] As to the second provision, the Court reasoned that a moratorium, while not pre-empted by the AEA per se, *would be prohibited* if "grounded in safety concerns."[78]

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[73] Pac. Gas & Elec. Co. v. State Energy Res. Conservation & Dev. Comm'n, 461 U.S. 190, 223 (1983) ("the legal reality remains that Congress has left sufficient authority in the States to allow the development of nuclear power be slowed or even stopped for economic reasons.").

[74] *Id.* at 194.

[75] *Id.* at 197-98 (quoting Cal. Pub. Res. Code § 25524.1(b) (Deering 1977)).

[76] *Id.* at 204 (stating that the statute "ignor[ed] the division between federal and state authority [and] f[ell] within the field" preserved for the exclusive control of the federal government).

[77] *Id.* at 203.

[78] *Id.* at 213 (discussing also that a state's prohibition on nuclear power development after deciding that nuclear power is generally unsafe would similarly conflict with federal authority.).

The question then, was whether there was a non-radiological safety rationale for the moratorium.[79] The Court accepted California's stated economic motive for the moratorium.[80] Additionally, the Court determined that the moratorium did not seek "to impose its own standards on nuclear waste disposal," and was not at odds with the NRC's regulations—which are grounded in safety concerns, not economic concerns.[81]

Another area where states may regulate nuclear matters is the mining of uranium, a common fuel used in power reactor fuel rods. In 2019, *Va. Uranium, Inc. v. Warren* held that a state ban on mining operations on private land within its territory was not pre-empted by the AEA.[82] In *Va. Uranium*, Petitioner Virginia Uranium, Inc., challenged a Virginia law that instituted a state-wide ban on uranium mining in Virginia.[83] Virginia Uranium argued that the Virginia law was preempted by the AEA in violation of the *Supremacy Clause* of the U.S. Constitution.[84] Specifically that the AEA granted the NRC sole regulatory power over uranium mining operations.[85] In affirming the Fourth Circuit's holding, the Supreme Court reasoned that while the AEA grants the NRC significant regulatory authority at all phases of the nuclear life cycle, including the construction of nuclear plants, and the "milling, transfer, use, and disposal of uranium," it specifically leaves out the historically-controlled area of mining on

[79] *Id.*
[80] *Id.* at 216 (explaining that the California Assembly Committee on Resources, Land Use, and Energy, which proposed the statute provision at issue, specifically reported that SNF disposal was a largely economic, not safety, issue). The Court noted that not only is it pointless to try and determine why a legislator voted, it is "clear that the States have been allowed to retain authority over the need for electrical generating facilities easily sufficient to permit a State so inclined to halt the construction of new nuclear power plants by refusing on economic grounds . . . ." *Id.* The Court also discussed the economic ramifications of the build-up of SNF in Spent Fuel Pools past capacity, which could force reactors to have to shut down, and the increasing economic risk to construct and operate new reactors without a permanent long-term storage facility. *Id.* at 195-96.
[81] *Id.* 218-19.
[82] Va. Uranium, Inc. v. Warren, 139 S. Ct. 1894, 1900, 1902 (2019) (explaining that the NRC may regulate uranium mining on federal lands, but if the NRC desires to mine on private land, it must purchase that land "by eminent domain and *make* it federal land").
[83] *Id.*
[84] *Id.* at 1901-07 (arguing that the AEA solely occupied "the field of radiation safety in uranium mining", and that the statute conflicted with the Congressional intent of "developing nuclear power while mitigating its safety and environmental costs").
[85] *Id.* Virginia Uranium maintained that it was free to mine in Virginia because the NRC—the sole regulatory authority—had said nothing to prohibit uranium mining. *Id.* at 1901.

private lands to the states.[86] Additionally, an analysis of the law "suggest[ed] that Congress elected to leave mining regulations on private land to the States."[87]

Given the controversial nature of nuclear fission's most infamous use in atomic weapons, funding required for the research and development of nuclear technology, concerns about national security, and safely guarding the public health from the associated radiation hazards, all led to the early formation of the robust federal oversight program of nuclear energy. The AEC (and then NRC) was given almost exclusive authority to regulate every aspect of the nuclear life cycle, from the initial extraction of uranium ore at the milling phase (where uranium ore is filtered and turned into "yellowcake") to the disposal of spent fuel rods from a decommissioned reactor.[88] Despite this authority, states are not powerless to regulate nuclear matters within their territories. Amendments to the AEA and the judicial upholding of state law that regulated certain nuclear matters solidified the State's role in regulating nuclear energy for purposes other than radiation safety, while acknowledging the distinct boundary at which state authority ends and that of the NRC begins.

D. Special Protections and Subsidies

The uncertainties faced by nuclear power plant developers include: (1) the technical uncertainties in cost, time, effort, and materials associated with innovative reactor design; (2) the land, labor, and material costs associated with construction; and (3) the risk that a developer will not be able to recoup its capital investment due to changes in the price of uranium, electricity demand, competing energy resources technology, and federal and state policy changes throughout the life of the reactor plant.[89] These uncertainties risk the unprofitability of building and operating a nuclear power plant, and hinder the investment into new nuclear power plant construction.[90] From its inception in the 1950s to the early 1970s, the nuclear power industry amassed support from both the public and

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[86] *Id.* at 1900. The AEA specifically states that the NRC's authority begins "after [uranium's] removal from its place of deposit in nature." *Id.* at 1902.

[87] *Id.* at 1908. The Court declined to perform an inquiry into the purpose and intent of the Virginia legislature, stating that Virginia's law prohibiting mining was "far removed from the NRC's historic power," and therefore such an inquiry would be inappropriate. *Id.* at 1904.

[88] *Id.* at 1900, 1902.

[89] T.L. Fahring, *Nuclear Uncertainty: A Look at the Uncertainties of a U.S. Nuclear Renaissance*, 41 TEX. ENVTL. L.J. 279, 283-84 (2011).

[90] *Id.* at 284-85.

government.[91] During this period, recognizing the need for investment into nuclear technology, the federal government took an aggressive pro-nuclear stance, passing legislation that incentivized and subsidized research and development into nuclear energy, and attempted to streamline the permitting process for new power plants—effectively reducing uncertainty for would-be investors and developers.[92] To that end, various development subsidies have been granted in the form of tax credits, fuel and enrichment subsidies, subsidies associated with developing health and national security regulations, and liability limits for nuclear accidents.[93]

One of the most important subsidizations of the nuclear power industry was the Price-Anderson Act (the "Act"), which limited a private developer's liability for public harm caused by nuclear accidents associated with nuclear power generation.[94] Under the act, nuclear energy developers were only liable to cover a fraction of what the potential worst-case nuclear accident liabilities would be (the maximum coverage insurance companies were willing to provide was about sixty million and the worst-case scenario estimated liabilities of about five to seven billion); essentially, the Act capped the liability for nuclear accidents at a low $560 million, with the government accountable for the largest portion of such liabilities.[95] This liability cap and relatively small upfront insurance cost was seen as a necessary measure to reduce uncertainty in the new industry, and unburdened developers' fears of future insurance payouts for a, albeit unlikely, nuclear incident.[96]

The AEA also created a scholarship and fellowship program, allowing the NRC to award scholarships and fellowships to certain students who agreed to be employed by the NRC in certain areas of science.[97] The areas of study were broad, and included "science, engineering, or another field of study that the Commission determines is in a critical skill area related to [its] regulatory mission."[98]

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[91] *Id.* at 285. The nuclear power industry, initially designed as a federal monopoly, was opened to private developers who could receive licenses from the AEC to operate nuclear facilities. *Id.* at 286.

[92] *Id.* at 286

[93] *Id.* at 286-88.

[94] *Id.* at 286; 42 U.S.C. § 2210(c) ("The [NRC] shall [for licenses requiring financial protection of less the $560 million dollars] agree to indemnify and hold harmless the licensee and other persons indemnified . . . from public liability arising from nuclear incidents which is in excess of the level of financial protection required of the licensee.").

[95] Fahring, *supra* note 89, at 286.

[96] *See Id.*

[97] 42 U.S.C. § 2015(a)-(b).

[98] *Id.*

Research grants, loans, and other types of development assistance were also important programs authorized by the AEA.[99] The AEC was given broad discretion to distribute funds to private and public institutions in the form of loans, grants, agreements, and equipment in support of education, training, and research and development related to nuclear processes and radiation.[100]

These subsidies, combined with relatively straight forward and simple licensing procedures, contributed to the early boom and success of the nuclear power sector.[101]

Thus, between the 1950s and 1970s, the nuclear energy sector enjoyed favorable governmental policy, generally received public support (or at least little pushback), and was projected to be a cheap, prolific, and widespread electricity source in the United States.[102] But, the post-1970s saw an increase in public skepticism of nuclear power's possible effects on health and safety, national security, and the environment.[103] The nuclear accidents at Chernobyl and Three Mile Island during the 1970s and 1980s did little to allay the growing public fear of nuclear energy.[104] Furthermore, reductions or eliminations of certain subsidies, concerns that the newly created NRC was overlooking safety defects in the name of construction and production, and the growing uncertainty of future storage and disposal of SNF, increased uncertainty in the market and choked the nuclear power industry at every level of development—effectively making it unable to compete with traditional fossil fuel-powered plants.[105] As a result, no new reactors were constructed for over two decades after the late 1970s.[106]

Since the late 1980s there have been various revitalization efforts at the federal and state government level to reinvigorate the nuclear power industry.[107] The NRC made efforts to streamline the licensing process—

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[99] *Id.* § 2051(a)-(b).
[100] *Id.*
[101] *See* Fahring, *supra* note 89, at 287-88.
[102] *See Id.* at 288 (describing how subsidies, public support, and smooth licensing led to a spurt of new construction, with the government projecting the construction of thousands of new plants and assuring the public that the electricity produced would be extremely cheap).
[103] *Id.* (discussing the public's growing "disillusionment with the industry").
[104] *See Id.*
[105] *See Id.* at 288-92 (discussing, for example, a 1975 amendment to the Price-Anderson Act which removed public funding for liability coverage).
[106] *Nuclear Power in the USA*, WORLD NUCLEAR ASS'N., https://www.world-nuclear.org/information-library/country-profiles/countries-t-z/usa-nuclear-power.aspx (last visited Nov. 17, 2019) [https://perma.cc/ANC2-8QKY].
[107] Fahring, *supra* note 89, at 294.

after finding that the previous licensing procedure, although simple, was fraught with defects that actually contributed to uncertainty in the industry—by creating Early Site Permits that allowed developers to begin safety, environmental, and emergency preparedness reviews early on, Standard Design Certifications that created an "off the shelf" design option, and the Combined Construction and Operating License (COL) that functioned as a construction and operation license.[108] In a related effort, the DOE created the Nuclear Power 2010 program, which created a "fifty-fifty cost-sharing agreement" that shared the cost of testing the new licensing process with developers.[109] Another revitalization mechanism was the Energy Policy Act of 2005, which incentivized new construction through renewed tax credits, insurance subsidies, and loan guarantees (given to energy production technologies that limit or eliminate emissions).[110] More recently, certain states have adopted Zero-emission Credit (ZEC) programs that compensate nuclear power plants for their carbon-free operation.[111]

While the future of nuclear power in the United States remains uncertain, a few points seem clear. First, public support for, or opposition of, nuclear power has fueled policy shifts regarding nuclear energy subsidies and development. Second, the stalemate over a site for the permanent repository for SNF, the high costs associated with construction, significant delays, and the availability of cheaper energy sources such as coal and natural gas has greatly suppressed the construction of new power reactors in the U.S. Third, electrical energy demands are rapidly increasing every year. Climate change has become an unavoidable consideration in the energy industry; specifically the controversy over burning fossil fuels such as coal and natural gas, which make up the largest percentage of our electricity generation capacity (slightly over sixty percent).[112] At this time, nuclear power (which provides approximately twenty percent of electricity generation in the U.S.) is the only electrical power generator that can simultaneously meet rising consumer energy demands while decreasing

[108] *Id.* at 295-97.
[109] *Id.* at 298.
[110] *Id.* at 299-302. These subsidies and credits were meant to reduce uncertainty in construction, operation, and the technology required for successful and lucrative nuclear energy projects. *Id.*
[111] *Five States have Implemented Programs to Assist Nuclear Power Plants*, U.S. ENERGY INFO. ADMIN. (Oct. 7, 2019), https://www.eia.gov/todayinenergy/detail.php?id=41534 [https://perma.cc/W4PT-TTNV].
[112] WORLD NUCLEAR ASS'N., *supra* note 106.

GHG emissions contributing to climate change.[113] But, the significant cost and timeline for bringing a new nuclear reactor online, combined with the need to rapidly reduce global emissions to meet climate change targets, means that nuclear power cannot alone provide the short-term solution.[114]

III. THE DEVELOPMENT OF OFFSHORE WIND POWER IN THE U.S.

A. The History of Wind Power in the U.S.

The driving forces behind the investment into renewable energy are politically, environmentally, and socially motivated. Today, the effects of global warming are being felt more acutely. Sea level is rising dangerously in some areas, storms are intensifying, and extensive drought periods and more frequent heat waves are impacting every sector of the economy and every human life. Changes in the earth's climate have altered fragile ecosystems, affected our agricultural sector and food supply chains, put city populations and infrastructure at risk (sea level rise continues to encroach on coastal communities while acid rain corrodes infrastructure), and has put the public health at risk from increased air pollution and compromised water quality.[115]

Even before climate change and climate science became true foundations for policy, the U.S. was attempting to reduce its reliance on foreign energy resources, most significantly oil. The 1970's oil and gas shortage in the increasingly energy-hungry U.S., combined with skyrocketing prices, led lawmakers to reassess the U.S. dependence on

[113] Ken Silverstein, *If Nuclear Energy Is Replaced By Natural Gas, Say Goodbye to Climate Goals*, FORBES (May 10, 2019), https://www.forbes.com/sites/kensilverstein/2019/05/10/if-nuclear-energy-is-replaced-by-natural-gas-say-goodbye-to-climate-goals/?sh=2defae2c2016 [https://perma.cc/6HB2-698D]; Chris Mooney, *It's the First New U.S. Reactor in Decades. And Climate Change Has Made That a Very Big Deal*, THE WASHINGTON POST (June 18, 2016), https://www.washingtonpost.com/news/energy-environment/wp/2016/06/17/the-u-s-is-powering-up-its-first-new-nuclear-reactor-in-decades/ (discussing that as nuclear plants shut down, solar and wind are unable to keep up with the electricity-generating capacity of nuclear power, which could actually increase emissions due to the need to rely more on fossil fuels to pick up the slack) [https://perma.cc/L43A-T226].

[114] Mooney, *supra* note 113 (discussing that international climate change targets that seek to "keep global warming below 2 degrees or even 1.5 degrees Celsius above late-19th-century levels" mean emissions reductions need to occur fast).

[115] *The Effects of Climate Change*, NASA, https://climate.nasa.gov/effects/ (last visited Nov. 23, 2019) [https://perma.cc/C9L5-SWKD].

foreign oil.[116] The energy crisis put the issues of energy resource dependency and consumption on the front burner, and led to energy reform in the U.S., including efforts to reduce dependency on foreign oil and promote alternative sources like wind, solar, and nuclear.[117]

Against this backdrop, the Public Utility Regulatory Policies Act (PURPA) of 1978, was enacted to promote energy conservation, and required state utility companies to purchase a certain amount of electricity from renewable energy sources.[118] Additionally, Congress promoted research, production, and the purchase of electricity from renewable energy through legislation such as the Energy Policy Act of 1992 (which, for example, created tax credits for renewable energy), and the Energy Policy Act of 2005 (which extended some renewable energy provisions, and attempted to stimulate investment into renewable and sustainable energy).[119] As alternatives to legislation, resources have been devoted to promoting the research and development of renewable energy, including wind. The National Wind Technology Center, built in the 1990s, was designated as the U.S. central hub for wind technology development, and in 2011, the DOE and DOI released a National Offshore Wind Strategy—an initiative designed to reduce energy costs through investment in wind technology.[120]

B. Land-based Wind Power

The first major development in wind energy was land-based wind power, originally developed for use in the western U.S.[121] The late nineteenth and early-twentieth centuries brought with them the innovation

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[116] *Energy Crisis (1970s)*, HISTORY, https://www.history.com/topics/1970s/energy-crisis (last visited Nov. 20, 2019) [https://perma.cc/H3KD-9SV5].

[117] *Id.*

[118] *History of U.S. Wind Energy*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, https://www.energy.gov/eere/wind/history-us-wind-energy (last visited Nov. 26, 2019) [https://perma.cc/5NTX-W2QZ].

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[119] Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. 2776 (codified in scattered sections of 12 U.S.C., 16 U.S.C., 25 U.S.C., 26 U.S.C., 30 U.S.C., 42 U.S.C.); Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 (codified in scattered sections of 7 U.S.C., 10 U.S.C., 15 U.S.C., 16 U.S.C., 22 U.S.C., 26 U.S.C., 30 U.S.C., 40 U.S.C., 42 U.S.C.).

[120] OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, *supra* note 118.

[121] *Id.*

of turbine design, and the shift from windmills as pumping power to windmills as electrical power. PURPA promoted investment into renewable energy sources like wind power, including investment into the first utility-scale, land-based wind farm in California.[122] As wind technology developed, many organizations contributed to its research and development, including NASA (developing a method for predicting turbine performance),[123] the National Renewable Energy Laboratory (NREL) (conducting extensive research and data analysis on wind power plants, and working with industry leaders to advance land-based wind power use and reliability),[124] and the Wind Energy Technologies Office (WETO) (investing into the research and development of wind technology and sciences).[125] Due to the fact that offshore wind turbines have the potential to produce substantially greater amounts of energy than their land-based equivalents—due to more abundant, frequent, and consistent wind resources at sea—there has been a relatively recent shift towards offshore wind development.[126]

C. Offshore Wind Power

OSW is increasingly being utilized globally, with the United Kingdom coming in at the top with the largest market for power generated by offshore wind in the world—with other European countries, Asia, and the U.S. following.[127] The U.S., for its part, recognizing the abundant and untapped wind resources of the oceans and Great Lakes of the U.S., released the first National Offshore Wind Strategy in 2011.[128] The

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122 *Id.*
123 *Id.*
124 *Land-Based Wind Research*, NAT'L RENEWABLE ENERGY LAB'Y, https://www.nrel.gov/wind/land-based-wind.html (last visited Nov. 26, 2019) [https://perma.cc/4CLC-U4TP].
125 WIND ENERGY TECH. OFF., OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, https://www.energy.gov/eere/wind/key-activities-wind-energy (last visited Nov. 22, 2020) [https://perma.cc/JYY9-LH8P].
126 BUREAU OF OCEAN ENERGY MGMT., U.S. DEP'T OF THE INTERIOR, RENEWABLE ENERGY ON THE OUTER CONTINENTAL SHELF, https://www.boem.gov/renewable-energy/renewable-energy-program-overview (last visited Nov. 10, 2020) [https://perma.cc/UH4B-9XVK].
127 Úna Brosnan, *Offshore Wind Overview*, *in* OFFSHORE WIND HANDBOOK 7, 8-10 (2019).
128 *See generally*, U.S. DEP'T OF ENERGY & U.S. DEP'T OF THE INTERIOR, NATIONAL OFFSHORE WIND STRATEGY: FACILITATING THE DEVELOPMENT OF THE OFFSHORE WIND ENERGY INDUSTRY IN THE UNITED STATES (2011),

Strategy outlined the potential value and challenges associated with the development of OSW as a renewable energy competitor in coastal-state energy markets.[129] Some of the challenges included overcoming the high cost of energy produced by wind power, installation and grid interconnections, the lack of site data (i.e., geological and metocean data), and the lack of industry experience.[130] Research and development, test projects, and data collection followed. In 2016, the DOE and DOI released an updated National Offshore Wind Strategy to address changes in the energy policy landscape in the U.S., new domestic and foreign energy markets, innovative wind technology, and state actions taken to promote renewable energy sales within their borders.[131] The 2016 National Offshore Wind Strategy included federal action items targeted at reducing uncertainty and increasing reliability in the OSW industry including: (1) advancing methods for obtaining metocean and geological conditions; (2) advancing wind plant technology (adapting existing and developing new technology catered to U.S. potential wind plant sites which could meet rigorous safety standards); (3) streamlining and re-assessing current supply chains of wind plant components (including port access for imported parts, and manufacturing capabilities of U.S. facilities); (4) streamlining the regulatory process for planning, siting, constructing, and operating a wind plant (modifying site assessment plan requirements to be less costly, providing greater flexibility in leasing, promoting efficient intergovernmental coordination, and developing safety guidelines); (5) furthering research efforts to understand and mitigate OSW effects on other ocean resources (e.g., effects on coastal environments and communities, wildlife and habitat impacts, commercial uses, military operations, and radar systems used by the military and the Federal Aviation Administration); (6) analyzing and optimizing methods of grid interconnection and integration (i.e., for OSW to compete with other energy sources, and for state and regional energy stakeholders to incorporate OSW into the local energy market, there must be a cost effective and reliable path to transmit electricity generated by OSW to

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https://www.energy.gov/sites/prod/files/2013/12/f5/national_offshore_wind_strategy.pdf [https://perma.cc/3STR-86LL].

[129] *See Id.*

[130] *Id.* at 8-11.

[131] *See generally*, U.S. DEP'T OF ENERGY & U.S. DEP'T OF THE INTERIOR, NATIONAL OFFSHORE WIND STRATEGY: FACILITATING THE DEVELOPMENT OF THE OFFSHORE WIND ENERGY INDUSTRY IN THE UNITED STATES (2016), https://www.boem.gov/sites/default/files/renewable-energy-program/National-Offshore-Wind-Strategy-report-09082016.pdf [https://perma.cc/6BKN-KBJQ].

coastal load centers); and (7) developing investor-friendly policies and increasing confidence through pilot projects.[132]

The DOI's Bureau of Ocean Energy Management (BOEM) is responsible for the regulation, management, and development of offshore resources in the U.S.[133] Any OSW project proposed in federal waters is subject to the licensing process administered by BOEM. "Federal waters" in this usage refers to the Outer Continental Shelf (OCS)—that portion of the "submerged land, subsoil, and seabed" of the United States that is subject to federal jurisdiction (as opposed to that area under state jurisdiction or the high seas).[134] States may regulate activities within their jurisdiction (submerged land within three nautical miles from shore), but certain federal laws may impact the states' use of their territory. On the other hand, although the federal government has exclusive authority to regulate activities in the OCS, extending out to the high seas (200 nautical miles from shore), several statutes allow for state review of federal activities in federal waters.[135]

D. Overview of BOEM Leasing Process

The Energy Policy Act of 2005 granted BOEM regulatory authority over offshore resources on the OCS.[136] BOEM was given the authority to implement regulations including "issuing leases, easements and rights-of-ways for OCS activities that support production and transmission of renewable energy."[137] BOEM has authority over offshore resources under Chapter V of Title 30 of the *Code of Federal Regulations*.[138] Even with

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132 *Id.* at 47-64.
133 BUREAU OF OCEAN ENERGY MGMT., U.S. DEP'T OF THE INTERIOR, BOEM GOVERNING STATUTES, https://www.boem.gov/about-boem/regulations-guidance/boem-governing-statutes (last visited Jan. 10, 2020) [https://perma.cc/FL2G-KU3W].
134 BUREAU OF OCEAN ENERGY MGMT., U.S. DEP'T OF THE INTERIOR, OUTER CONTINENTAL SHELF, https://www.boem.gov/oil-gas-energy/leasing/outer-continental-shelf (last visited Jan. 10, 2020) [https://perma.cc/EZ3U-895D].
135 *Id.*; *see* Jeffery Thaler, *Fiddling as the World Floods and Burns: How Climate Change Urgently Requires A Paradigm Shift in the Permitting of Renewable Energy Projects*, 42 ENVTL. L. 1101, 1130-31 (2012).
136 BUREAU OF OCEAN ENERGY MGMT., *supra* note 133.
137 BUREAU OF OCEAN ENERGY MGMT., U.S. DEP'T OF THE INTERIOR, WIND ENERGY COMMERCIAL LEASING PROCESS (2017).
https://www.boem.gov/sites/default/files/oil-and-gas-energy-program/Leasing/Five-Year-Program/2019-2024/DPP/NP-Wind-Energy-Comm-Leasing-Process.pdf (last visited Oct. 26, 2020) [https://perma.cc/S4PA-WEDK].
138 30 C.F.R. § 585.100.

BOEM's authority over significant aspects of OSW leasing and development, the regulatory pathway remains a complex process involving the cooperation of multiple federal, state, and local entities.

To address this complexity, BOEM established Intergovernmental Renewable Energy Task Forces (Task Forces) in states seeking to promote and develop OSW projects.[139] The Task Force is comprised of all parties with a relevant interest in the project, and seeks to "collect and share relevant information that would be useful to BOEM" while it engages in the leasing process.[140]

The first phase of the BOEM offshore leasing process is the "planning and analysis" phase.[141] During this initial phase, BOEM may solicit developers for applications, or might receive unsolicited applications.[142] The Task Force, responsible for identifying suitable Wind Energy Areas—those areas of the OCS most suitable for OSW, may take two years or more to conduct the necessary investigation to identify these areas.[143] The second phase, leasing, is done competitively, and if there are multiple applicants, a lease auction may take place.[144] If a lease is granted by BOEM, the developer receives access and rights to produce and sell electricity generated by OSW, but cannot begin construction at this point in the process.[145]

After a lease is granted, the lessee/developer has twelve months to submit a Site Assessment Plan (SAP) to BOEM for approval.[146] The SAP includes the data and analysis of the potential wind resources, and the geographical and metocean data of the proposed OSW plant site.[147] BOEM conducts extensive environmental and technical reviews of the SAP, and typically either approves the SAP, or "approves with conditions."[148] Once the SAP is approved, the final stage of the leasing process is the Construction and Operations phase.[149] The lessee has five years to engage in further site assessments and submit a Construction and Operation

139 BUREAU OF OCEAN ENERGY MGMT., *supra* note 133.
140 *Id.*
141 Úna Brosnan, *Consent and Permitting, in* OFFSHORE WIND HANDBOOK 53 (2019).
142 *Id.*
143 *Id.*
144 *Id.* at 53-54.
145 David Wochner & Ankur Tohan, *Laws and Regulations Shaping Offshore Wind Development*, *in* OFFSHORE WIND HANDBOOK 13, 15 (2019).
146 *Id.*
147 *Id.*
148 *Id.*
149 *Id.*

Plan (COP), including a decommissioning plan.[150] Once the COP is submitted to BOEM, public comments will be solicited prior to a final approval decision issued to the developer.[151] If the COP is approved, the developer receives a twenty-five-year permit, with the possibility of a renewal.[152] Typically, in conjunction with this phase, easements to install the necessary cables, pipelines, and other support structures required to transmit electricity to shore are issued to the developer. It can take up to ten years for commercial operation of an offshore wind plant to commence.

E. NEPA, Migratory Bird Treaty Act, and Other Federal and State Agency Requirements

Collaboration between BOEM and various federal and state agencies plays a vital role in permitting and operating OSW facilities. These agencies include the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Services (USFWS), the Army Corps of Engineers (responsible for enforcing requirements under the Clean Water Act), the Department of Defense (DOD), the Federal Aviation Agency (FAA) (responsible for the administration of the Federal Aviation Act), and various state agencies—such as a State's Department of Nature Resources.[153]

The National Environmental Policy Act (NEPA) provides the federal framework for assessing the acceptability of Wind Energy Areas (WEAs)—areas offshore considered most well-suited for OSW.[154] BOEM conducts an Environmental Assessment (EA) of any proposed OSW project, providing the public and officials with a comprehensive study of

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150 *Id.*
151 *Id.*
152 *Id.*
153 *See* Jeffery Thaler, *Permitting and Leasing Roadmap for Offshore Maine Wind Energy Projects,* OFFSHORE WIND ENERGY PROJECT ROADMAP 9-19 (2013), https://e2tech.org/Resources/Documents/MOWII_Offshore_Wind_Roadmap_JAN2013.pdf (discussing the various federal statutes that must be taken into account and federal permits required for a state to install and operate an OSW project in state waters) [https://perma.cc/9CXY-XKRN]. However, these considerations are applicable to projects in federal waters as well. Wochner & Tohan, *supra* note 145, at 13.
154 Wochner & Tohan, *supra* note 145, at 15.

the potential environmental consequences of a proposed wind plant, which includes possible mitigation tactics

and any alternatives that could lessen environmental impacts.[155] The EA is conducted as part of the planning and analysis phase of OSW permitting, in cooperation with other interested agencies, and provides for a thirty-day public comment period. If no significant effects are indicated in the EA, a Finding of No Significant Impact (FONSI) is issued.[156] Further along in the permitting process, when the BOEM receives the COP from the developer, it will prepare an Environmental Impact Statement (EIS)—a more detailed, comprehensive, and rigorous analysis of the potential environmental impacts of a proposed action, with a significant focus on "objectively evaluat[ing] all reasonable alternatives" to "include reasonable alternatives not within the jurisdiction of the lead agency," allowing the public to make clear and informed decisions on the proposed action and reasonable alternatives.[157]

As part of this collaborative framework to assess and analyze the environmental consequences of a proposed OSW project, BOEM consults with the NMFS and USFWS on compliance with the Endangered Species Act of 1973 (ESA).[158] BOEM—under the guidance of the NMFS and USFWS—prepares an assessment of potential impacts to wildlife, habitats, and endangered species, and proposes measures to reduce any potential adverse effects.[159] Generally, the NMFS and USFWS will give their concurrence (or not) that the proposed project is unlikely to negatively impact endangered (or threatened) species (or habitats). If they do not concur, then a more in-depth, formal examination is conducted, including reasonable alternatives and measures needed to mitigate those effects.[160] The developer may be required to implement mitigation tactics that were identified during this consultation process.

The Migratory Bird Treaty Act (MBTA) makes it illegal to "pursue, hunt, take, capture, kill, attempt to take, capture, or kill . . . any migratory bird, any part, nest, or egg of any such bird."[161] If violated, the MBTA carries with it criminal penalties whether the violation was done

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[155] *Id.* at 14.
[156] BUREAU OF OCEAN ENERGY MGMT., *supra* note 133.
[157] 40 C.F.R. §§ 1502.14(a), (c) (2019).
[158] Endangered Species Act, 16 U.S.C. § 1531 et seq. (1973) (enacted to protect endangered or threatened species and their habitats from human activities); Wochner & Tohan, *supra* note 145, at 16.
[159] Wochner & Tohan, *supra* note 145, at 16-17.
[160] *Id.*
[161] Migratory Bird Treaty Act (MBTA), 16 U.S.C. § 703.

knowingly or not.[162] BOEM utilizes the NEPA process to conduct studies on the possible impact of OSW development on migratory birds, and consults with the USFWS—the agency responsible for administering the MBTA—on offshore projects that could potentially threaten protected migratory bird species, and on mitigation measures that could be employed to reduce those risks.[163] Risks to migratory birds include "attraction to and collision with [offshore] structures," habitat destruction, and those associated with accidents such as oil spills.[164]

The Coastal Zone Management Act (CZMA) requires federal activities, "within or outside the coastal zone," which might impact a coastal zone to "be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs."[165] Consequently, in the case of an OCS lease sale by BOEM, a state may object to BOEM's Consistency Determination (CD)—a document stating either that the activity is "fully consistent" or "to the maximum extent practicable" with a State's management program; however, BOEM may still proceed with the action without a state's permission if the CD fully explains the "legal impediments to being fully consistent", or if BOEM determines that the activity is "fully consistent."[166] In the case of an applicant seeking a federal license or permit for activities on the OCS, a Consistency Certification (CC) must be completed before the COP is approved.[167] BOEM then submits the CC and proposed development and or

[162] *Id.* §§ 707(a)-(b).
[163] Wochner & Tohan, *supra* note 145, at 17.
[164] *Id.*
[165] Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456. The "coastal zone" is the "coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder), strongly influenced by each other and in proximity to the shorelines of the several coastal states . . . ." *Id.* § 1453(1). The CZMA assists states in developing effective coastal management programs, and OSW actions likely to impact the coastal zone should be consistent with the "enforceable policies" of an affected state's coastal management plan. Wochner & Tohan, *supra* note 145, at 18.
[166] BUREAU OF OCEAN ENERGY MGMT., DEP'T OF THE INTERIOR, COASTAL ZONE MANAGEMENT ACT, https://www.boem.gov/environment/environmental-assessment/coastal-zone-management-act (last visited Nov. 22, 2020) [https://perma.cc/YYT2-6TZS].
[167] BUREAU OF OCEAN ENERGY MGMT., DEP'T OF THE INTERIOR, INFO. GUIDELINES FOR A RENEWABLE ENERGY CONSTR. & OPERATIONS PLAN (COP) (2020), https://www.boem.gov/sites/default/files/documents /about-boem/COP%20Guidelines.pdf [https://perma.cc/V9RS-8ADH]; 30 C.F.R. §§ 585.627(a)(9), (b) ("stating that the proposed activities described in detail in your plans comply with the State(s) approved coastal management program(s) and will be conducted in a manner that is consistent with such program(s).").

construction plan to the affected states for a consistency review.[168] If the State objects to the CC, BOEM is prohibited from issuing the permit or license, and the applicant must either appeal the State's decision, or resubmit the CC with the appropriate amendments.[169]

Other important federal statutes affecting BOEM's OSW licensing and permitting process include: (1) the Jones Act, requiring vessels operating between points in U.S. territorial waters and the OCS to be built in the U.S., owned and controlled by a U.S. citizen, primarily operated by a U.S. crew, and operated with a coastwise endorsement issued by the U.S. Coast Guard;[170] (2) the Outer Continental Shelf Lands Act (OCSLA), which extends U.S. jurisdiction to the OCS "and to all artificial islands, and all installations and other devices permanently or temporarily attached to the seabed, which may be erected thereon for the purpose of exploring for, developing, or producing resources therefrom;"[171] (3) the Clean Water Act (CWA), requiring any applicant for a federal license or permit to "construct[] or operat[e] facilities, which may result in any discharge into the navigable waters," to provide a certification to the state "in which the discharge originates or will originate" that it complies with water quality and effluent standards; and (4) the Clean Water Act (CWA), requiring a permit (issued by the USACE) to discharge dredging materials into specified disposal sites in navigable waters.[172]

The preceding list does not exhaust the federal statutes requiring consideration in permitting OSW facilities in federal waters. Among other permissions, the FAA's approval to erect turbines of a certain height when installed in certain locations, so to not interfere with navigation radar and paths, may be required.[173] As further considerations, OSW facilities potentially impact commercial vessel and fishing routes, and military operations.[174]

Because of the diversity of the OCS landscape, the many configurations that a project may take (e.g., floating versus anchored turbines, federal versus state waters, nuances in State coastal management programs, and alternatives and mitigation techniques that need to be considered based on potential sites), the path to developing an OSW plant

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[168] Wochner & Tohan, *supra* note 145, at 18.
[169] BUREAU OF OCEAN ENERGY MGMT., *supra* note 166.
[170] William Myhre & Lindsey Greer, *The Jones Act Maritime Law, in* OFFSHORE WIND HANDBOOK 28, 28 (2019).
[171] 43 U.S.C. § 1333(a)(1). The extent of this jurisdiction has been interpreted to apply to renewable energy production and transmission. Myhre & Greer, *supra* note 170, at 28.
[172] 33 U.S.C. §§ 1311-12, 1341, 1344.
[173] *See* Thaler, *supra* note 153, at 10.
[174] Brosnan, *supra* note 141, at 54.

may be considerably different in complexity and duration from one project to the next.

F. A Brief Overview of OSW Technology

The design, materials, and ultimate construction of an offshore wind facility may vary depending on the terrain, water depth, wind resources available in the area, the distance from shore, biological habitats in the area, the surrounding coastal landscape, the number of turbines, flight paths, military operations, and commercial fishing operations in the development area. While the ultimate layout of the plant may differ from one to the next, they all share certain components, including a generator, foundation, electrical cabling, and substations.

Offshore turbines are traditionally anchored in shallow areas of the OCS; however, new technology is exploring utilizing floating turbines in deep water areas of the OCS. Regardless of the method utilized, turbines must have a foundation that allows them to withstand conditions at sea including hurricanes, heavy loading from sea currents, and metal fatigue from constant submersion in salt water. Designs for grounded (or anchored) foundations include, among others, the monopile (essentially a single pile driven into the seabed), the gravity foundation (a steel or concrete platform placed in an area of the seabed terrain specifically prepared for the foundation to rest), and the jacket foundation (multiple anchoring points driven into the seabed).[175] Floating foundations may be moored, ballasted, or have buoy-type systems to stabilize them.[176]

Turbine blades, the most prominent and notable feature on a wind turbine, harness the kinetic energy of the wind, turning the blades, which are connected to a gearbox that sits behind the blades in a structure called the nacelle. The nacelle also contains the turbine's generator. As the turbine blades spin, so do the gears in the gear box, stepping up the rotational speed and ultimately causing the generator to spin This action

[175] Úna Brosnan & Andrew Thompson, *Offshore Wind Infrastructure, in* OFFSHORE WIND HANDBOOK 59, 60-62 (2019).

[176] Ian Baring-Gould*, Offshore Wind Plant Electrical Systems*, NAT'L RENEWABLE ENERGY LAB. (2014), https://www.boem.gov/sites/default/files/about-boem/BOEM-Regions/Pacific-Region/Renewable-Energy/6-Ian-Baring-Gould---BOEM-Offshore-Wind-Plant-Electrical-Systems-CA.pdf [https://perma.cc/2EMJ-8TVY].

converts the kinetic energy of the wind (and mechanical rotation of the turbine blades) into electrical energy in the generator.[177]

The complexities of OSW plant electrical cabling are beyond the scope of this article, but every OSW facility will have an electrical cable design layout that connects the offshore turbines to each other (called inter-array cables), connects the offshore turbines to an offshore Substation Platform (OSS) (essentially collecting the electricity generated by the turbines at an offshore structure), and which connect the OSS to an onshore substation (through the export cable) where the electricity will ultimately be connected to the regional electricity grid (called an "interconnection").[178] These high-voltage electrical cables are typically laid down along or buried in the seabed, although the design would be altered for floating-foundation wind turbines.[179]

G. Offshore Wind Projects in the U.S.

Despite the growing concern of climate change, rising energy demands, and the potential for OSW to lead the way in U.S. clean energy, the U.S. is still lagging behind countries such as China, the U.K., and other European nations in developing and harnessing offshore wind resources.[180] Currently, there is only one commercially operating wind farm offshore near Block Island, Rhode Island. The Block Island plant came online in 2016, is in state waters, and has a nameplate capacity of thirty megawatts.[181]

Concerns in the U.S. about negative environmental impacts, effects on the U.S. fishing industry, potential conflicts with air traffic routes, military operations, and commercial vessel routes, high development costs, lengthy and complex permitting process, the uncertainty of subsidies and tax credits, and coastal aesthetics, have all kept potential investors and developers from moving forward on OSW projects up until recently.

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[177] Anmar Frangoul, *From Top to Bottom: How a Wind Turbine Actually Works*, CONSUMER NEWS & BUS. CHANNEL (CNBC) (May 14, 2019), https://www.cnbc.com/how-a-wind-turbine-works/ [https://perma.cc/TGG5-WTHG].

[178] Baring-Gould, *supra* note 176.

[179] *Id.*

[180] Jennifer A. Dlouhy, *Why It's So Hard to Build Offshore Wind Power in the U.S.*, BLOOMBERG L. (Oct. 1, 2019), https://www.bloomberg.com/news/articles/2019-10-01/why-it-s-so-hard-to-build-offshore-wind-farms-in-the-u-s [https://perma.cc/2YVD-GNB6].

[181] *Id.*

Cape Wind, proposed by Cape Wind Associates (CWA) in 2001, was a front-runner in the budding commercial OSW industry in the U.S.[182] The Cape Wind farm was to be installed in the Nantucket Sound (in federal waters) with a potential output of 174 megawatts.[183] The project garnered much opposition and debate, largely local. The Aquinnah Wampanoag Tribe of Gay Head claimed that the project would disrupt a spiritual seabed area.[184] A local group of citizens also challenged the FAA's Determination of No Hazard with respect to the wind farm's effect on air navigation.[185] Ultimately, CWA relinquished its lease in 2018, effectively hammering the last nail in the coffin of the Cape Wind project.[186]

Despite the setbacks of Cape Wind, the phasing out of previously available federal Production Tax Credits (PTC), and an attitude towards OSW that shifts with the changing political winds, many states are not ready to furl the sails of OSW.[187] With the eastern seaboard states the prime target for large-scale OSW development, BOEM has been conducting lease auctions for areas off the shores of New England states.[188] As a result, companies are seeking federal permits to build large-scale transmission lines (effectively an OSW transmission infrastructure) to carry wind-produced electricity into New England.[189] Offshore transmission infrastructure (requiring connections to existing regional power grids) and existing regional power grid upgrades (in order to handle the influx and fluctuations of offshore wind electricity) may be the key to enticing offshore wind investors and developers to the market.[190] It could

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[182] BUREAU OF OCEAN ENERGY MGMT., DEP'T OF THE INTERIOR, CAPE WIND, https://www.boem.gov/renewable-energy/studies/cape-wind (last visited Jan. 20, 2020) [https://perma.cc/7PQM-J42W].
[183] *Id.*
[184] *See* Timothy H. Powell, *Revisiting Federalism Concerns in the Offshore Wind Energy Industry in Light of Continued Local Opposition to the Cape Wind Project*, 92 B.U. L. REV. 2023, 2026 (2012).
[185] *Id.* at 2027.
[186] BUREAU OF OCEAN ENERGY MGMT., *supra* note 182.
[187] Adrianne Appel, *Anbaric Seeks First Federal OK for Offshore Wind Energy Grid*. BLOOMBERG L. (Nov. 22, 2019), https://news.bloomberglaw.com/environment-and-energy/anbaric-seeks-first-federal-ok-for-offshore-wind-energy-grid [https://perma.cc/T5MM-G3AW].
[188] *Id.*
[189] *Id.*
[190] *See* Samantha Maldonado & Marie J. French, *New York, New Jersey Hesitant on Offshore Grid Planning amid Federal Uncertainty*, POLITICO (Aug. 24, 2020), https://www.politico.com/states/new-york/albany/story/2020/08/23/new-york-new-jersey-hesitant-on-offshore-grid-planning-amid-federal-uncertainty-1311557 (discussing how the development of an offshore grid that transmits electricity from multiple offshore

significantly reduce OSW development risk by providing known transmission paths, and reduce the cost for individual developers who would otherwise have to chart their own transmission paths to connect to onshore regional grids.[191] Some New England states, however, are skeptical about the cost to upgrade their regional power grids, and about the lack of clarity, planning, and certainty in the development of offshore wind projects.[192]

States along the eastern seaboard with aggressive decarbonization goals are developing favorable renewable energy policies which promote offshore wind development. Dominion Energy's Coastal Virginia Offshore Wind Project proposal to build a wind plant off the shore of Virginia Beach, Virginia, could potentially power over 650,000 homes during peak wind, and comes on the heels of the Governor's 2018 Virginia Energy Plan, which took an energetic stance towards accelerating OSW development and production.[193]

The University of Maine's Aqua Ventus project, a floating offshore wind technology demonstration project, is a collaboration between the University and New England Aqua Ventus, LLC (NEAV)—a joint venture between offshore wind developers Diamond Offshore Wind and RWE Renewables.[194] The demonstration seeks to evaluate floating turbine technology and gather environmental data on OSW interaction with the marine environment and activities.[195] Maine, a coastal state with plentiful offshore wind resources, has aggressively developed policies

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wind plants to an upgraded onshore grid system could lower costs for consumers, as well as lower the impact on other maritime interests) [https://perma.cc/F8BN-NP32].

[191] *See id.* (discussing that as offshore developers pick the "least-cost" and "best-located" areas to connect to the onshore grid, the number of prime spots decrease, and the potential upgrade costs increase).

[192] *See id.*; *see also* Sarah Shemkus, *Groups Say Boston Electric Grid Upgrades Should Anticipate Offshore Wind*, ENERGY NEWS NETWORK (Sept. 1, 2020), https://energynews.us/2020/09/01/northeast/groups-say-boston-electric-grid-upgrades-should-anticipate-offshore-wind/1 [https://perma.cc/B9U4-FJV2].

[193] OFFICE OF THE SEC'Y OF COMMERCE & TRADE, THE COMMONWEALTH OF VIRGINIA'S 2018 ENERGY PLAN (2018), https://www.governor.virginia.gov/media/governorvirginiagov/secretary-of-commerce-and-trade/2018-Virginia-Energy-Plan.pdf [https://perma.cc/E54R-J2QW].

[194] Margaret Nagle, *Diamond Offshore Wind, RWE Renewables Join the University of Maine to Lead Development of Maine Floating Offshore Wind Demonstration Project*, UMAINE NEWS BLOG (Aug. 5, 2020), https://umaine.edu/news/blog/2020/08/05/diamond-offshore-wind-rwe-renewables-join-the-university-of-maine-to-lead-development-of-maine-floating-offshore-wind-demonstration-project/ [https://perma.cc/UX25-7JSX].

[195] *Id.*

favorable to renewable energy development.[196] The demonstration is also a chance to engage with the fishing industry, coastal communities, and other interested parties on issues related to offshore wind development.[197] For example, Environmental Impact Statements (EISs) can cause long delays in the leasing and permitting process. Furthermore, pushback from local coastal communities and maritime industries can halt a project in its tracks. By involving the community early on, gathering relevant environmental impact data, and developing lessons learned, Maine's Aqua Ventus project could be poised to streamline and shorten BOEM's leasing and permitting process, attracting investors and developers to future commercial projects.

Projects like Vineyard Wind, off the coast of Martha's Vineyard, Massachusetts, which leased 160,000 acres from BOEM and expects to generate enough energy to meet the power needs of the equivalent of 400,000 homes, was stalled when BOEM delayed its release of the EIS in order to conduct additional studies.[198] BOEM completed a supplement to its draft EIS in mid-2020, with the permitting approval currently under consideration.[199] Delays in the NEPA process have pushed back the project's anticipated commercial date of 2022.[200]

While investors are warming up to the idea of large-scale OSW farms, other interested parties are not as keen to place massive turbines off the coast of the U.S. Despite these conflicts, the general trend is pro-offshore wind development. In the coming decades, federal agencies, state and local entities, developers, and special-interest groups will need to work together to ensure that offshore wind projects move forward in an economically, socially, and environmentally responsible way. Furthermore, the federal and state commitment to renewable energy

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[196] *Id.*
[197] *Id.*
[198] Sarah E. Hunt & Charles Hernick, *INSIGHT: Trump's Environmental Legacy Could be the Rise of U.S. Offshore Wind*, BLOOMBERG L. (Nov. 8, 2019) https://news.bloomberglaw.com/environment-and-energy/insight-trumps-environmental-legacy-could-be-the-rise-of-u-s-offshore-wind [https://perma.cc/TN8W-PK6D]; Colin A. Young, *Vineyard Wind Announces New Delay in Offshore Wind Project*, WBUR (Feb. 11, 2020), https://www.wbur.org/earthwhile/2020/02/11/vineyard-wind-delay-boem-eis [https://perma.cc/R5WR-9FVG].
[199] BUREAU OF OCEAN ENERGY MGMT., DEP'T OF THE INTERIOR, VINEYARD WIND, https://www.boem.gov/vineyard-wind (last visited Nov. 22, 2020) [https://perma.cc/5FPY-2K9G]. BOEM's Vineyard Wind Permitting Dashboard lists March, 18, 2021 as the estimated completion date for the environmental review and permitting. *Id.*
[200] *See* Young, *supra* note 198.

production, regulatory certainty, and investment into OSW technology research and development, is essential if electricity produced by offshore wind is going to be an economic competitor with other energy sources.

IV. ENVIRONMENTAL AND SOCIAL IMPACT COMPARISONS

Nuclear power is generally regarded as something to be feared, and accidents like SL-1 in 1961 (SL-1 was an experimental U.S. Army reactor which experienced a meltdown due to human error),[201] the release of radioactivity at Three Mile Island in 1979, the explosion at Chernobyl in 1986, and the containment breach at the Fukushima Daiichi plant in 2011 following multiple natural disasters, have done little to assuage the fears of the public.[202] Furthermore, the ongoing issue of developing a national repository for SNF, significant construction and decommissioning costs and cost overruns, and cheaper fuels like natural gas, have stifled nuclear power plant construction in the last two-and-a-half decades.[203] And in fact, the U.S. has brought online only two new commercial nuclear reactors in that time, the most recent being in 2016, with its sister reactor the next newest in 1996.[204]

Offshore wind energy, on the other hand, promises clean energy (zero GHG emissions and no liquid or solid waste), lower electricity prices, and minimal-impact designs; and climate change goals continue to feed the U.S. appetite for electricity generated from renewable sources like wind.[205] However, as the tale of Cape Wind demonstrates, the promise of emissions-free energy did not prevent local groups from opposing the

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[201] Matt Reiman, *The First Fatal Nuclear Meltdown in the U.S. Happened in 4 Milliseconds*, TIMELINE (Dec. 20, 2016), https://timeline.com/arco-first-nuclear-accident-f16ec1105b9c [https://perma.cc/MXR2-R3WV].

[202] *See* Shigenori Matsui, *T-Rex, Jurassic Park and Nuclear Power: Nuclear Power Plants and the Courts after the Fukushima Nuclear Accident*, 42 WM. & MARY ENVTL. L. & POL'Y REV. 145, 153 (2017).

[203] *See* Silverstein, *supra* note 113 (discussing that decommissioning Three Mile Island's remaining "facility will cost $1 billion and take 60 years"); Mooney, *supra* note 113 (discussing the challenge nuclear power faces due to "cheap natural gas and deregulated energy markets in some states").

[204] Mooney, *supra* note 113.

[205] *See e.g.,* Kellie Lunney, *Oceans Seen as Ally in Climate Fight Under House Democrats' Bill*, BLOOMBERG L. (Oct. 21, 2020), https://www.bloomberglaw.com (discussing legislation proposed by House Democrats that seeks to increase the government's investment in offshore wind energy, setting a goal of "at least 25 gigawatts by Jan. 1, 2030"). The Chairman of the House Select Committee on the Climate Crisis stated her belief that the legislation would get pushed through because "the public will force policymakers to take action." *Id.*

project to its demise.[206] It begs the question of why there is such opposition to a clean and reliable renewable energy source such as offshore wind? It is possible that one of the answers lies in the importance placed on ocean resources and habitats. Throughout history, humans have placed a very high value on the ocean and the resources it provides.[207] The oceans are a source of wealth and a means to stay connected with the rest of the world.[208] A large portion of the world's population relies on seafood as the main sources of animal protein.[209] Many coastal communities have spiritual connections to the shores of their ancestors.[210] These things have proven to be no less important in the modern era, and as the demand for ocean space for human activities increases, biodiversity decreases, and marine resources are stressed to the max, the effective management of the ocean's resources is vital.[211] Additionally, coastal economies prosper due to waterfront properties and beaches with unfettered views of the ocean—the high aesthetic value associated with the ocean.[212] Lastly, as the demand for ocean resources increases, the impacts of industry and human activity on fragile ocean habitats has increased in kind, leading to a

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[206] *See* Powell, *supra* note 184.

[207] *See* Letter from the Co-Chairs of the Ad Hoc Working Grp. of the Whole on the Regular Process for Global Reporting and Assessment of the State of the Marine Env't, Including Socioeconomic Aspects to the President of the General Assembly, 3 (July 22, 2015), http://undocs.org/A/70/112 [hereinafter Working Grp. Letter] (discussing that "one fifth of a cubic kilometre portion [of ocean] generates half of the annual production of oxygen that each of us breathes, and all of the sea fish and other seafood that each of us eats. It is the ultimate source of all the freshwater that each of us will drink in our lifetimes") [https://perma.cc/Q7N4-LRW5].

[208] *Id.* (discussing the role of commercial shipping in transporting consumer goods for sale and consumption, the seabed cables used for communication, and the riches of minerals and oil and gas deposits found in and below the ocean seabed).

[209] *Id.* at 11.

[210] *See e.g.,* Powell, *supra* note 184, at 2026-2027 (discussing the Aquinnah Wampanoag Tribe of Gay Head in Martha's Vineyard, who alleged that Cape Wind's development would destroy their "historical, cultural, and spiritual resources" by obstructing their view of the eastern horizon as part of their sunrise ceremonies and likely disrupting ancient burial grounds).

[211] *See* Working Grp. Letter, *supra* note 207, at 3-4.

[212] Justin Good, *The Aesthetics of Wind Energy*, 13 HUMAN ECOLOGY REV. 76, 77 (2006), http://www.humanecologyreview.org/pastissues/her131/good.pdf (discussing how local opposition to Cape Wind's offshore wind farm proposal were against what they saw as an ugly, industrial obstruction to a beautiful landscape in a popular tourist area) [https://perma.cc/6ARK-T22M].

renewed consciousness about what activity we allow to take place in the oceans of the world.[213]

Some organizations have taken measures to protect ocean wildlife and habitats, which could hinder OSW development in certain areas. For example, in late 2019, the National Marine Fisheries Service (NMFS) proposed designating almost 176,000 square nautical miles of the Pacific Ocean as a critical habitat for three species of humpback whales."[214] This area would cover a "mostly shoreline habitat" running from California to Alaska."[215] The area's designation as a critical habitat would require federal agencies to ensure "that actions they authorize, fund, or carry out are not likely to destroy or adversely modify that habitat."[216] While there are some proposed exclusion areas for economic and military reasons, the designation could effectively prohibit OSW development in the protected area.[217] OSW, among other activities, potentially impacts whales' feeding grounds by "prevent[ing] or imped[ing] the whales' ability to access prey" freely.[218] However, the proposed rule acknowledged that the impact on whales' prey due to alternative energy activities "are speculative at this time."[219] Additionally, certain areas may be excluded from critical habitat designation if it is determined that the benefit gained by excluding the area outweighs the benefit of designating the area as a critical habitat, so long as the exclusion of the area will not result in the extinction of the species.[220] Therefore, it is also possible OSW development may be determined to have a low or insignificant impact on whales' feeding

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[213] *See e.g.,* Working Grp. Letter, *supra* note 207, at 4 (discussing the World Summit on Sustainable Development recommendation in 2002 that there be a "regular process for global reporting and assessment of the state of marine environment, including socioeconomic aspects").

[214] Proposed Rule to Designate Critical Habitat for the Central America, Mexico, and Western North Pacific Distinct Population Segments of Humpback Whales, 84 Fed. Reg. 54354 (proposed Oct. 9, 2019) (to be codified at 50 C.F.R. pt. 223, 224, and 226), [hereinafter Proposed Rule]; Emily C. Dooley, *Humpback Whale Protections Proposed in Pacific Ocean*, BLOOMBERG L. (Oct. 9, 2019), https://www.bloomberglaw.com.

[215] Dooley, *supra* note 214.

[216] Proposed Rule, *supra* note 214, at 54354. This is a separate, but additional, requirement from a federal agency's requirement that their actions do not threaten the existence of endangered species. *Id.*

[217] *Id.* at 54382 (listing "alternative energy development" as a potentially impacted activity due to the designation of the humpback whale critical habitat).

[218] *Id.* at 54362, 54382.

[219] *Id.* at 54382.

[220] *Id.* at 54378.

grounds in the critical habitat areas, or certain offshore wind areas may be assessed for exclusion from critical habitat designation under the benefits balancing analysis.[221]

OSW farms require a large acreage of ocean space. Advances in technology with the development of larger, more efficient, turbine blades, may eventually decrease the area an offshore wind plant requires; but other requirements such as spacing between turbines and offsets from other structures also need to be taken into consideration. For example, the Cape Wind project, estimated at producing 174 megawatts on average (utilizing 130 3.6-megawatt Siemans turbines mounted on monopile foundations) and supplying seventy-five percent of Martha's Vineyard's, Cape Cod's, and Nantucket's energy demands, would have covered a total footprint (with a buffer zone) of forty-six square miles, not including the supporting platforms and transmission lines to transmit electricity to shore.[222] On the scale of the ocean, that acreage might be insignificant, but as viewed from the shore could potentially significantly disrupt a coastal community's aesthetic views or impede fishing activities and other uses of the coastal zone.[223]

On the other hand, a typical commercial nuclear power plant producing approximately 1000 megawatts can operate on a little over one square mile.[224] Taking into account the operating facilities in the U.S., that means twenty percent of the U.S. electricity demand being met by nuclear power takes up a little over seventy-five square miles.[225] That is significant land-savings for the amount of electricity produced. Furthermore, nuclear power plants have an average capacity factor of about ninety percent (a measure of how often a plant is online in a specified time),[226] while

[221] The Proposed Rule solicited public commentary on alternative energy activities to better inform the impact analysis; but, did not attempt to propose conservation recommendations or estimate the cost of likely project modifications. *Id.* at 54375.
[222] BUREAU OF OCEAN ENERGY MGMT., *supra* note 182.
[223] *See* Powell, *supra* note 184, at 2026-2027; Good, *supra* note 212, at 77; Working Grp. Letter, *supra* note 207, at 28-29 (discussing generally the increase in demand for ocean space to conduct human activities such as tourism, aquaculture, shipping, oil and gas drilling, etc.).
[224] *Land Needs for Wind, Solar Dwarf Nuclear Plant's Footprint*, NUCLEAR ENERGY INST. (July 9, 2015), https://www.nei.org/news/2015/land-needs-for-wind-solar-dwarf-nuclear-plants [https://perma.cc/47N8-329J].
[225] *Id.*
[226] *Id.*

offshore wind farms have a capacity factor of about fifty percent.[227] This means that nuclear power is also more energy efficient per square mile.

However, this does not account for waste produced by nuclear power generation, and estimates project that of the approximately 370,000 MTHM (metric tonnes of heavy metal) of waste produced by commercial nuclear power in the world, slightly less than a third has been reprocessed for other uses, while the balance is stored while it decays to safe levels over the next thousands of years.[228]

These comparisons also do not take into account the underground land mass required for spent nuclear fuel.[229] Furthermore, nuclear power plants utilizing cooling water from rivers, lakes, and oceans contribute to thermal pollution in the form of hot water or steam discharges, which can dangerously increase water temperatures and acerbate the effects of already-existing chemical pollution.[230] Another important comparison is the environmental and public health cost of a radiological accident. Rigorous safety controls minimize the potential for a nuclear accident, but the health consequences of a nuclear accident dwarf those associated with wind turbine failures.

Nuclear plants have greater siting flexibility than OSW plants, meaning that they can potentially be less visible to the public ("out of

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[227] *Offshore Wind Outlook 2019*, INT'L ENERGY AGENCY (2019), https://www.iea.org/reports/offshore-wind-outlook-2019 (last visited Nov. 22, 2020) [https://perma.cc/3AB4-RUZ5].

[228] *Radioactive Waste Management*, WORLD NUCLEAR ASS'N., https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-wastes/radioactive-waste-management.aspx (last visited Jan. 4, 2020) [https://perma.cc/4K8L-4HFN].

[229] Deep geological storage is the globally-favored method of disposing of spent nuclear fuel, and depending on the geology of the bedrock designated as a potential site, and limited by the state of current mining and drilling technology, could range from 250 meters to 1000 meters deep. *Storage and Disposal of Radioactive Waste*, WORLD NUCLEAR ASS'N., https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-waste/storage-and-disposal-of-radioactive-waste.aspx (last visited Nov. 28, 2020) [https://perma.cc/YZ4W-B84L]. For example, Sweden's proposed site would utilize a combination of man-made and natural barriers to store spent nuclear fuel in a repository approximately 500 meters into the bedrock. *Id.* Yucca Mountain proposed to store spent nuclear fuel approximately 300 meters underground, with the fuel housed in metal containers covered in titanium. *Id.*

[230] *See* C. E. Raptis et al., *Global Thermal Pollution of Rivers from Thermoelectric Power Plants*, 11 ENV'T RESEARCH LETTERS 1 (Oct. 12, 2016), https://iopscience.iop.org/article/10.1088/1748-9326/11/10/104011/pdf (discussing that thermal pollution from the "thermoelectric power sector," which includes nuclear power, is one of the leading causes of thermal pollution in freshwater sources) [https://perma.cc/B5PT-4YWG].

sight, out of mind"). OSW plants must be located within the constraints of the natural landscape. While the northern states' Atlantic shores, Southern Atlantic, Great Lakes, and the Gulf of Mexico have robust wind resources, their water depths vary greatly. For instance, off the Maine coast and Pacific coast, a floating foundation is necessary;[231] whereas for the rest of the Atlantic coast, fixed-bottom turbines can be deployed by building them into the seabed.[232] Additionally, given the cost of running cables along the seabed, OSW plants rely on the proximity of shore facilities and load centers, and also the ability to build new infrastructure to support it.

In summary, a nuclear plant takes up minimal space in relation to its power generation capacity and efficiency, while offshore wind plants take up larger amounts of offshore acreage to produce comparable amounts of electricity. But, comparing only generation capacity does not take into account the added acreage and underground volume required to store SNF after the life of the reactor—a volume that could not be utilized for any other purpose during our collective lifetimes.

Despite the shared potential to reduce GHG emissions, both nuclear and offshore wind have received a Not-In-My-Back-Yard ("NIMBY") response from some citizen groups.[233] First, for nuclear power, a survey series completed in 2015 found that nuclear power "plant neighbors" largely *favor* nuclear power.[234] The surveys determined that familiarity

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[231] *See* David Thill, *Why Floating Turbines are so Important to Maine's Offshore Wind Prospects*, ENERGY NEWS NETWORK (Aug. 7, 2020), https://energynews.us/2020/08/07/northeast/why-floating-turbines-are-so-important-to-maines-offshore-wind-prospects/#:~:text=The%20development%20keeps%20the%20New,for%20Maine's%20deep%20ocean%20waters (discussing the necessity of offshore turbines in "Maine's deep ocean waters") [https://perma.cc/Z4PL-HTU6]; Bobby Magill & Emily C. Dooley, *Floating Wind Farms for California Move a Step Closer to Reality*, BLOOMBERG L. (Oct. 26, 2018), https://news.bloomberglaw.com/environment-and-energy/floating-wind-farms-for-california-move-a-step-closer-to-reality-1 (discussing that California's ocean floor is too deep for anchored turbines) [https://perma.cc/V8F3-56LV].

[232] *See* U.S. DEP'T OF ENERGY & U.S. DEP'T OF THE INTERIOR, *supra* note 131, at 31.

[233] Peter D. Kinder, *Not in My Backyard Phenomenon*, BRITANNICA (June 14, 2016), https://www.britannica.com/topic/Not-in-My-Backyard-Phenomenon (NIMBY likely first appeared in the 1970s in response to local opposition to developing nuclear power facilities near neighborhoods) [https://perma.cc/QZA6-MJJG].

[234] Ann S. Bisconti, *NIMBY and Nuclear Energy*, THE HILL (June 25, 2015, 8:36 AM), https://thehill.com/sponsored/content/246018-nimby-and-nuclear-energy [https://perma.cc/5TE4-C6NC]. The surveys were conducted from 2005-2015, and in the most recent survey conducted in 2015, over one-thousand residents living near sixty nuclear plant sites were polled. *Id.* The survey purposely excluded polling households with nuclear plant workers. *Id.*

was a key factor in public support for a local nuclear facility.[235] Those residents living in proximity to a nuclear power facility associated nuclear power with reliable energy, efficiency, job creation, clean air, energy security, and affordable electricity.[236] Furthermore, plant neighbors gave their local plant "high marks for safety and environmental protection."[237] NIMBY was once thought to be a barrier to nuclear power development, but the results of the survey suggest that nuclear power has a "reverse NIMBY" effect due to the small-scale nature of a nuclear plant compared to its electricity generation potential.[238] Meaning, that while a nuclear facility generates enough electricity to power hundreds-of-thousands of homes, its small plant footprint touches few communities directly. Thus, while less than thirty-percent of the general public *strongly* favors nuclear power (even though about seventy-percent of the general public is pro-nuclear energy utilization), nuclear facility developers only need the support and approval of relatively few communities to construct and operate a facility in their neighborhood.[239] On the other hand, the build-up of spent nuclear fuel without a designated permanent storage and disposal site has modernized the NIMBY response to refer to residents who oppose living near proposed nuclear waste storage sites.[240]

The NIMBY response has also been felt in the wind energy industry. The failed Cape Wind project provides an example of how such opposition can stop a project in its tracks.[241] While opposition came from a local Native American tribe and fisherman, the project also faced multiple lawsuits backed by wealthy oceanfront property owners who opposed the aesthetics of the OSW farm.[242] Aesthetics can impact the success of an OSW project proposal, even garnering local opposition from those residents who support clean energy and wind power—as long as it is not

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[235] *Id.* (finding that eighty-three percent of nuclear power plant neighbors favor utilizing nuclear energy as compared to sixty-eight percent of the general public).
[236] *Id.*
[237] *Id.*
[238] *Id.*
[239] *Id.* The survey found that almost fifty percent of plant neighbors strongly favored nuclear power as compared to twenty-seven percent of the general public. *Id.*
[240] *See* Katie Meehan, *Lawmakers Must Overcome the "Not in My Backyard" Mentality to Find a Site for the Nation's Nuclear Waste*, STATE LEGISLATURES MAG. (May 1, 2017), https://www.ncsl.org/bookstore/state-legislatures-magazine/lawmakers-must-overcome-nimby-mentality-when-storing-nuclear-waste.aspx [https://perma.cc/SYF3-CB5T].
[241] *See* Ros Davidson, *Cape Wind: Requiem for a dream*, WINDPOWER MONTHLY (May 1, 2018), https://www.windpowermonthly.com/article/1462962/cape-wind-requiem-dream [https://perma.cc/BH42-NSSY].
[242] *Id.* (Bill Koch, one of the ocean-front estate owners, referred to Cape Wind as "visual pollution").

installed where they can view it.[243] Moving forward, OSW developers are in a position to take the lessons learned from nuclear power, on-shore wind, solar, and projects like Cape Wind, and engage with communities early-on in a project's lifetime to address local concerns.[244] A national survey conducted in March of 2020, showed across-the-board support for offshore wind power.[245] The idea that OSW is widely favored by the general public, but locally opposed, shows that local residents who are directly or indirectly impacted by an OSW farm will prioritize their local interests (fishing, heritage, aesthetics, etc.) over the potential environmental (and economic) benefits of an OSW farm. Therefore, by understanding the concerns of the local communities, and addressing them early-on in the proposal, offshore wind can possibly avoid the costly and potentially catastrophic opposition to development.[246]

Environmental and social risks accompany any attempt to develop an electric power generator, regardless of the energy source. Nuclear power and wind power are similar to the degree that they produce emissions-free energy. Both energy sources come with their share of environmental concerns: nuclear power with its worst-case-scenario for irreparable harm to the environment and public health in the event of an accident, and the protracted issue surrounding the need for a permanent repository for SNF; and OSW with its potential to disrupt endangered habitats and species, and to disrupt migratory patterns and feeding grounds of birds, mammals and other sea creatures. The coming decades predict no decline in the world's hunger for more power, or in the pressing need to develop less carbon-intensive energy sources to curb global climate change. Federal, state, and local governments will have to prioritize the risks they are willing to take. Nuclear power risks environmental disaster, but the probability of an accident is marginal; and, the "amount" of emissions-free energy produced by nuclear power is not matched by any other energy source currently utilized. Offshore wind power is also an emissions-free energy, but we have yet to fully understand the long-term

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[243] *See* Good, *supra* note 212, at 77.

[244] *See* Mike Casey, *Why US Offshore Wind Developers Need [sic] take a digital-first tack against Nimbyism*, RECHARGE (June 25, 2020, 12:44 PM), https://www.rechargenews.com/wind/why-us-offshore-wind-developers-need-take-a-digital-first-tack-against-nimbyism/2-1-831611 [https://perma.cc/YM9Y-GZY8].

[245] *US Voters Strongly Favor Offshore Wind Energy*, RENEWABLE ENERGY WORLD (Apr. 15, 2020), https://www.renewableenergyworld.com/2020/04/15/us-voters-strongly-favor-offshore-wind-energy/?topic=263754 (citing the American Wind Energy Association (AWEA) announcement that the poll showed over eighty percent of voters are in favor of OSW) [https://perma.cc/P6KJ-SRFC].

[246] *See* Casey, *supra* note 244.

environmental consequences of large-scale offshore wind plants, including burning fossil fuels to power the boats and barges that will be required to maintain the turbines, and the potential disruption to delicate habitats due to anchoring turbines and the related infrastructure required to deliver wind-generated electricity to shore.

V. REGULATORY COMPARISONS

The electricity industry touches the lives of every human, plant, and animal species on this planet. Whether the effect is felt directly—such as the convenience of knowing that when you flick the switch the light will come on, or indirectly—the vast and varied environmental impacts inevitably intertwined with any source of electricity production. Energy security (broadly referring to the adequate and uninterrupted supply of electricity) is inherently intertwined with national security, and is therefore a national interest.[247]

Nuclear energy is the poster child of a tightly regulated industry. In the 1950s, Congress wasted little time in establishing an administrative framework around which the new atomic energy industry would revolve. At that time, the federal government had a pro-nuclear stance, and shortly thereafter placed the task of developing the technology and facilities for nuclear energy production in the hands of civilian developers with heavy oversight from the federal government.[248] Tax subsidies, research grants, scholarships, and a favorable political climate all contributed to building a robust nuclear power industry. When skepticism over the dual role of the AEC in regulating and promoting nuclear energy came to a head, Congress abolished the AEC with the Energy Reorganization Act of 1974 (ERA), separating the two function into the Energy Research and Development Administration (ERDA), and an independent Nuclear Regulatory Commission (NRC).[249] Certain research and development functions were consolidated within the ERDA, while the NRC was given authority over the licensing and regulatory functions of the commercial atomic energy

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[247] *See e.g.,* Stephen Eule, *Energy a Key Part of New National Security Strategy*, GLOBAL ENERGY INST.: FUEL FOR THOUGHT (Jan. 2, 2018), https://www.globalenergyinstitute.org/energy-key-part-new-national-security-strategy (discussing that the current Administration's national security policy included ensuring energy security by protecting energy infrastructure) [https://perma.cc/KT8C-4XH2].
[248] *See* Fahring, *supra* note 89, at 285.
[249] 42 U.S.C. § 5801; Fahring, *supra* note 89, at 289 (discussing concerns over potential conflicts of interest whereby the AEC might sacrifice public safety in the name of nuclear power development).

industry.[250] The NRC's authority to regulate nuclear power production and operation is near absolute. The NRC has rulemaking power, issues guidance and develops industry standards, licenses plant operators, oversees plant decommissioning and various aspects of SNF storage, conducts safety inspections, assesses plant operations, conducts investigations of wrongdoing and enforces regulations through sanctions issued to licensees who violate NRC regulations, and performs an adjudicatory function for affected parties.[251] However, the "generation, sale, or transmission of electrical power produced" by a nuclear facility remains within the realm of other federal, state, or local entities, provided those actions do not "regulate, control, or restrict any activities of the [NRC]."[252] Additionally, states have the authority to control uranium mining operations on private land within their borders, with the NRC's regulatory authority beginning at the milling stage.[253] State and local entities also have a role in designating SNF storage locations and disposal within their territory, and developing the safety measures related to that storage and disposal. Finally, the AEA provides for cooperation between the NRC and states, and allows agreements whereby the NRC can agree to relinquish certain regulatory functions to the State.[254]

Centralized authority and relatively streamlined licensing do not equate to simple or fast nuclear power facility construction and operation. Applying for and receiving licenses, conducting necessary environmental assessments, receiving design approval, addressing public concerns, amassing the capital required to construct a nuclear facility, and ultimately bringing a new commercial reactor online, takes years.[255] The expenses related to the construction and operation of a nuclear plant, and competition in the electricity market from other energy sources like natural

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[250] 42 U.S.C. § 5801.

[251] NUCLEAR REGULATORY COMM'N, *supra* note 35.

[252] 42 U.S.C. § 2018. States are allowed to regulate nuclear power within their borders for *economic*, not radiation safety, reasons. Pac. Gas & Electric Co. v. State Energy Res. Conservation & Dev. Comm'n, 461 U.S. 190, 222-223 (1983). An example of another Federal agency with authority over "the establishment, review, and enforcement of rates and charges for the transmission or sale of electric energy" is the Federal Energy Regulatory Commission (FERC). 42 U.S.C. § 7172(a)(1)(B).

[253] Va. Uranium, Inc. v. Warren, 139 S. Ct. 1894, 1900 (2019).

[254] *See* 42 U.S.C. § 2021(b).

[255] *See e.g.,* Darrell Proctor, *More Delays for Votgle Plant Expansion*, POWER MAG. (Oct. 25, 2020), https://www.powermag.com/more-delays-for-vogtle-plant-expansion/ (discussing that the Votgle nuclear plant project under development by Georgia Power is "years behind schedule and billions of dollars over budget") [https://perma.cc/TPC6-TE2W]; WORLD NUCLEAR ASS'N, *supra* note 106 (discussing the delays in the Vogtle plant project since its inception in 2008 and NRC COL approval in 2012).

gas, means that nuclear power plants run the risk of being unprofitable to build or operate absent subsidies or investment into technology that could increase efficiency.[256]

Nuclear energy's distant carbon-free cousin has not yet had greater success bringing online power generation facilities that could economically compete with conventional energy resources; although, strides are being made in offshore wind technology such as floating turbine technology, which could help offshore wind become a real competitor. BOEM has regulatory authority over all offshore renewable energy projects in federal waters pursuant to the Energy Policy Act of 2005 and 30 C.F.R. § 585, and in that way performs roughly the same function as atomic energy's NRC. Similar to commercial nuclear energy developers, offshore wind developers must apply for leases and permits with BOEM. BOEM is involved at every stage of the leasing process, and—comparable to the NRC—coordinates and conducts the required environmental assessments. While the regulatory structures of the two organizations have similarities, BOEM faces a different set of challenges. The offshore wind energy industry is a relatively "new" sector of the renewable energy industry. BOEM has been in existence and performing its functions for only about a decade; and like most new areas of administration, it takes time, trial, and error to develop efficient and effective policies and regulations.

The Cape Wind project stands as a testament to the lengthy timelines of OSW leasing. Cape Wind first applied to build an OSW facility with the U.S. Army Corp of Engineers (USACE) in 2001.[257] When the Energy Policy Act of 2005 vested regulatory authority in the DOI, Cape Wind subsequently applied for a commercial lease from the Minerals Management Service (subsequently renamed the BOEM) later that year.[258] The draft EIS for the facility began in 2004, with the final EIS was published in the beginning of 2009.[259] Due to local opposition, revisions to the COP, and lease extension requests, the project effectively stalled

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[256] *See generally* Brian Mann, *Unable to Compete on Price, Nuclear Power On the Decline in the U.S.*, NPR: ALL THINGS CONSIDERED (Apr. 7, 2016, 5:28 PM), https://www.npr.org/2016/04/07/473379564/unable-to-compete-on-price-nuclear-power-on-the-decline-in-the-u-s (discussing the fact that nuclear plants "keep coming in over budget" and that the "U.S. has reached a pivot point, where new nuclear power plants are just too expensive") [https://perma.cc/6R8M-R5YZ]. Nuclear plants are also facing competition from renewable sources, with investment increasingly shifting to wind and solar. *Id.*
[257] BUREAU OF OCEAN ENERGY MGMT., *supra* note 182.
[258] *Id.*
[259] *Id.*

and was ultimately abandoned in 2018.[260] In contrast, the Block Island Wind Farm, which began commercial service in late 2016, took considerably less time from design inception to operation (approximately seven years).[261] While many factors must be considered when analyzing why one project flourishes while another flounders, the Block Island Wind Farm had the advantages of being small, applying for permitting and licensing after the shift of regulatory authority from the USACE to the DOI, in a more pro-renewable climate, with less local opposition, and with the lessons-learned from Cape Wind behind it.[262] Another example is Vineyard Wind, which is suffering from delays related to its environmental review process.[263] In addition to delays due to local opposition, federal regulators recently determined that Vineyard Wind's EIS would be evaluated by examining the cumulative impacts of all planned OSW development on the Atlantic coast.[264]

While there may be valid comparisons to draw between the permitting, construction, and operational timelines of nuclear and offshore wind facilities, the sheer number of variables that may affect anticipated project completion timelines makes it almost moot. What can be concluded is that from its outset, Congress made it abundantly clear that the NRC was and is the chief authority in regulating nuclear matters in the U.S. The lines of jurisdiction were blurred only at the very beginning and end of the nuclear life-cycle, and have largely been drawn in subsequent litigation. And although the process of permitting, licensing, and constructing a nuclear power facility is extremely involved, the NRC has had over sixty years to collect lessons-learned, refine and streamline its licensing processes, rulemaking, and other regulatory functions. The NRC is essentially a full-service, one-stop-shop for commercial nuclear power developers.

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260 *Id.*

261 BUREAU OF OCEAN ENERGY MGMT., DEP'T OF THE INTERIOR, SEA2SHORE: THE RENEWABLE LINK, https://www.boem.gov/renewable-energy/state-activities/sea2shore-renewable-link [https://perma.cc/3XYK-QYAY].

262 *See* Michelle Froese, *Lessons Learned from Cape Wind*, WINDPOWER ENG'G (Jul. 30, 2019), https://www.windpowerengineering.com/lessons-learned-from-cape-wind/ [https://perma.cc/YGP7-3WS9].

263 Young, *supra* note 198.

264 Noah Asimow, *Vineyard Wind Sees More Permitting Delays*, VINEYARD GAZETTE (Nov. 23, 2020, 6:16 AM), https://vineyardgazette.com/news/2020/11/23/vineyard-wind-sees-more-delays-stays-track-be-first-race-build-offshore-wind-farm [https://perma.cc/JZ6K-REFH]. Vineyard Wind received the required state and local permitting, and recently entered into an agreement with ISO New England to transmit electricity to the regional grid. *Id.*

On the other hand, offshore wind has new and novel issues that must be considered in the permitting and leasing process.[265] BOEM faces challenges from multiple interested parties—other federal agencies, state agencies, tribes, and local citizen groups. BOEM may be disadvantaged in that OSW farms impact a greater number of communities than a nuclear power facility—i.e., disadvantaged in the fact that BOEM must essentially receive more support from more locales, and more diverse approvals from multiple jurisdictions to move forward successfully on a project.[266] Public support (gained through public engagement) is critical to a project's viability since public opposition can stall or put the kibosh on a project, and can potentially sway state and federal policy attitudes towards OSW.[267] BOEM's *A Citizen's Guide to the Bureau of Ocean Energy Management's Renewable Energy Authorization Process* indicates that for both the competitive leasing and non-competitive leasing process: (1) a public comment period is available at almost every phase of the process, and (2) public meetings are held at the NEPA review stage.[268] BOEM also posts public engagement opportunities on its website.[269] As part of the NEPA review, BOEM solicits input from the public on a variety of issues important to the public in a process called scoping.[270] At first glance, it appears that BOEM has a robust public outreach program, comparable to

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265 For example, pushback from local residents because of the aesthetic value placed on unobstructed ocean views.

266 *See* Bisconti, *supra* note 234.

267 *See generally* Casey, *supra* note 244 (explaining that "community engagement matters not just for project permitting but also for building local support that translates to real clout with state and federal policy makers in the years ahead").

268 BUREAU OF OCEAN MGMT., A CITIZEN'S GUIDE TO THE BUREAU OF OCEAN ENERGY MANAGEMENT'S RENEWABLE ENERGY AUTHORIZATION PROCESS 6-9 (2016), https://www.boem.gov/sites/default/files/renewable-energy-program/KW-CG-Broch.pdf [https://perma.cc/TG62-ZDGK]. BOEM solicits public comment by publishing notices in the Federal Register at various stages in a projects development. *Id.* at 15.

269 *Public Engagement*, BUREAU OF OCEAN MGMT., https://www.boem.gov/public-engagement (last visited Nov. 23, 2020) [https://perma.cc/W52X-H2VL]. BOEM's website states that methods of public engagement include "accepting public comments online," "interact[ing] with stakeholders and partners in state, local and tribe governments through task force meetings and small community meetings on specific issues," and publications. *Id.*

270 BUREAU OF OCEAN MGMT., *supra* note 268, at 16 (including archaeological/cultural sites, fisheries, historic properties, migratory species, Native American Interests, navigation/maritime commerce, protected species, sensitive offshore habitats, socioeconomic issues and environmental justice, recreation and tourism, viewshed, aviation, and national security).

the NRC's.[271] Yet, despite the numerous opportunities for public commentary (assuming that the public is utilizing the channels provide to voice concerns about OSW), offshore wind projects are being delayed or outright failing because of local opposition.[272] In other words, an effective public engagement program should be able to relieve local concerns early and expeditiously so that local opposition does not hinder project completion. The answers of why BOEM has continued to struggle to gain local support through its public engagement, especially when surveys show widespread support for utilizing offshore wind, could be due to a few factors. First, offshore wind is a new energy sector, and the public is generally skeptical of the unknown and untested.[273] Second, the large area offshore wind projects require impacts multiple jurisdictions, meaning that defeat in one jurisdiction due to public opposition can terminate the entire project.[274] Third, offshore wind is just that, offshore. The ocean's vast resources, habitats, and wildlife are under the control or protection of too many interested parties. It is sufficing to say that an offshore wind developer is unlikely to alleviate the concerns of, or the burden on, all those in opposition.[275] Fourth, because of the environmental benefits

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[271] The NRC provides numerous opportunities for public commentary and public involvement in hearings, rulemaking, licensing, and enforcement proceedings. *Public Meetings and Involvement*, NUCLEAR REGULATORY COMM'N, https://www.nrc.gov/public-involve.html (last visited Nov. 23, 2020) [https://perma.cc/UX2S-S5D8].

[272] For example, Cape Wind, and more recently Vineyard Wind, which is facing continuing opposition because of its potential impacts on commercial fisheries and endangered North Atlantic right whales. Samantha Gross, *Renewable, Land Use, and Local Opposition in the United States*, FOREIGN POL'Y AT BROOKINGS 1, 13 (2020), https://www.brookings.edu/wp-content/uploads/2020/01/FP_20200113_renewables_land_use_local_opposition_gross.pdf [https://perma.cc/3S4H-7KPR].

[273] *See generally* Casey, *supra* note 244 ("new sectors require[] a much greater commitment to public affairs and external communications right from the start in order to forge a place within an established industry").

[274] As opposed to a nuclear power plant, which directly impacts a much smaller community, and requires approval from a smaller local population. Bisconti, *supra* note 234.

[275] Limitations in offshore wind technology might play a part as well. For example, offshore wind turbines have height, spacing, location, orientation, and connection requirements. These requirements are not necessarily flexible in the sense that they are fixed depending on the project and its location. In other words, if the wind currents are coming from a certain direction—a fact out of human control—it may set the location and orientation of the turbines. Another example is the size of the turbine required to harness offshore wind energy, which in turn dictates turbine spacing. *See* Gross, *supra* note 272 at 9-14.

associated with renewable energy, developers might make premature assumptions about the public acceptance of a proposed project, neglecting to fully engage with the interested community on its concerns.[276] Lastly, when it comes to citizens' priorities, protecting their communities from the perceived downfalls of OSW could outweigh any real environmental or economic benefits stemming from the project.[277]

BOEM has established Intergovernmental Task Forces (made up solely of government entities) in fourteen states.[278] The Task Force is BOEM's "primary mechanism for coordinating with governmental partners."[279] BOEM's other major mechanism to coordinate with state and federal agencies is through developing Memoranda of Understanding (MOUs), which "describe[e] each agency's roles for reviewing renewable energy projects on the OCS."[280] While these mechanisms are in place to help streamline the permitting and licensing process, it could still take up to ten years for a commercial offshore wind farm to come online, and the developer receives only a twenty-five year permit.[281] Additionally, offshore wind developers face the challenges associated with creating an offshore grid and tying it in to existing on-shore grids.

Thus, even if BOEM faces little public opposition (or at the very least adequately addresses the concerns of various groups), and the Intergovernmental Task Force and MOUs effectively streamline the licensing and permitting process for a new offshore wind farm, the process still could take approximately ten years (from inception to operation). Moreover, the developer receives only a twenty-five-year permit (with the possibility of renewal), and still faces immense uncertainty associated with

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[276] *See id.* at 14 (discussing the fact that renewable energy developers sometimes assume community support is automatic).

[277] *But see, e.g., id.* at 13 (discussing that although negative tourism and fishing impacts were associated with the Block Island Wind Farm, preliminary data shows an actual increase in tourism due to, perhaps, curiosity about the wind farm). Also, the submerged part of the turbines acts as artificial reefs and are attracting more wildlife to the area. *Id.*

[278] BUREAU OF OCEAN MGMT., *supra* note 268, at 15.

[279] *Id.* at 15 (stating that the Intergovernmental Task Force is comprised of federally recognized tribes, federal agencies, state, and local governments, and that the Task Force is involved at every phase).

[280] *Id.* at 18 (listing the Bureau of Safety and Environmental Enforcement, Federal Energy Regulatory Commission, U.S. Coast Guard, U.S. Army Corps of Engineers, U.S. Department of Defense, and U.S. Fish and Wildlife Service).

[281] BUREAU OF OCEAN MGMT., REGULATORY FRAMEWORK AND GUIDELINES, https://www.boem.gov/renewable-energy/regulatory-framework-and-guidelines (last visited Nov. 23, 2020) [https://perma.cc/C5QP-5FR2]. Nuclear power plants can take a similar amount of time to construct and begin operation, but receive a forty-year vice twenty-five-year license.

cost-effectively generating and transmitting electricity to the on-shore grid.[282] Besides the small (thirty-megawatt) Block Island Wind Farm (which took approximately seven years to bring online), the ten-year timeline has not proven to be a reality for offshore wind projects.

Neither of the regulatory frameworks for nuclear energy or wind energy have demonstrated an effective and efficient path to commercial power operation. Both energy sector's projects have been subject to extreme delays, termination, or gross cost overruns. For nuclear power this is true despite the fact that the NRC is essentially a one-stop-shop, and given great latitude in reviewing and approving design and construction plans. On the other hand, the regulatory landscape of offshore wind is more spread out, with BOEM at the helm, but required to rely on the consultation with and approvals of multiple state and federal agencies through the Intergovernmental Task Force or NEPA Process. Centralizing greater authority in BOEM "for all things offshore wind" may help streamline the leasing and permitting process, decreasing the costs associated with developing an OSW project. But, two of the biggest contributors to OSW project delays appear to be public opposition to the project (and BOEM's inability to fully allay those fears and move forward), and the delays in the NEPA review process. Furthermore, nuclear power, with all its centralized authority, has struggled to construct and bring online new reactors in the last two-and-a-half decades because of delays, construction timelines, and related cost overruns.[283] Thus, it may be that, in addition to centralizing BOEM's authority, strengthening BOEM's public engagement at critical phases in the OSW project's development, while also stabilizing and greatly streamlining its regulatory landscape, would have the effect of making a more efficient and expeditious permitting and leasing process.[284] To that end, BOEM could utilize its Intergovernmental Task Force to facilitate early engagement between OSW developers and local communities to address local concerns.

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[282] *See e.g.,* Gross, *supra* note 272 at 11 (discussing that the transmission infrastructure required to connect renewable sources to the grid are costly and risk the financial viability of renewable projects. But, also that investment into renewable energy is "needed to justify construction of new transmission.").

[283] *See e.g.,* Mooney, *supra* note 113 (discussing the only two new nuclear reactors brought online since 1996).

[284] This idea is supported by nuclear power's early success, largely due to favorable policy driven by "widespread popular support." Fahring, *supra* note 89, at 287-88.

VI. CONCLUSION

It is premature to conclude that policymakers and energy sector developers have an altruistic view of protecting the environment and public health from the dangers of electricity production. The histories of nuclear and wind energy unveil the naivety of that sentiment. Nuclear energy is a zero-emissions power source, and its capacity and generation potential are completely unmatched by any other resource on earth. It is arguably the only energy source that could effectively curb the changing climate if we refuse to make drastic changes such as decreasing our overall energy consumption. But nuclear energy faces many other roadblocks to its development, one of the biggest being how and where to store SNF, with others being national security concerns, fears about radiological accidents, and the incredible expense involved in constructing and operating a nuclear facility. Without extensive subsidies, nuclear power struggles to remain profitable enough to be a serious player in the electricity market. On the other hand, wind resources are arguably free.[285] OSW plants also produce emissions-free electricity, and even come without the added concerns of waste discharges. At a conceptual level, OSW is an economic, social, and environmental win-win. Still, the offshore wind industry faces its own set of challenges, including public opposition to utilizing local coastal zones, and uncertainties in the profitability of generating electricity using a resource whose consistency can only be estimated, not controlled. The costs associated with leasing, designing, and constructing offshore wind plants, combined with the added expense of building the necessary offshore and onshore support infrastructure, and the fact that offshore wind's electrical generation capacity is small compared to that of fossil fuels and nuclear, means that offshore wind cannot economically compete in the electricity market, yet.

It seems that it is not enough that habitats are being destroyed, species are going extinct, and sea levels are dangerously rising. Consumers demand more electricity at low prices, and state utility companies tightly control their territory's electrical grids and energy markets. Without some certainty of profitability, commercial developers will not invest in low-carbon electricity generators. In the same vein, developers will not get into the business of renewable or sustainable energy without regulatory certainty. Low-carbon energy sources are ripe for development and utilization. But without a stable regulatory framework and nation-wide (and local) public support, commercial production of renewable and

[285] There are complex issues surrounding the ownership of wind resources that are beyond the scope of this article.

sustainable energy will remain a dream for the future—a future that may come too late.

Nuclear energy's "glory days" do not need to be a thing of the past, but if the U.S. is to see a revival of the nuclear power industry, there are keys areas that need to be addressed including designating a national repository for spent nuclear fuel, decreasing nuclear plant construction costs and timeline, and a renewed commitment from policymakers to promote nuclear power as a carbon-free energy source.[286] Offshore wind, poised to provide long-term emissions-free electricity in the carbon-saturated world, must stay relevant-i.e., economically viable, and publicly in favor. It cannot afford to be bogged down by unstable regulation or ineffective public engagement. If the U.S. is going to rely on offshore wind as a method to combat climate change, it needs to make significant investment into wind research and technology, increase economic certainty, and develop an efficient regulatory structure.

When it comes to suffering the impacts of climate change, we may be past the point of no return, or we may still have time to revamp and revise how we do business in the U.S. when it comes to regulating renewable energy development. The U.S. should be taking a hard look at its policies and reviewing acts such as NEPA for outdatedness and irrelevancy, tailoring legislation to help push renewable energy projects through in an efficient and responsible manner, and developing a regulatory structure within agencies like BOEM that would give them a more "soup-to-nuts" type of authority in permitting and leasing renewable energy facilities. BOEM should review its public engagement policy and program for effectiveness, and utilize its Intergovernmental Task Force to connect with the communities the Task Force serves. Efforts like these could ultimately assist in accelerating clean energy efforts, curbing the effects of GHG-induced climate change, and changing the course of our harsh reality.

[286] *See* Silverstein, *supra* note 113 (discussing that a "price on carbon" by policymakers could help nuclear power's financial struggles, and that a central question for policymakers is whether nuclear energy is part of the "Green New Deal"); Mooney, *supra* note 113 (discussing that nuclear power is not "valued properly" due to the fact that there is not a price on carbon").