Establishing Floating Offshore Wind Development in Oregon: Lessons From East Coast State Policy Tools Promoting Offshore Wind

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Abstract

In the past several years, offshore wind developments have increased across Europe, Asia, and the Eastern United States. This Comment analyzes the policy tools that East Coast states use to promote offshore wind development and to help overcome the economic, environmental, and land use barriers to offshore wind. The Comment analyzes policy tools, including (1) establishing an aggressive state Renewable Portfolio Standard (RPS), (2) passing procurement mandates for certain level of offshore wind development, and (3) funding investment in infrastructure, education, and research and development. Lastly, the Comment analyzes Oregon's energy sector and applies the lessons from the East Coast state policy tools to make recommendations for policy actions that Oregon could adopt to promote offshore wind development.

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Introduction

As we transition from fossil fuels to renewable resources, our world must undertake an energy revolution to address the climate change crisis. To facilitate a large scale and just transition, our energy sector must develop new renewable resources. Offshore wind energy is one new energy resource that Europe, Asia, and the Eastern United States are attempting to develop. Offshore wind energy development offers many advantages. The technical offshore wind resource in the United States has the potential to provide twice the current total U.S. energy consumption.[1] There is significant room for development of new energy resources as existing coal, natural gas, and nuclear generation is retired due to old age or policy choices, especially because electricity demand is expected to increase through 2050.[2] In restructured electricity markets, offshore wind also offers economic benefits as the marginal cost of generating the resource can reduce the market's clearing price. The clearing price in the wholesale electricity market is determined by an auction in which generation resources bid in a price at which they can supply a specific number of megawatt-hours of power with the cheapest resource clearing the market first, until the supply meets the needed demand.[3] Reducing the clearing price would save

1. Gilman et al., U.S. Dep't of Energy, National Offshore Wind Strategy: Facilitating the Development of the Offshore Wind Industry in the United States 6 (2016), https://www.energy.gov/sites/prod/files/2016/09/f33/National-Offshore-Wind-Strategy-report-09082016.pdf [https://perma.cc/QT83-3QP8].

2. *Id.* at 11.

3. *Market for Electricity*, PJM, https://learn.pjm.com/electricity-basics/market-for-electricity.aspx [https://perma.cc/6JPX-C68U].

ratepayers money, even if the long term Power Purchase Agreement (PPA) price is above market.[4] Offshore wind also lowers prices because it has the tendency to coincide with peak summer electricity use loads and often has a "diurnal pattern aligned with peak demand."[5] Additionally, offshore wind has a favorable capacity value, which is the amount of energy that can be relied on during peak demand.[6] Offshore wind is often more energetic and less turbulent than onshore wind, and its energy output is typically more stable and less variable.[7] These attributes of offshore wind complement onshore wind and solar resources by providing an additional renewable resource that offers capacity value and stability.[8] Offshore resources also provide increased energy diversity and security that can hedge against electricity prices.[9] Land use is another advantage of offshore wind, as land use restraints and concerns are reduced offshore and certain impacts on wildlife are reduced.[10] Offshore projects also introduce fewer aesthetic and sound concerns than onshore ones because they are sited further offshore.[11] In coastal population centers, including much of the Eastern United States and California, transmission costs and risks are also reduced as the energy does not require long distance transmission lines to reach these population centers.[12] Offshore wind also offers economic benefits, with estimates of 170,000 new jobs by 2050.[13]

The first attempt to build offshore wind in the United States was the failed Cape Wind project in Massachusetts.[14] This project faced large scale opposition from local communities, which ultimately led to its termination after sixteen years in the planning and permitting stage.[15] The first and only finished project in the United States was completed in 2016 off the coast of Rhode Island.[16] In 2013, Principle Power, Inc. attempted to build floating offshore wind off the coast of Oregon.[17] Ultimately, the project was unsuccessful

4. Gilman et al., *supra* note 1, at 19.
5. *Id.*
6. *Id.* at 20.
7. *Id.*
8. *Id.* at 21.
9. *Id.* at 22.
10. *Id.*
11. *Id.*
12. *Id.*
13. *Id.*
14. Katharine Seelye, *After 16 Years, Hopes for Cape Cod Wind Farm Float Away*, N.Y. Times (Dec. 19, 2017), https://www.nytimes.com/2017/12/19/us/offshore-cape-wind-farm.html [https://perma.cc/RDX3-T7GW].
15. *Id.*
16. Joseph B. Nelson & David P. Yaffe, *The Emergence of Commercial Scale Offshore Wind: Progress Made and Challenges Ahead*, 10 San Diego J. Climate & Energy L. 25, 45 (2019).
17. Kevin Banister, Principle Power Inc., WindFloat Pacific Project Final Scientific/Technical Report (DOE-F 241.3) 4 (2017), https://www.osti.gov/servlets/purl/1339449 [https://perma.cc/GN44-3NRL].

because it failed to obtain a longterm purchase agreement with Oregon utilities.[18] As of 2018, however, there is significant development on the horizon with 25,824 MW of offshore wind currently in the development pipeline in the U.S.[19] This development increase has been fueled by nearly 20,000 MW of state-level offshore wind development commitments by 2035.[20] Globally, the United States is well behind the rest of the world, especially Europe and Asia, where global offshore development has reached 22,592 MW of offshore capacity as of 2018, and 272,000 MW more is in the development pipeline.[21]

In the United States, the federal and state government often provide support for renewable electricity generation to enter the market.[22] The government creates "(i) a target market demand for renewable energy output (i.e., renewable portfolio standards), (ii) incentives to make development of renewable generation economically feasible given the early stage of development of utility-scale technologies, and (iii) research and development to allow for new technology introduction and proliferation."[23] Over time, these mechanisms allow the renewable resource to reach market parity and become competitive with other resources.[24]

This Comment will recommend policy tools that Oregon can use to best support offshore wind development, drawing lessons from the experience of east coast states in developing offshore wind policies. First, this Comment will examine the barriers to floating offshore wind development, as Oregon would implement this type of technology for any development. The Comment will then focus on state policies that have been used in eastern states to promote and overcome these barriers to create the necessary commercial demand. Next, the Comment will outline the current state of Oregon's energy market to examine whether the identified policy tools have the potential to promote development of offshore wind in Oregon. Lastly, drawing from these east coast policy lessons, this work will provide policy recommendations to encourage Oregon offshore wind development.

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18. *Id.* at 9; *see also* Joe Burns, *California Takes Up Ocean Wind Energy After Oregon Project Fails*, Opb (Apr. 4, 2018), https://www.opb.org/news/article/california-oregon-ocean-wind-energy [https://perma.cc/M3Z2-T9BM]. Chelsea Davis, *Without Oregon Utilities Nod, Coos Bay WindFloat Dead in the Water*, The World (Dec. 7, 2015), https://theworldlink.com/news/local/without-oregon-utilities-nod-coos-bay-windfloatdead-in-the/article_095e12ca-6d7e-53e0-a313-05181d324cf3.html [https://perma.cc/N7PV-PZ3E].

19. U.S. Dep't of Energy, 2018 Offshore Wind Technologies Market Report ix (2019), https://www.energy.gov/sites/prod/files/2019/09/f66/2018%20Offshore%20Wind%20Technologies%20Market%20Report.pdf [https://perma.cc/B8VX-PTXQ].

20. *Id.* at x.

21. *Id.* at xii.

22. Nelson & Yaffe, *supra* note 16, at 44.

23. *Id.*

24. *Id.*

I. Barriers to Floating Offshore Development

A. *Floating Technology Cost Barriers*

Any offshore wind development off Oregon's coast would have to utilize floating wind turbine technology, as opposed to the conventional fixed bottom turbines. This is because 97 percent of the technical offshore wind resources off of Oregon's coast are in more than sixty meters (197 ft) of water, a depth at which floating technology is the primary technology.[25] Floating offshore wind technology has unique cost barriers as it is less developed than conventional fixed bottom technology, which has been used on the east coast and for most projects around the world. Oregon's previous attempt at floating offshore wind development are an example of how the cost barrier of the floating technology is a barrier that can be difficult to overcome.

In 2013, Principle Power attempted to build up to 30 MW of offshore wind off the coast of Coos Bay, Oregon utilizing floating wind turbine technology.[26] This project would have been the first floating offshore wind development in the U.S., and the first offshore wind project on the West Coast.[27] The project ultimately failed to secure a long term power purchase agreement (PPA), which was necessary to qualify for a $40 million grant from the U.S. Department of Energy.[28] Securing a long term PPA was also required for the project to obtain adequate financing.[29] Furthermore, the project's high levelized cost of energy (LCOE) would require Oregon to pass legislation mandating utilities enter into 20–25 year PPAs to purchase the project's electricity at above market price.[30] In opposition to the legislation, several utilities, including Oregon's two largest, PacifiCorp and PGE, wrote a letter to the House Energy and Environment Committee.[31] The utilities argued that the proposed offshore project would cost between three and four times more than they paid for offshore wind, and that it is "unreasonable to require by law that the responsibility for the costs of a[] [research, development and demonstration] project is

25. Walter Musial et al., Nat'l Renewable Energy Lab, Oregon Offshore Wind Site Feasibility and Cost Study 30 (2019), https://www.nrel.gov/docs/fy20osti/74597.pdf [https://perma.cc/KED3-CD46].

26. Banister, *supra* note 17, at 4.

27. *Id.*

28. *Id.* at 9; *see also* Davis, *supra* note 18.

29. Banister, *supra* note 17, at 9.

30. Hillary Borrud, *State Says Offshore Wind Project Too Expensive*, Portland Tribune (Nov. 23, 2015), https://pamplinmedia.com/pt/9-news/282515-159166-state-says-offshore-wind-project-too-expensive [https://perma.cc/9Y7K-N8E9]; Banister, *supra* note 17, at 9.

31. Letter from PacifiCorp, Portland General Electric, Citizens' Utility Board and Indus. Customers of NW Utilities to Or. House Comm. on Energy & Env't (Apr. 21, 2015) https://olis.leg.state.or.us/liz/2015R1/Downloads/CommitteeMeetingDocument/67540 [https://perma.cc/RAQ4-GMWA].

saddled on the backs of the customers of two utilities . . . "[32] The required purchase agreement for a 24 MW project would have cost ratepayers an estimated $0.14 a month more if spread across all Oregon ratepayers and $0.45 a month more if spread only to IOU customers.[33] The estimated PPA price would have been $240/MWh to $260/MWh for the project.[34] The estimated LCOE for the project was $197/MWh.[35]

This cost barrier that the Principle Power project faced has decreased over the last few years and floating offshore wind is projected to become more cost competitive. Part of the high cost of the Principle Power project was that it was going to be a pilot-scale demonstration project using semisubmersible floating technology.[36] In 2013, Principle Power was one of only two companies that had successfully deployed and operated a multi-megawatt floating turbine.[37] In the years since, floating technology has developed quickly. Eight floating offshore wind projects currently exist worldwide, with fourteen more projects under construction or approved by regulators.[38] Moreover, sixteen other projects are in the planning and permitting phases. By the end of 2018, there was 4888 MW of floating offshore wind in operation or in the development pipeline.[39] There are no commercial-scale projects yet in operation, but several have been proposed.[40] There are three design concepts for floating technology, the spar-buoy, semisubmersible, and tension leg platform.[41] Of the project proposals in the pipeline, 94 percent use semisubmersible technology.[42] The semisubmersible technology relies on buoyancy and water plane area in order to maintain stability.[43]

The potential cost barrier of floating offshore wind is predicted to decrease and become more cost-competitive. In October 2019, the Bureau of Ocean Energy Management (BOEM) and the National Renewable Energy Lab (NREL) released a study on Oregon Offshore Wind Site Feasibility and Cost.[44] The study found that improvements in technology and economies of scale have greatly reduced the LCOE since the 2014 Principle Power Windfloat

32. *Id.*
33. Banister, *supra* note 17, at 30.
34. *Id.*
35. Musial et al., *supra* note 25, at 30.
36. *See* Banister, *supra* note 17, at 30; Principle Power Inc., Unsolicited Application for an Outer Continental Shelf Renewable Energy Commercial Lease Under 30 CFR 585.230: Principle Power WindFloat Pacific Pilot Project 1 (2013), https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/OR/WindFloat-Pacific-Lease-Request.pdf [https://perma.cc/J2K9-QT96].
37. Principle Power Inc., *supra* note 36, at 35.
38. Musial et al., *supra* note 25, at 30.
39. *Id.*
40. *Id.*
41. *Id.* at 31.
42. *Id.* at 32.
43. *Id.* at 31.
44. *Id.* at i.

project.[45] The LCOE of the 24 MW Windfloat project was $197/MWh, whereas the commercial sized 600 MW project that the study compared it to is projected to be $63/MWh by 2032.[46] The study modeled five potential 600 MW offshore wind sites geographically dispersed off the Oregon coast.[47] The study found that the LCOE for commercial operation date (COD) 2032 would range from $53/MWh to $74 MWh and $74/MWh to $102/MWh for COD 2027.[48] These estimates are lower than the estimated $100/MWh (or less) in 2030 off the California coast in a 2016 study by BOEM and NREL.[49] The decreases in LCOE are based on a 65 percent strike price decline for European offshore projects commissioned between 2017 and 2025, a lower than expected PPA price for the new Vineyard Wind project off the coast of Massachusetts, lower than expected finance costs, increased turbine power capacity (expected to be 15 MW by 2032), and lower component costs of floating platforms.[50]

This projected LCOE of $53/MWh to $74/MWh for a commercial operation date of 2032 indicates that floating offshore wind will likely be competitive with other renewable energy options. PG&E predicts LCOE of $46/MWh for onshore wind from Montana and $41/MWh for onshore wind from Washington for COD 2023.[51] The U.S. Energy Information Administration (U.S. EIA) predicts a LCOE of $35.97/MWh for new onshore wind entering service in 2040.[52] U.S. EIA also predicts a LCOE of $29.70/MWh for solar photovoltaic entering service in 2040.[53]v Although slightly more expensive, offshore wind LCOE is becoming more competitive with new onshore wind and solar projects, and additional incentives on the state or federal level could make offshore even cheaper. Going forward, the cost barriers of floating offshore are likely to decrease and thus the cost challenges that the Principle Power Windfloat project faced will not be as great. The state policy tools analyzed below can help further overcome the cost barrier of floating offshore wind.

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45. *Id.* at x.
46. *Id.*
47. *Id.* at viii.
48. *Id.* at ix.
49. *See id.* at v.
50. *Id.* at 63. *But see* Will Mathis & Christian Wienberg, *Offshore Wind Gets a Warning From Its Biggest Developer*, Bloomberg (Oct. 29, 2019), https://www.bloomberg.com/amp/news/articles/2019-10-29/orsted-sinks-as-company-slashes-outlook-and-warns-of-job-cuts?__twitter_impression=true [https://perma.cc/C838-YKYR] (noting that Orsted A/S, the world's largest offshore wind developer, announced that offshore wind farms will not produce as much energy as forecast, but added the mistake is "not a major setback for the industry at all. The industry will still grow.").
51. Portland Gen. Elec., 2019 Integrated Resource Plan 173 (2019), https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/2019-integrated-resource-plan.pdf?la=en [https://perma.cc/6YNB-YHDH].
52. U.S. Energy Info. Admin., Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2020 19 (February 2020), https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf [https://perma.cc/3668-9N29].
53. *Id.*

B. *Environmental Challenges*

Environmental challenges often present additional barriers to offshore wind development. Concerns that must be addressed include potential collisions with birds, whales, and other marine animals, and the effect of electromagnetic fields on fish, turtles, and elasmobranchs (sharks and rays).[54] BOEM has commissioned many studies that examine the specific environmental impacts of potential offshore wind development in different parts of the country.[55] Developers must provide BOEM with site-specific information about a project's expected environmental impacts, which BOEM uses to support the environmental analysis that the agency must publish.[56]

C. *Community Barriers*

Community and human use conflicts are also a potential barrier to offshore projects.[57] Projects must consider impacts on the fishing industry, shipping and navigation routes, air traffic, and the visual impacts on local communities.[58] Strong local opposition can arise when these potential conflicts are not considered in the planning process. For example, the Cape Wind Project off the coast of Cape Cod, Massachusetts, was successfully stalled for sixteen years by local opposition until developers decided to terminate the project.[59] The project was opposed by prominent local residents such as Senator Ted Kennedy and billionaire businessman William Koch, as well as fishing interests and Native American communities.[60] The Alliance to Protect Nantucket Sound, led by William Koch, spent $40 million fighting the project.[61]

Opponents argued that the project's proximity to the shore in the shallow waters of Nantucket Sound posed navigational hazards and threats to the environment.[62] The failed Cape Wind project has taught future offshore

54. Banister, *supra* note 17, at 8.

55. *See*, *e.g.*, Bureau of Ocean Energy Mgmt., Selected BOEM Funded Research Informing Renewable Energy Offshore Oregon (2019) https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/OR/Selected-BOEM-Research-Renewable-OR.pdf [https://perma.cc/JP85-VJLD]; Josh Adams et al., Bureau of Ocean Energy Mgmt., Collision and Displacement Vulnerability among Marine Birds of the California Current System Associated with Offshore Wind Energy Infrastructure (2017), https://pubs.usgs.gov/of/2016/1154/ofr20161154.pdf [https://perma.cc/KX26-CPY4]; A. Copping & M. Grear, Pac. Nw. Nat'l Lab., Humpback Whale Encounter with Offshore Wind Mooring Lines and Inter-Array Cables (2018), https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Pacific-Region/Studies/BOEM-2018-065.pdf [https://perma.cc/9BN3-DG54].

56. Gilman et al., *supra* note 1, at 39.

57. *Id.*

58. *Id.*

59. Seelye, *supra* note 14.

60. *Id.*

61. *Id.*

62. *Id.*

wind projects to conduct a public process to minimize conflicts.[63] The Oregon Windfloat project was sited eighteen miles offshore, so it did not have the close proximity to shore concerns; however, the project did face opposition from the local fishing industry as it would have limited access in the area of the offshore wind, and would function similarly to a marine reserve.[64] The Oregon projects are located far enough from the shore and beyond the Dungeness crab harvesting grounds, which usually occur in waters between thirty and six hundred feet deep.[65]

D. *Transmission Barriers*

A critical component of developing offshore wind resources is integration to the grid to facilitate the delivery of offshore electricity.[66] Oregon offshore wind in particular has potential transmission and integration barriers because of the state's unique grid interconnection environment.[67] Unlike on the east coast, Oregon's population centers are not on the coast. Rather, they are in the Willamette Valley, which is separated from the ocean by the Coast Range.[68] Currently, power flows from the Willamette Valley to the coast.[69] Offshore wind generation would likely reverse the direction of this power flow.[70] Any offshore wind development could be limited by the capacity of the transmission line going over the Coast Range.[71] At present, most of the transmission lines over the Coast Range are 115-kV to 345-kV lines.[72] The grid connections on the coast may also present a difficulty when injecting 600 MW into one point.[73] Transmission upgrades could be costly and challenging.[74]

II. State Policies Promoting Offshore Wind Development

In order to support offshore wind, states can use policy tools to lower the cost, environmental, community, and transmission barriers to development.

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63. *Id.*

64. Banister, *supra* note 17, at 4 (the proposed project was eighteen miles offshore); Erin Ross, *Offshore Wind Energy Looks More Promising for Oregon*, Or. Pub. Broad. (Sept. 13, 2019), https://www.opb.org/news/article/oregon-offshore-wind-energy-coast-ocean [https://perma.cc/PUM6-E93X] (discussing the concerns of the fishing industry).

65. Ross, *supra* note 64 (discussing the concerns of the fishing industry); *see also The Fishery*, Or. Dungeness Crab Comm'n, http://oregondungeness.org/fishery [https://perma.cc/R652-SMJR] (the average boat fishes in 30 to 600 feet of water, and "[t]he Dungeness crab fishery usually is the most valuable single-species fishery in Oregon").

66. Banister, *supra* note 17, at 27.

67. Musial et al., *supra* note 25, at 45.

68. *Id.*

69. *Id.*

70. *Id.* at 44–45, fig.33.

71. *Id.* at 48.

72. *Id.* at 46, fig.33.

73. *Id.* at 62.

74. *Id.*

The following are various tools that East Coast states have used to support offshore wind development.

A. *Renewable Portfolio Standards and Offshore Wind Carve Outs and Mandates*

1. Benefit to Offshore Wind Development

One of the most effective state tools to promote the development of renewable resources and help overcome the cost barriers of offshore wind development is through an RPS. Thirty states and Washington D.C. have developed an RPS.[75] A RPS requires electricity suppliers in the state to procure a certain percentage of their electricity from renewable resources.[76] RPSs promote renewable development by forcing utilities to meet the standards. Around half of all growth of renewable electricity generation since 2000 is partly attributable to compliance with RPS programs.[77] In the Western United States, 70–90 percent of renewable energy additions have been built to meet RPS requirements.[78] RPSs theoretically lead to securing renewable energy at the lowest cost as generators compete to sell to suppliers.[79]

Utilities often demonstrate their compliance with RPSs through renewable energy certificates (RECs), which is the property right to the renewable attribute of electricity that is generated from renewable resources.[80] Some states allow utilities to purchase both unbundled RECs (those that are separate from the associated electricity) and bundled RECs (those that are bought in conjunction with the associated electricity).[81] RECs provide a record of the renewable attributes generated and create a "fungible commodity that

75. *State Renewable Portfolio Standards and Goals*, Nat'l Conference of State Legislatures (Apr. 17, 2020), http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx [https://perma.cc/T8V8-WAJ9].

76. Warren Leon, Clean Energy State All., Designing the Right RPS: A Guide to Selecting Goals and Program Options For a Renewable Portfolio Standard 3 (2012), https://www.cesa.org/assets/2012-Files/RPS/CESA-RPS-Goals-and-Program-Design-Report-March-2012.pdf [https://perma.cc/SF64-RP3L].

77. Galen Barbose, Lawrence Berkley Nat'l Lab., U.S. Renewables Portfolio Standards: 2019 Annual Status Update 4 (2019), https://eta-publications.lbl.gov/sites/default/files/rps_annual_status_update-2019_edition.pdf [https://perma.cc/U3ZU-HFRU].

78. Or. Dept. of Energy, Ch. 3 *Renewable Energy*, *in* Biennial Energy Report 1, 5 (2018), https://www.oregon.gov/energy/Data-and-Reports/Documents/BER-Chapter-3-Renewable-Energy.pdf [https://perma.cc/EFD6-XGB6].

79. Leon, *supra* note 76.

80. Ryan Wiser et al., Lawrence Berkeley Nat'l Lab. & Nat'l Renewable Energy Lab., A Retrospective Analysis of the Benefits and Impacts of U.S. Renewable Portfolio Standards 5 (2016), http://www.nrel.gov/docs/fy16osti/65005.pdf [https://perma.cc/LCK9-HVDJ]; *Renewable Energy Certificates (RECs)*, U.S. Envtl. Protection Agency, https://www.epa.gov/greenpower/renewable-energy-certificates-recs [https://perma.cc/3ZXG-CS7X].

81. *Id.*

can be traded among suppliers."[82] Each state establishes a particular shelf life for that state's RECs, which designates how long the REC can be used for compliance.[83] The longer the shelf life of an REC, the more flexibility utilities have to comply by banking RECs for future use. A longer shelf life can also limit the demand for new production and development as utilities can rely on older RECs.[84] Some argue that RECs help to promote development by providing revenue for renewable generators, thereby enhancing the profitability of the project.[85] Even with the projected revenue stream of RECs, however, investors are often hesitant because fluctuating REC prices and possible state policy changes create risk.[86] States can reduce this risk and uncertainty by adding additional policies to support or mandate the formation of longterm power purchase agreements, adopt a REC price floor, and increase RPS standards over time.[87]

One tool that can support the development of specific renewable resources, especially new technology, is a carve-out for that resource as part of an RPS program.[88] A carve-out is a preference mechanism that sets different targets for different renewable resources as part of an RPS.[89] Without a preference mechanism, an RPS program will lead to the development of only the most cost effective renewable resources.[90] A carve-out can be expressed as a specific percentage of an RPS that must be met by that specific resource or by mandating the procurement of a specific amount.[91] Carve-outs can increase the certainty of how much of a resource will be developed.[92] A disadvantage is that carve-outs often result in higher electricity costs as opposed to even competition among all resources.[93]

A carve-out or procurement mandate also can lower the cost of developing new renewable technologies by creating certainty in size and timing of future demand.[94] In planning to develop offshore wind in New York, the

82. K.S. Cory & B.G. Swezey, Nat'l Renewable Energy Lab., Renewable Portfolio Standards in the States: Balancing Goals and Implementation Strategies 3 (2007), https://www.nrel.gov/docs/fy08osti/41409.pdf [https://perma.cc/H6NK-E7KR].

83. *Id.* at 5.

84. *Id.*

85. Holt et al., Nat'l Renewable Energy Lab, The Role of Renewable Energy Certificates in Developing New Renewable Energy Projects 1 (2011), https://www.nrel.gov/docs/fy11osti/51904.pdf [https://perma.cc/DLK8-3WLL].

86. Leon, *supra* note 76, at 11.

87. *Id.*

88. *Id.* at 40.

89. *Id.*

90. *Id.*

91. *Id.*

92. *Id.* at 41.

93. *Id.*

94. Stephanie McClellan, Ph.d. et al., N.Y. State Energy Res. and Dev. Auth., New York Offshore Wind Cost Reduction Study S-12 (2015), https://green-giraffe.eu/sites/green-giraffe.eu/files/1503_new_york_offshore_wind_cost_reduction_study-ff8-2_final.

New York State Energy Research and Development Authority (NYSERDA) commissioned a study that looked at the potential impacts of several state interventions on lowering the Levelized Cost of Energy (LCOE) for offshore wind development in the state.[95] The study found that the intervention with the largest impact was creating market visibility by establishing certainty with regard to the size and timing of future market demand.[96] The authors found that by committing to a minimum of 2400 MW through a phased-in series of projects, capital expenditures would decrease as such scaling attracted more competition among bidders.[97] The study also concluded that the phased-in projects would lower maintenance and insurance costs by creating economies of scale.[98] Lastly, the phased-in projects would lower the weighted average cost of capital as the projects attract repeat investment from more sector-knowledgeable investors.[99]

The combination of a strong RPS and a carve-out or procurement mandate for offshore wind has been utilized by east coast states to spur development the offshore wind.[100] The following Subpart provides examples of how states have used this RPS and carve-out procurement mandate model.

2. East Coast State Policy Survey

In July 2019, the New York legislature increased the state's RPS to 70 percent renewable electricity by 2030.[101] The legislature also created an offshore wind mandate of 9000 MW by 2035.[102] In addition, the NYSERDA developed an Offshore Wind Master Plan in 2018, with the goal of reaching 2400 MW of offshore resources by 2030.[103] To facilitate the procurement of

pdf [https://perma.cc/8BLX-T7UZ].

95. *Id.* at ix.

96. *Id.* at 37.

97. *Id.* at 37, n.78.

98. *Id.* at 38.

99. *Id.*

100. *See* Mass. Dep't of Energy Res., Offshore Wind Study, app. A at 20 (2019), https://www.mass.gov/files/documents/2019/05/31/OSW%20Study%20-%20Final.pdf [https://perma.cc/6GTP-WL9C] (chart outlining recent state policies promoting offshore wind); *State Renewable Portfolio Standards and Goals*, *supra* note 75; *see also* Shiva Polefka, *State Policies can Unleash U.S. Commercial Offshore Wind Development*, Center for American Progress (Sept. 18, 2017), https://www.americanprogress.org/issues/green/reports/2017/09/18/439078/state-policies-can-unleash-u-s-commercial-offshore-wind-development [https://perma.cc/PQ52-SW3Y] (discussion of state policies that have promoted offshore wind as of 2017).

101. S. 6599, 2019 Reg. Sess. § 75-0119(2) (N.Y. 2019), https://legislation.nysenate.gov/pdf/bills/2019/S6599 [https://perma.cc/QG2R-49TE]; *Renewable Portfolio Standard*, N.Y. State Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard/Renewable-Portfolio-Standard [https://perma.cc/2YK4-D4KJ].

102. N.Y. S. 6599 § 75-0103(13)(e), https://legislation.nysenate.gov/pdf/bills/2019/S6599 [https://perma.cc/QG2R-49TE].

103. *Getting to 2035*, N.Y. State Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Offshore-Wind-in-New-York-State-Overview/Getting-to-2035 [https://perma.cc/FJT8-EQ84]; *NYS Offshore Wind Master Plan*, N.Y. State

offshore resources, the New York Public Service Commission issued an order that authorized NYSERDA, in consultation with the Long Island Power Authority and New York Power Authority, to solicit bids for the first phase of offshore wind procurements.[104] New York has created an offshore renewable energy certificate (OREC) program to facilitate the achievement of the state's offshore wind goals.[105] An OREC represents the "environmental attributes associated with one megawatt-hour (MWh) of electricity generated from offshore wind resources and consumed by retail customers."[106] The stated purpose of the OREC program is to provide financial support for investments in offshore wind energy and stimulate the development of New York's offshore wind industry.[107] NYSERDA will purchase the ORECs from the offshore developers and then resell them to the load serving entities, who are the electric utility companies.[108] Much like the regular RPS requirements, each load serving entity will have to purchase ORECs proportional to the amount of electricity they provide to customers each year.[109]

New Jersey has an RPS of 21 percent renewables by 2020, 35 percent by 2025, and 50 percent by 2030.[110] The legislature has codified the 3500 MW offshore wind goal the state previously outlined.[111] In November 2019, Governor Murphy increased the offshore wind mandate from 3500 MW to 7500 MW by 2035, which will be enough electricity to meet half of the state's electricity needs.[112] The legislature's bill calls for the development of an OREC program requiring a "percentage of the kilowatt hours sold in this State by each electric power supplier . . . be from offshore wind energy" to reach the goal.[113] The Governor directed the New Jersey Board of Public Utilities to solicit bids

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Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Offshore-Wind-in-New-York-State-Overview/NYS-Offshore-Wind-Master-Plan [https://perma.cc/ZLP8-ESNE].

104. *See Offshore Wind Solicitations*, N.Y. State Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Offshore-Wind-Solicitations [https://perma.cc/64RE-SD84].

105. *Offshore Wind Renewable Energy Certificates*, N.Y. State Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Offshore-Wind-Solicitations/ORECs [https://perma.cc/87EH-KBL8].

106. *Id.*

107. *Id.*

108. *Id.*

109. *Id.*

110. Press Release: Governor Murphy Signs Measures to Advance New Jersey's Clean Energy Economy (May 23, 2018), https://www.nj.gov/governor/news/news/562018/approved/20180523a_cleanEnergy.shtml [https://perma.cc/S3Zk-PW2B].

111. *Id.*

112. Chris Martin, *New Jersey Doubles Down on Offshore Wind for Half Its Power*, Bloomberg: Bloomberg Green (Nov. 19, 2019, 10:28 AM), https://www.bloomberg.com/news/articles/2019-11-19/new-jersey-doubles-down-on-offshore-wind-for-half-its-power [https://perma.cc/S9Y5-49UD].

113. Gen. Assemb. 3723, 218th Leg. 2(d)(4) (N.J. 2018).

from offshore wind projects, which will be awarded ORECs for their electricity production.[114] To comply with the OREC program, the utilities must buy the ORECs from that offshore wind generator.[115] New Jersey recently chose a bid from a developer, Orsted A/S, for a 1100 MW facility to be completed by 2024.[116] The state Public Utility Commission predicts the project will increase bills for residential customers by $1.46 per month.[117]

Massachusetts has set a goal to obtain 35 percent of electricity from renewables by 2030 and 55 percent by 2050.[118] To facilitate offshore wind development, the Massachusetts Legislature passed the Energy Diversity Act in 2016, which mandated that "every distribution company shall jointly and competitively solicit proposals for offshore wind energy generation" and "enter into cost-effective longterm contracts for offshore wind energy generation equal to approximately 1,600 megawatts of aggregate nameplate capacity not later than June 30, 2027."[119] Massachusetts will likely soon add to this mandate as the legislature passed a bill in 2018 instructing the Department of Energy Resources (DOER) to "investigate the necessity, benefits and cost" of requiring utilities to procure an additional 1600 MW of offshore wind by December 21, 2035.[120] In May 2019, DOER completed its investigation and concluded that the "solicitation of [an additional] 1,600 MW will likely provide benefits for Massachusetts ratepayers in excess of the anticipated costs of the contracts as long as offshore wind pricing remains similar to the first" solicitations.[121] Based on these findings, DOER recommended and "will require the Massachusetts Electric Distribution Companies to proceed with an additional 1,600 MW of offshore wind generation solicitations."[122] This is a different model

114. N.J. Bd. Pub. Health, Clean Energy Program: Offshore Wind, New Jersey's Offshore Wind Goal: 3,500 MW by 2030 https://nj.gov/infobank/eo/056murphy/pdf/EO-8.pdf [https://perma.cc/62J3-7ETC]; *What is the New Jersey Board of Public Utilities' Role?*, New Jersey's clean Energy Program: Offshore Wind, https://www.njcleanenergy.com/NJ-Offshore-Wind#bpurole [https://perma.cc/KV8F-5Z69].

115. Gen. Assemb. 3723, 218th Leg. 2(d)(4) (N.J. 2018) ("[E]lectric power supplier or basic generation service provider shall comply with the OREC program . . . through the purchase of offshore wind renewable energy certificates at a price and for the time period required by the board").

116. David Porter, *With Gore, New Jersey Announces Aggressive Wind Energy Goals*, The Associated Press (Nov. 19, 2019), https://apnews.com/b824912b8bbc47cb852ae8a5dd7f30e3 [https://perma.cc/52LV-WZBN].

117. *Id.*

118. An Act to Advance Clean Energy, Mass. Acts Ch. 227 (2016); Acadia Ctr., 2018 Clean Energy Legislation in Massachusetts—An Act to Advance Clean Energy: Chapter 227 of the Acts of 2018 1 (2018), https://acadiacenter.org/wp-content/uploads/2018/08/Acadia-Center-Summary-of-2018-Clean-Energy-Legislation-in-MA.pdf [https://perma.cc/3NX4-J8HV].

119. An Act to Promote Energy Diversity, Mass. Acts Ch. 188 § 83C(b) (2016).

120. An Act to Advance Clean Energy, Mass. Acts Ch. 277 § 21(a) (2018).

121. *Offshore Wind Study*, Mass.gov: Mass.Dep't of Energy Res., https://www.mass.gov/service-details/offshore-wind-study [https://perma.cc/AZV5-VAXT].

122. *Id.*

from the one implemented in New York, Maryland, and New Jersey because the electricity providers collectively bid for electricity, as opposed to individual offshore renewable energy certificate requirements.

In 2019, Maryland increased its RPS to 50 percent renewables by 2030 with the goal of reaching 100 percent clean energy by 2040.[123] The new law also included doubling the state's previous offshore mandate, with a new goal of 1200 MW of offshore wind by 2040.[124] In the Maryland Offshore Wind Act of 2013, the state set a carve-out of about 480 MW by 2020.[125] The Maryland Offshore Wind Act of 2013 also created ORECs that helped to provide financial support to projects as part of the RPS program.[126]

Connecticut has a goal of 100 percent zero-carbon energy by 2040 and 44 percent renewables by 2030.[127] Connecticut has also recently passed legislation requiring the state to solicit 2000 MW of offshore wind by 2030, which represents 30 percent of the state's load requirement. This is the largest offshore wind commitment by load percentage in the country.[128]

Virginia does not have a compulsory RPS program; instead, it has a voluntary renewable portfolio goal of 15 percent renewable energy by 2025.[129] Utilities are required to report their efforts to reach this goal.[130] Governor Ralph Northam recently issued an executive order calling for 2500 MW of

123. S. 516, 2019 439th Reg. Sess. 7-703 (b)(25), 7-714 (F)(1) (Md. 2019) http://mgaleg.maryland.gov/2019RS/bills/sb/sb0516f.pdf [https://perma.cc/D5QJ-NX5W]; Catherine Morehouse, *Maryland 50% RPS Bill Doubles Offshore Wind Target, Expands Solar-Carve Out*, Utility Dive (Apr. 10, 2019), https://www.utilitydive.com/news/maryland-50-rps-bill-doubles-offshore-wind-target-expands-solar-carve-out/552421 [https://perma.cc/K9EN-Q9GB].

124. Md. S. 516 7-703 (b)(25)(II); *Maryland 50% RPS Bill Doubles Offshore Wind Target*, *supra* note 123.

125. *Offshore Wind Energy in Maryland*, Maryland Energy Administration, https://energy.maryland.gov/Pages/Info/renewable/offshorewind.aspx [https://perma.cc/DX37-YTYU].

126. *Id.*; *see also* Nelson & Yaffe, *supra* note 16, at 47.

127. Press Release, Governor Lamont Signs Executive Order Strengthening Connecticut's Efforts to Mitigate Climate Change (Sept. 3, 2019), https://portal.ct.gov/Office-of-the-Governor/News/Press-Releases/2019/09-2019/Governor-Lamont-Signs-Executive-Order-Strengthening-Connecticuts-Efforts-to-Mitigate-Climate-Change [https://perma.cc/N63F-BXMM]; *State Renewable Portfolio Standards and Goals*, *supra* note 75.

128. Press Release, State of Connecticut, Governor Lamont Signs Legislation Authorizing the Development of Offshore Wind in Connecticut (June 7, 2019) https://portal.ct.gov/Office-of-the-Governor/News/Press-Releases/2019/06-2019/Governor-Lamont-Signs-Legislation-Authorizing-the-Development-of-Offshore-Wind-in-Connecticut [https://perma.cc/8NM4-T32S]; Jan Ellen Spiegel, *Connecticut Takes a Major Step into Offshore Wind*, The CT Mirror (June 4, 2019), https://ctmirror.org/2019/06/04/connecticut-takes-a-major-step-into-offshore-wind [https://perma.cc/YUR9-6FFR]; Press Release, Governor Lamont Signs Executive Order Strengthening Connecticut's Efforts to Mitigate Climate Change, *supra* 127.

129. *Virginia*, Nat'l Renewable Energy Lab: Solar Research, https://www.nrel.gov/solar/rps/va.html [https://perma.cc/SP25-S5WJ].

130. *Id.*

offshore wind to be operational by 2026.[131] Virginia is in a different position than many other states, as its hybrid electricity market only has one dominant electricity provider: Dominion Energy.[132]

These case studies demonstrate that, each still state follows a similar structure, although they vary in some regards. First, the states all have aggressive RPS or renewable energy goals, ranging from 35 percent renewable energy by 2030 in Massachusetts to 70 percent renewable energy by 2030 in New York.[133] Each state then creates a carve out in the RPS or a procurement mandate for offshore wind, which dictates a specific offshore wind goal. Some states, like Massachusetts, require utilities to solicit bids collectively and form contracts with offshore wind developers.[134] In other states, such as New Jersey and New York, the state PUC solicits bids from offshore developers, and utilities purchase the created ORECs.[135] The source of the mandate also varies from state to state. Most offshore mandates come from legislation, although the governors of Virginia and New Jersey have used executive action.[136] Overall, the programs implement a strong RPS in addition to a specific carve-out or mandate for offshore wind.

B. *Infrastructure and Port Development*

1. Benefit to Offshore Wind Development

Another tool states use to promote renewable resources and lower the cost barrier is infrastructure investment. A NYSERDA study on offshore wind cost reduction found that port investment would lower the LCOE as local port facilities decrease construction time and installation transfer time, allowing for faster and more predictable installation.[137] These improvements would reduce projects' capital expenditures and thus the LCOE.[138] The same study also found that investing in local port development would add to the market visibility of New York's commitment to developing offshore wind projects and would lead—in combination with other market visibility tools—to

131. Va. Exec. Order No. 43, 4 (Sept. 16, 2019); Catherine Morehouse, V*irginia Gov. Northam Orders 100% Carbon-Free Power by 2050*, Utility Dive (Sept. 18, 2019), https://www.utilitydive.com/news/virginia-gov-northam-orders-100-carbon-free-power-by-2050/563161 [https://perma.cc/MH2Y-JEW5].

132. Catherine Morehouse, *Dominion's 100% Renewables Tariff Could Kill Virginia's Retail Choice Ambitions*, Utility Dive (Aug. 5, 2019), https://www.utilitydive.com/news/dominions-100-renewables-tariff-could-kill-virginias-retail-choice-ambit/559983 [https://perma.cc/W8DU-JVV6].

133. S. 6599, 2019 Reg. Sess. § 1(12)(d) (N.Y. 2019); Acadia Center, *supra* note 118.

134. Mass. Acts Ch. 188 sec. 83C(b) (2016).

135. Gen. Assemb. 3723, 218th Leg. 2(d)(4) (N.J. 2018); *Offshore Wind Renewable Energy Certificates*, *supra* note 105.

136. *See* Va. Exec. Order No. 43, (Sept. 16, 2019); Martin, *supra* note 112 (New Jersey's most recent goal of 7500 MW came from executive action).

137. McClellan et al., *supra* note 94, at 49–50.

138. *Id.* at 50.

less expensive and longer term capital.[139] Along with RPSs and offshore mandates, East Coast states are investing in infrastructure development to further offshore wind projects. The following Subpart outlines the different infrastructure investments East Coast states are making to further stimulate offshore wind growth.

2. East Coast State Policy Survey

Massachusetts has put considerable funds toward creating the infrastructure and port facilities necessary to accommodate and promote offshore wind development. In 2010, the Massachusetts Clean Energy Center (MassCEC) commissioned a report to analyze potential port locations for offshore wind development.[140] After MassCEC determined the New Bedford port would be the best location, Massachusetts invested $113 million in dredging and expanding the harbor for offshore wind capabilities.[141] The New Bedford Marine Commerce Terminal, opened in 2015, is the first terminal of its kind in North America and has the heavy lifting, depth, and birthing capabilities to support offshore wind construction, assembly, and deployment.[142] In addition to the New Bedford investment, MassCEC commissioned the Massachusetts Offshore Wind Ports & Infrastructure Assessment to identify additional locations for offshore infrastructure and port development.[143]

New York has followed a similar infrastructure path, investing extensively in building port infrastructure for offshore wind and commissioning reports to research the best locations for such development. New York committed to invest $200 million in port infrastructure and, as part of its Offshore Wind Master Plan, ordered reports to identify the best areas for investment.[144] The first report analyzed sixty port facilities that could support offshore wind infrastructure. The second report in 2018 further refined and expanded upon

139. *Id.*

140. Tetra Tech Ec, Inc., Port and Infrastructure Analysis for Offshore Wind Energy Development (2010), https://files.masscec.com/Port%20%26%20Infrastructure%20Report.pdf [https://perma.cc/3GRW-3Q74].

141. *Id.*; Stanley Reed & Ivan Penn, *Massachusetts Gains Foothold in Offshore Wind Power, Long Ignored in U.S.*, N.Y. Times (May 23, 2018), https://www.nytimes.com/2018/05/23/business/energy-environment/offshore-wind-massachusetts.html [https://perma.cc/5AWL-5RG8].

142. *New Bedford Marine Commerce Terminal: About*, Mass. Clean Energy Ctr., https://www.masscec.com/facilities/new-bedford-marine-commerce-terminal [https://perma.cc/GX59-XGFM].

143. *Massachusetts Offshore Wind Ports & Infrastructure Assessment*, Mass. Clean Energy Ctr., https://www.masscec.com/massachusetts-offshore-wind-ports-infrastructure-assessment [https://perma.cc/R8HC-A28H].

144. *New York State Launches Process to Upgrade Port Infrastructure to Support Expanding Offshore Wind Industry*, N.Y. State Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/About/Newsroom/2019-Announcements/2019-10-02-New-York-State-Launches-Process-to-Upgrade-Port-Infrastructure-to-Support-Expanding-Offshore-Wind-Industry [https://perma.cc/RB7W-DPVY].

the initial report.[145] In Fall 2019, New York accepted applications from port applicants as part of a prequalifying step, and in 2020, the state will conduct a competitive solicitation for up to $200 million for a public-private port infrastructure project.[146] The state hopes to use the public investment to unlock private supply chain capital and maximize the longterm economic benefits.[147]

Connecticut implemented a public-private investment model as it committed to a public-private partnership with wind developers Ørsted and Eversource to redevelop the New London State Pier. This reinvestment focused on developing the port's necessary infrastructure, including as heavy lifting capabilities, to enable the port to be a regional hub for offshore wind.[148] The $93 million partnership agreement commits the state to invest $35.5 million, as well as a new developer commitment of $35 million in addition to the developer's previous $22.5 million investment.[149]

Maryland spurred private infrastructure investment by adding conditions to the approval process for ORECs.[150] As part of the approval of two offshore wind projects, the Maryland Public Service Commission required developers, U.S. Wind, Inc., and Skipjack Offshore Energy, to collectively invest $39.6 million in port improvements at Trademark Atlantic Shipyard in Baltimore County and $76 million in an instate steel fabrication plant.[151]

Rhode Island received promises from developers for investment in state infrastructure as part of project approvals.[152] The 400 MW Revolution Wind Project promised $250 million in local investment which includes $40 million for local port improvements and higher education.[153]

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145. *Ports and Infrastructure*, N.Y. State Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Economic-Opportunities/Ports-and-Infrastructure [https://perma.cc/3JM7-FLNN].

146. *Id.*

147. *Id.*

148. Press Release, Governor Ned Lamont, State of Conn., Governor Lamont Announces Major Development Plan That Will Establish New London as a Central Hub of the Offshore Wind Industry (May 2, 2019), https://portal.ct.gov/Office-of-the-Governor/News/Press-Releases/2019/05-2019/Governor-Lamont-Announces-Development-Plan-That-Will-Establish-New-London-as-a-Hub-of-Offshore-Wind [https://perma.cc/JW7P-BYTQ].

149. *Id.*

150. Press Release, Md. Pub. Serv. Comm'n, Maryland PSC Awards ORECS to Two Offshore Wind Developers Projects to Create Jobs, Economic Development in New Industry (May 11, 2017), http://www.psc.state.md.us/wp-content/uploads/PSC-Awards-ORECs-to-US-Wind-Skipjack.pdf [https://perma.cc/7LD9-TWNV].

151. *Id.*

152. Press Release, R.I. Office of the Governor, Rhode Island Advances Offshore Wind Development (Feb. 7, 2019), https://www.ri.gov/press/view/35210 [https://perma.cc/C93G-QVXH]; Press Release, Ørsted, Rhode Island Regulators Approve Revolution Wind Power Contract (May 28, 2019),

https://us.orsted.com/News-Archive/2019/05/Rhode-Island-Regulators-Approve-Revolution-Wind-Power-Contract [https://perma.cc/A9BP-ZDBJ].

153. Press Release, R.I. Office of the Governor, *supra* note 152.

Overall, these case studies show that states have either directly invested in infrastructure to support and grow an offshore wind industry, or have incentivized private actors to provide investment.

C. *Education and Workforce Training Investment*

1. Benefit to Offshore Wind Development

To facilitate offshore wind development, East Coast states have invested in educational and workplace training opportunities to create a local workforce that can support offshore development. Offshore wind requires a workforce capable of planning, constructing, deploying, and servicing offshore wind farms.[154] The Department of Energy's National Offshore Wind Strategy Report estimates that the industry may create 181,000 jobs by 2050.[155] Workplace training is necessary to facilitate this growth. A NYSERDA offshore wind cost reduction study found that workplace training could lower capital expenditures by reducing the projects' needed contingency budgets and lowering operating expenses by decreasing on-job mistakes, thereby avoiding cost overruns.[156] Experts also predict that a locally trained workforce could lower the required internal rate of return for investors because investors perceive a trained workforce as low risk.[157] The study also found that a trained workforce would lead to increased production as turbines would have higher reliability and availability.[158]

2. East Coast State Policy Survey

To create trained workforces necessary to grow the offshore wind industry, East Coast states have researched workforce needs and allocated funds to create education and training programs.[159] In 2018, the Massachusetts Clean Energy Center commissioned a report analyzing the workforce needs of the emerging offshore industry.[160] The report concluded that the 1600 MW offshore wind mandate would create between 2279 and 3171 direct job-years in Massachusetts.[161] To provide the necessary workforce, the report recommended "strategic investments in key courses and physical facilities" to provide industry recognized technical training for technicians and health and safety

154. Mass. Clean Energy Ctr., 2018 Massachusetts Offshore Wind Workforce Assessment III (2018), https://files.masscec.com/2018%20MassCEC%20Workforce%20Study.pdf [https://perma.cc/QZ9P-UPQB].

155. Gilman et al., *supra* note 1, at 44.

156. McClellan et al., *supra* note 94, at 48.

157. *Id.*

158. *Id.*

159. *Offshore Wind*, Mass. Clean Energy Ctr., https://www.masscec.com/offshore-wind [https://perma.cc/QBV4-HLZX].

160. *Id.*; *see* Mass. Clean Energy Ctr., 2018 Massachusetts Offshore Wind Workforce Assessment, *supra* note 154.

161. Mass. Clean Energy Ctr., 2018 Massachusetts Offshore Wind Workforce Assessment, *supra* note 154, at 38.

training.[162] In May 2019, MassCEC announced $721,500 in government seed money to establish training programs at local educational institutions and provide grants to local organizations.[163]

New York has also committed state funds to create the training programs necessary for an offshore wind workforce.[164] New York estimates that the procurement of 9000 MW of offshore wind by 2035 will create 10,000 new jobs.[165] To provide adequate workforce training, the state announced a plan to create a New York State Advisory Council on Offshore Wind Economic and Workforce Development, and create, in partnership with the private sector, a $20 million Offshore Wind Training Institute and a $3 million Community and Workforce Benefits Fund.[166] The Offshore Wind Training Institute will train the workforce "through new job training programs, tailored college curriculum, and enhanced academic research opportunities."[167] As of November 2019, the Offshore Wind Training Institute was still in its planning stage conducting meetings with NYSERDA as well as community and labor organizations.[168] The training programs also aim to benefit New York's low-income and environmental justice communities.[169]

By providing investment in training and education to create an offshore wind workforce, states are attempting to provide the necessary additional support for an offshore industry to succeed.

D. *Research and Development*

Another vital tool for promoting offshore wind is research and planning surrounding transmission, other ocean uses, and additional information that will help offshore wind developers.[170] Massachusetts exemplifies how states might use this tool.[171] In Massachusetts, MassCEC commissioned studies to

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162. *Id.*

163. Press Release, Mass. Clean Energy Ctr., Baker-Polito Administration Awards Funding for Offshore Wind Workforce Training Programs (May 10, 2019), https://www.masscec.com/about-masscec/news/baker-polito-administration-awards-funding-offshore-wind-workforce-training [https://perma.cc/P4DD-7JHU].

164. *Workforce*, N.Y. State Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Economic-Opportunities/Workforce [https://perma.cc/XGV5-MTKB].

165. *Id.*

166. *Offshore Wind Jobs Fact Sheet*, N.Y. State Energy Res. & Dev. Auth. (Feb. 2020), https://www.nyserda.ny.gov/-/media/Files/Programs/offshore-wind/ows-jobs-fact-sheet.pdf [https://perma.cc/BU4H-ALK3].

167. *Announcements and Events: Offshore Wind Technical and Training Workshop*, N.Y. State Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Contact/Events [https://perma.cc/YK52-N5H4].

168. *Id.*

169. *Workforce*, *supra* note 164.

170. Polefka, *supra* note 100.

171. Massachusetts is not the only example as many of the other states that are discussed in above Parts also have significant investment in research and development. *See*,

help identify the potential physical and biological impacts on the environment of development in certain regions as well as the locations best-suited for development.[172] For years, MassCEC and BOEM have conducted surveys and research on the wildlife activity in the area.[173] This information helps reduce the environmental impacts of development and helps guide and expedite the federal permitting process.[174] In 2016, the state partnered with Woods Hole Oceanographic Institution and AWS Truepower to build infrastructure to collect meteorological and oceanographic information near potential offshore wind sites.[175] The data provides increased certainty of investment for developers by "evaluating the energy potential, economic viability, and engineering requirements of project site."[176]

In 2014, the state published an Offshore Wind Transmission study that addressed the technical approaches for building offshore wind turbines, potential interconnection points for transmission, any upgrades or improvements needed for interconnection, and potential expansion of offshore transmission as the industry progresses.[177]

MassCEC also opened the Wind Technology Training Center in 2011.[178] The Center provides certification tests for wind turbine blades to meet international standards, which is vital for "developers to mitigate the technical and financial risk of deploying mass-produced wind turbines."[179] The Center's testing and prototype development allows for development of emerging wind technology.[180]

One tool that states can use to help fund research and development is public benefit funds. Massachusetts created a public benefit fund called the Massachusetts's Renewable Energy Trust Fund, which imposes a $0.0005/kWh surcharge on electricity that customers buy from retail providers.[181] The fund

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e.g., *NYS Offshore Wind Master Plan*, *supra* note 103. However, in the interest of brevity, the other examples are not discussed in detail, as Massachusetts provides a sufficient example.

172. *Offshore Wind*, Mass.gov, https://www.mass.gov/service-details/offshore-wind [https://perma.cc/8KAJ-AS4M].

173. *Offshore Wind Marine Wildlife Surveys*, Mass. Clean Energy Ctr., https://www.masscec.com/offshore-wind-marine-wildlife-surveys [https://perma.cc/PB5Z-HXR8].

174. *Id.*

175. *MassCEC Metocean Data Initiative*, Mass. Clean Energy Ctr., https://www.masscec.com/masscec-metocean-data-initiative [https://perma.cc/57AY-XDKW].

176. *Id.*

177. *Massachusetts Offshore Wind Transmission*, Mass. Clean Energy Ctr., https://www.masscec.com/massachusetts-offshore-wind-transmission [https://perma.cc/LAP3-ZW5M].

178. *Wind Technology Testing Center*, Mass. Clean Energy Ctr., https://www.masscec.com/wind-technology-testing-center [https://perma.cc/J9KS-7GJ5].

179. *Id.*

180. *Id.*

181. *Massachusetts: Renewable Energy Trust Fund*, Database of State Incentives for Renewables & Efficiency, https://programs.dsireusa.org/system/program/detail/732 [https://perma.cc/5CZC-YZVJ].

began in 1997 as part of the state's restructuring legislation, along with the state RPS.[182] The fund provides the Massachusetts Clean Energy Center with about $24 million annually for clean energy development.[183]

E. *Management Plans*

Other tools states have used are comprehensive ocean management plans and comprehensive offshore wind plans. These comprehensive plans can help circumvent the environmental and community barriers of offshore wind development by outlining potential problems at the outset. Massachusetts created the Massachusetts Ocean Management Plan, which outlines a blueprint to manage and protect critical marine habitat and water dependent uses, while setting standards for ocean-based projects.[184] The plan aims to create a pragmatic management structure that allows the state to balance current and future uses, while also protecting critical ocean habitats and promoting economic development.[185] The plan designated specific wind energy areas in state waters that are suitable for commercial and community scale energy projects.[186] The plan also maps and designates potential regions in which to build transmissions cables for offshore wind projects.[187]

The state of New York created the Offshore Wind Master Plan, which sets out a comprehensive roadmap that identifies ways to develop offshore wind resources and recognizes "environmental, maritime, economic, and social issues while addressing market barriers and aiming to lower costs."[188] The plan works to detect areas that will maximize output while minimizing potential conflicts.[189] The plan consists of twenty studies combined with community and stakeholder engagement.[190]

By ascertaining potential conflicts early in the process, comprehensive plans try to minimize environmental, community, and transmission barriers.

F. *State Tax Incentives*

Another tool that states use to promote offshore wind is a state tax credit. Tax credits can encourage private capital investment and employment

182. *Id.*

183. *Id.*

184. *Massachusetts Ocean Management Plan*, Mass. Office of Coastal Zone Mgmt., https://www.mass.gov/service-details/massachusetts-ocean-management-plan [https://perma.cc/9T4J-TE82].

185. Mass. Exec. Office of Energy and Envtl. Affairs, *Opening Letter* to 2015 Massachusetts Ocean Management Plan, Vol. 1—Management and Administration (2015).

186. Mass. Exec. Office of Energy and Envtl. Affairs, 2015 Massachusetts Ocean Management Plan, Vol. 1—Management and Administration 2–2 (2015).

187. *Id.* at 1–9.

188. *NYS Offshore Wind Master Plan*, *supra* note 103.

189. *Id.*

190. *Id.*

growth.[191] New Jersey's Offshore Wind Tax Credit program provides tax credits equal to up to 100 percent of qualified investments in offshore wind related facilities.[192] The investment in the offshore wind infrastructure must be over $50 million and the company must employ over 300 employees who spend 80 percent of their time in New Jersey.[193] The program is capped at $100 million and ends in 2027.[194] Companies can elect to use 10 percent of their credits against their tax burden per year over a ten-year period, or they can sell the credits.[195]

Rhode Island has also used tax incentives to promote offshore wind development through the state's Qualified Jobs Tax Credit program.[196] The program is designed to attract high paying jobs to the state and to encourage offshore wind companies to establish facilities in the state.[197] The state has offered more than $2.79 million in tax credits over ten years to draw wind operations and maintenance companies into the state.[198] In June 2019, the state granted $1.93 million in tax credits over ten years to global offshore wind maintenance company GEV Wind Power.[199] Then, in August 2019, the state granted over $800,000 of tax credits over ten years to incentivize another global offshore wind maintenance company to open its U.S. headquarters in Providence.[200]

III. Oregon Energy Market

In evaluating the applicability of the policy tools that East Coast states use to drive offshore wind development, it is important to analyze Oregon's energy market, electricity mix, and existing energy polices. East Coast state policy lessons can in turn be applied to achieve the best outcomes for Oregon's demands. Oregon's energy sector will likely experience an increase in

191. *Offshore Wind Tax Credit Program*, N.J. Econ. Dev. Auth., https://www.njeda.com/financing_incentives/large_business/Offshore-Wind-Tax-Credit-Program) [https://perma.cc/9D9Y-XD3N].

192. Press Release, N.J. Econ. Dev. Auth., Applications Now Open for NJ Offshore Wind Tax Credit Program (Jan. 22, 2019), https://www.njeda.com/offshorewindtaxcreditrelease [https://perma.cc/GTU8-7TBL]; *see also Offshore Wind Tax Credit Program*, *supra* note 191.

193. *Offshore Wind Tax Credit Program*, *supra* note 191.

194. *Id.*

195. Press Release, Applications Now Open for NJ Offshore Wind Tax Credit Program, *supra* note 192.

196. Lulia Gheorghiu, *Rhode Island Issues 10-year Tax Credit to Draw Offshore Wind Business*, Utility Dive (Aug. 29, 2019), https://www.utilitydive.com/news/rhode-island-issues-10-year-tax-credit-to-draw-offshore-wind-business/561928 [https://perma.cc/55HD-HP8R].

197. *See id.*

198. *Id.*

199. *Id.*

200. Press Release, R.I. Commerce Comm'n, Rhode Island to be U.S. Headquarters for GEV Wind Power (Jun. 24, 2019), https://www.ri.gov/press/view/36167 [https://perma.cc/RBK8-SCEV]; Gheorghiu, *supra* note 196.

demand for renewable resources in the coming years. A strong RPS and local clean energy goals, increasing demand from electrification of the transportation industry, retiring existing coal and natural gas plants, and potential dam removal will lead to greater demand for renewable resources. In order to satisfy the current 50 percent renewable energy by 2040 RPS[201], new energy generation will have to come from largely renewable resources. Although Oregon has potential for solar and onshore wind growth, the development of offshore wind would provide an additional resource. Offshore wind could provide energy diversity and complement solar and onshore wind with less variable energy generation. The capacity value and stability could decrease the need for capacity resources, such as natural gas.

In 2017 Oregon used over 51.4 million MWh of electricity a year.[202] Oregon's resource portfolio consisted of 44.81 percent hydroelectricity, 26.09 percent coal, 19.31 percent natural gas, 4.48 percent onshore wind, 3.02 percent nuclear, 0.59 percent biomass, 0.57 percent solar, and 0.11 percent geothermal.[203] In 2016, Oregon passed its most recent Renewable Portfolio Standard, which requires 50 percent renewable electricity by 2040. [204] The Oregon RPS allows a five-year shelf life for RECs.[205]

Hydropower makes up 40 percent of Oregon's electricity; however, most of these hydropower resources do not count toward the RPS goals and do not receive RECs. [206] In general, hydropower is often older and thus does not count because the RPS program is intended to promote new sources of renewable energy.[207] Additionally, large hydropower has ecological impacts that often weigh against counting it towards the RPS.[208] In order to qualify for the RPS, new hydroelectric must be deemed low-impact and must be located outside protected areas designated under the Wild and Scenic Rivers Act and the Oregon Scenic Waterways Act.[209] The amount of eligible electricity from these qualifying hydroelectric facilities is also limited to 50 MW.[210] Efficiency upgrades to this existing hydropower would count as eligible generation for the RPS.[211] Thus,

201. *Renewable Portfolio Standard*, Or. Dep't of Energy, https://www.oregon.gov/energy/energy-oregon/Pages/Renewable-Portfolio-Standard.aspx [https://perma.cc/X6XE-A5WN].

202. *Electricity Mix in Oregon*, Or. Dep't of Energy, https://www.oregon.gov/energy/energy-oregon/Pages/Electricity-Mix-in-Oregon.aspx [https://perma.cc/Y5A5-NV5Z].

203. *Id.*

204. *Renewable Portfolio Standard*, *supra* note 201.

205. Portland Gen. Elec., *supra* note 51, at 113.

206. *Renewable Portfolio Standard*, *supra* note 201.

207. *Id.*; Clean Energy State Alliance, Environmental Rules for Hydropower in State Renewable Portfolio Standards 2 (2013), https://www.cesa.org/assets/2013-Files/RPS/Environmental-Rules-for-Hydropower-in-State-RPS-April-2013-final-v2.pdf [https://perma.cc/277L-E25X].

208. Clean Energy State Alliance, *supra* note 207, at 2, 5.

209. Or. Rev. Stat. § 469A.020(4) (2019); Or. Rev. Stat. § 469A.025(4)(a) (2019).

210. Or. Rev. Stat. § 469A.025 (2019).

211. Or. Dept. of Energy, *supra* note 78, at 7.

Oregon cannot rely on the state's hydropower resources and it must develop other renewable energy sources to meet RPS requirements. When combining the existing hydropower (which does not count towards the RPS) with Oregon's RPS of 50 percent renewable electricity by 2040, Oregon's electricity mix has been projected to be 80 percent clean and renewable energy by 2040.[212]

The Oregon RPS also requires ending the use of coal-produced electricity by 2030.[213] Oregon's only coal plant is scheduled to close in 2020, but in recent years, Oregon has imported 30 percent of its electricity from coal fired power plants in Utah, Wyoming, and Montana.[214] As of 2017 Oregon relies on about 13.42 million MWh of coal a year.[215] Finding sources to replace the coal can be difficult, as Portland General Electric, owner of Oregon's Boardman Coal Plant, is still trying to figure out the mix of renewables to replace coal.[216] Meanwhile, PacifiCorp/Pacific Power, Oregon's second-largest utility, sources almost 60 percent of its electricity from out-of-state coal-fired power plants.[217] This means that by 2030, PacifiCorp must replace more than 8.5 million MWh of coal-generated electricity per year with electricity from renewable sources.[218] The U.S. Energy Information Administration predicts that wind development will account for much of the renewable energy growth needed to meet Oregon's RPS.[219]

City and county laws can also increase demand for renewables. Multnomah County, in partnership with the county's largest city, Portland, have committed to 100 percent renewable electricity by 2035.[220] Additionally, both

212. *Coal to Clean Energy*, Renew Oregon, https://www.reneworegon.org/coal_to_clean_energy [https://perma.cc/4XKM-KUW9]. Renew Oregon is a clean energy advocacy coalition. *The Campaign*, Renew Oregon, https://www.reneworegon.org/the_campaign [https://perma.cc/S3S9-GQEX].

213. Elimination of Coal from Electricity Supply Act, Ch. 28, § 1(2), 2016 Or. Laws 2574, 2574 (codified in scattered sections of Or. Rev. Stat. § 469, 757).

214. *Boardman Plant Air Emissions*, Portland Gen. Electric, https://www.portlandgeneral.com/corporate-responsibility/environmental-stewardship/air-quality-emissions/boardman-plant-air-emissions [https://perma.cc/3Y4G-B8DN]; Manussawee Sukunta, *Higher Oregon Renewable Portfolio Standard Targets Likely to Boost Wind Power*, U.S. Energy Info. Admin. Today in Energy (Apr. 22, 2016), https://www.eia.gov/todayinenergy/detail.php?id=25932 [https://perma.cc/K2BD-AVEQ].

215. Or. Dep't of Energy, *supra* note 202.

216. Courtney Flatt, *PGE Looks To Renewable Energy As Boardman Coal Plant Closes*, Or. Pub. Broad. (Jan. 7, 2019), https://www.opb.org/news/article/portland-general-electric-renewable-energy-coal-plant-closures [https://perma.cc/LHC7-CQZ7].

217. *Electricity Mix in Oregon: PacfiCorp*, Or. Dep't of Energy, https://www.oregon.gov/energy/energy-oregon/Pages/Electricity-Mix-in-Oregon.aspx [https://perma.cc/U5CJ-QXFG].

218. *Id.*

219. Sukunta, *supra* note 214.

220. *100% Renewable by 2050*, Multnomah Cty., https://multco.us/sustainability/100-renewable-2050 [https://perma.cc/9W53-R5MM].

the county and city have committed to 100 percent clean energy to satisfy all of the community's energy needs, including transportation.[221]

Oregon may also need to replace some hydropower facilities' electricity generation as momentum for dam removal in the state grows.[222] For example, four dams on the lower Snake River in Washington, across from the Oregon border, are under debate for removal because of their severe impact on salmon and, according to opponents, relative lack of economic and electricity generating value.[223] If the dams are removed, up to 3000 MW of generation would need to be replaced.[224] Other dam removals have already occurred or have been planned for Oregon and the Pacific Northwest region.[225] If more dams are removed, other energy resources would need to take the place of the resulting lost hydroelectricity.

Changing electricity demands may also increase demand for renewable energy. The National Renewable Energy Lab estimates that electrification of the transportation industry and, to a lesser extent, buildings, could result in a 20–38 percent increase in electricity demand by 2050.[226] Although the rate of

221. *Id.*; Robert Walton, *Portland Commits to 100% Economywide Renewable Energy by 2050*, Utility Dive (Apr. 12, 2017), https://www.utilitydive.com/news/portland-commits-to-100-economywide-renewable-energy-by-2050/440335 [https://perma.cc/9NPS-FX77].

222. *See*, *e.g.*, Courtney Flatt, *Study: It's Possible to Replace Snake River Dams with Renewable Energy*, Or. Pub. Broad. (Apr. 4, 2018), https://www.opb.org/news/article/snake-river-dams-renewable-energy-salmon [https://perma.cc/7Y4L-XBPK] (discussing study arguing that renewable energy could replace energy from Snake River dams if they are removed).

223. *See* Jacques Leslie, *On the Northwest's Snake River*, *the Case for Dam Removal Grows*, Yale Env't 360 (Oct. 0, 2019), https://e360.yale.edu/features/on-the-northwests-snake-river-the-case-for-dam-removal-grows [https://perma.cc/52GG-74KZ] (discussing the case for dam removal based on removal opening 70 percent of the habitat available for chinook in the entire Columbia Basin, and that the dams are unneeded and unprofitable).

224. NW Energy Coalition, Lower Snake River Dams Power Replacement Study 19 (2018), https://nwenergy.org/wp-content/uploads/2018/04/LSRD_Report_Full_Final.pdf [https://perma.cc/A7HE-KHYM].

225. *See*, *e.g.*, *Lower Klamath Project*, Cal. Water Bds., https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/lower_klamath_ferc14803.html [https://perma.cc/V5QV-RAAC]. (discussing the Klamath Dam removals, owned by PacifiCorp, which will be that largest dam removal in history); *Marmot Dam Removal*, Sandy River Watershed Council, https://sandyriver.org/projects/marmot-dam-removal [https://perma.cc/UD5W-BVBC] (discussing 2007 removal of 22 MW hydroelectric dam on Oregon's Sandy River); Dameon Pesanti, *Condit Dam: Life After the Breach*, The Columbian (Oct. 23, 2016), https://www.columbian.com/news/2016/oct/23/condit-dam-life-five-years-after-breach-white-salmon-river [https://perma.cc/QU3Q-657A] (discussing 2011 removal of 125-foot dam on Washington White Salmon River); Lynda V. Mapes, *Elwa: Roaring Back to Life*, Seattle Times (Feb. 13, 2016) http://projects.seattletimes.com/2016/elwha [https://perma.cc/7G96-6RUF] (discussing 2011 removal of two PacifiCorp dams on the Elwa River in the Olympic Peninsula of Washington that were the largest dam removals in history).

226. Trieu Mai et al., Nat'l Renewable Energy Lab., Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States xiv (2018), https://www.nrel.gov/docs/fy18osti/71500.pdf [https://perma.cc/XDP3-5QUW].

increase in this scenario would be lower than during the past thirty-four-year period, the absolute change in consumption would be larger, potentially as high as 80 TWh/yr.[227] Even in a scenario of limited electrification, NREL estimates an increase of electricity demand due to population and economic growth.[228]

Looking at Oregon's two major utilities, Integrated Resources Plans also provide information about the expected renewable resource demand. In its 2019 Integrated Resource Plan, PacifiCorp outlined its preferred network portfolio, which includes Washington, Oregon, Wyoming, Utah, and Idaho.[229] The preferred portfolio phases out sixteen of the company's twenty-four coal power plants by 2030.[230] To replace this coal generation, the company plans to develop 3000 MW of new solar, and 3500 MW of new wind by 2023.[231] In the preferred portfolio for the twenty-year planning horizon, PacifiCorp anticipates adding 4600 MW of new wind resources, 6300 MW of new solar resources, and 2800 MW of new storage.[232]

Portland General Electric (PGE), in its 2019 Integrated Resource Plan, recognizes that its resource portfolio must shift due to "changes in demand, changes in our resource mix (due to retirements or expiring contracts), as well as policy drivers, such as the Renewable Portfolio Standard (RPS)."[233] PGE predicts that the company must add 150 MW of new renewables by 2023.[234] PGE forecasts that due to banked RECs from previous compliance years, it could meet its RPS obligations until 2035 without incremental change.[235] To meet long term decarbonization and RPS goals, however, the utility predicts that it will need to procure between 475 MW and 1093 MW of new renewables by 2040.[236]

Both utilities demonstrate a desire to increase their renewable portfolio with a mix of onshore wind and solar. As of 2017, Oregon is the eighth-largest wind producer in the country.[237] There is currently 3383 MW of onshore wind capacity in Oregon and 2147 MW of additional capacity proposed, approved, or under review.[238] As of 2018 Oregon has 296 MW of utility level solar, with additional 685 MW of capacity proposed, approved, or under review.[239] One of the

227. *Id.*

228. *Id.*

229. PacifiCorp, 2019 Integrated resource plan: Volume i 3 (2019), https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2019_IRP_Volume_I.pdf [https://perma.cc/52CU-GM96].

230. *Id.* at 209.

231. *Id.* at 6.

232. *Id.* at 7.

233. Portland Gen. Elec., *supra* note 51, at 25.

234. *Id.* at 34.

235. *Id.* at 113.

236. *Id.* at 115.

237. *Wind Power in Oregon*, Or. Dep't of Energy, https://www.oregon.gov/energy/energy-oregon/Pages/Wind.aspx [https://perma.cc/8QB8-Q7QA].

238. *Id.*

239. *Solar*, Or. Dep't of Energy, https://www.oregon.gov/energy/energy-oregon/Pages/Solar.aspx [https://perma.cc/VTL2-UCW3].

challenges that solar poses is that peak output occurs in the middle of the day with no production at night.[240] This integration problem forces utilities to balance their electricity generation with customer demand.[241] Although Oregon is currently utilizing only a small amount of solar, the state predicts that integration could become a problem as Oregon's RPS increases to reach the 50 percent renewables by 2040 goal.[242] As solar and onshore wind development continue, offshore wind could provide an additional resource to complement both resources.

This study of Oregon's energy market and resources shows that the state's demand for renewable resources will increase. Oregon's increasing RPS, local renewable energy goals, rising demand driven by electrification of transportation, reduced reliance on hydropower assets, and phasing out of aging power plants will lead to greater demand for renewable resource generation. Offshore wind could be an important additional resource to compliment onshore wind and solar development.

IV. Policy Recommendations for Oregon

It is clear that Oregon will have to increase its renewable energy generation to meet the RPS, replace aging fossil fuel plants and hydroelectric, and satisfy increases in demand for electricity as the transportation system electrifies. The optimal balance between renewable resources, such as solar, onshore wind, and offshore wind, is not within the scope of this Comment, and more research will have to be done. This Comment does provide an analysis of the types of policy tools that a state can use once it determines how much support to give to the development of offshore wind.

Further research is necessary to determine the benefits that offshore wind development could have on Oregon's renewable energy demands when combined with solar and onshore wind. All of the policy tools that have been analyzed could be used depending on the need and desire to develop the offshore wind resource. The policy levers must be balanced to achieve the best result. Polices supporting offshore wind that are too strong could lead to higher than necessary costs for consumers. More information is required to determine the right balance between supporting the offshore wind industry and potential costs.

When reviewing the state policy tools, Oregon should draw from the lessons learned from wind energy development on the East Coast. Using East Coast state policies as a model, Oregon should develop a management plan for offshore wind, adopt a more aggressive RPS and offshore wind carve-out or procurement mandate, increase investment and development of the infrastructure and ports needed to support offshore wind, expand education and workforce training programs, invest in research and development, and create state tax incentives. Although not all tools are as useful or applicable to

240. *Id.*
241. *Id.*
242. *Id.*

Oregon's particular energy needs and market, most of the larger policy tools can be adapted or modified to fit Oregon's particular conditions.

First, Oregon should develop a comprehensive offshore wind plan, like those developed in New York and Massachusetts. By identifying potential conflicts early in the process, comprehensive plans can try to minimize the environmental, community, and transmission barriers. Using the Massachusetts Ocean Management Plan as an example, Oregon's plan should include a blueprint to manage and protect critical marine habitat and water dependent uses, while setting standards for ocean-based projects.[243] Oregon should also use New York's Offshore Wind Master Plan as a model to create a comprehensive roadmap to develop offshore wind, identifying the "environmental, maritime, economic, and social issues while addressing market barriers and aiming to lower costs."[244] Drawing from these two plans, Oregon should create a comprehensive plan to properly manage its offshore wind resources prior to development, in order to avoid problems at the development stage.

Second, Oregon should increase and modify the state's RPS to be more aligned with leading renewable resources. Oregon's goal of 50 percent renewables by 2040 is an aggressive RPS, but since its passage in 2016, several states, including New York, have increased their RPSs to be even more ambitious than Oregon's. New York now has a RPS of 70 percent renewable electricity by 2030,[245] New Jersey's RPS is 50 percent renewables by 2030,[246] and Maryland's RPS is 50 percent renewables by 2030.[247] Oregon has a history of strong renewable development and clean hydropower electricity, and it should continue this leadership by increasing its RPS to be closer to New York's 70 percent renewables by 2030 goal.[248] Oregon should also establish a zero-emissions or clean energy goal. Eleven other states and Puerto Rico have all established 100 percent zero-emissions or clean energy standards for 2045–2050.[249] Increasing its RPS to be in line with other renewable resource leading states and creating a 100 percent zero-emissions or clean energy goal would keep Oregon at the forefront of the U.S.'s clean energy revolution. Offshore wind could provide an important additional renewable resource to meet these more ambitious policies.

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243. *Massachusetts Ocean Management Plan*, *supra* note 184.

244. *NYS Offshore Wind Master Plan*, *supra* note 103.

245. N.Y. S. 6599 § 75-0103(13)(e), https://legislation.nysenate.gov/pdf/bills/2019/S6599 [https://perma.cc/QG2R-49TE]; *Renewable Portfolio Standard*, N.Y. State Energy Res. & Dev. Auth., https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard/Renewable-Portfolio-Standard [https://perma.cc/B8X6-NJA3].

246. Press Release: Governor Murphy Signs Measures to Advance New Jersey's Clean Energy Economy, *supra* note 110.

247. Morehouse, *supra* note 123.

248. *See State Renewable Portfolio Standards and Goals*, *supra* note 75 (for example, Oregon's Renewable Portfolio Standard of 50 percent renewable electricity by 2040).

249. *See id. See also* Morehouse, *supra* note 123; Press Release, Governor Lamont Signs Executive Order Strengthening Connecticut's Efforts to Mitigate Climate Change, *supra* note 127.

Third, Oregon should decrease the REC shelf life from five years to three years to promote more new resource development.[250] PGE's Integrated Resource Plan implies that the utility could likely meet its RPS obligations without building new generation for several years because they have banked REC credits.[251] Lowering the REC shelf life would provide PGE with an incentive to invest in additional new renewable resources.

Fourth, Oregon should establish a carve-out or procurement mandate for offshore wind resources. A carve-out or mandate would avoid the problem the Windfloat project faced, where developers had to go to legislature to try to force utilities buy their energy. Instead, a mandate would establish the level of capacity the utility must procure. Oregon could choose a Massachusetts-type model that requires utilities to solicit bids together and form contracts with offshore wind developers.[252] The other option is exemplified by the policy in New York, where the state PUC solicits bids from offshore developers, and utilities must purchase the ORECs created based on their load percentage.[253] The source of the mandate could also come from legislation or executive action. A commercial size mandate would also avoid utilities' critique of the Windfloat project that ratepayers should not have to pay for research and development projects.

In establishing the size of the procurement mandate, Oregon would not need the same largescale procurement targets like those in New York and other East Coast states. If all thermal plants that Oregon relies on for generation retired, 25,000,000 MWh per year would need to be replaced, which would mean developing 5000 MW of offshore capacity.[254] This maximum build establishes the maximum generation that would be needed, but the amount of offshore wind that would create the best balance is likely less than this. In analyzing the minimum size of the state procurement mandate, the New York Offshore Wind Cost Reduction study found that at least 2400 MW of planned offshore development would be needed to lead to the required market visibility benefits and the resulting reductions in financing cost and LCOE.[255] Thus, based on Oregon's size relative to states like New York, and the resulting commercial benefits from scale, a mandate of 2400–3000 MW could be appropriate. In addition, based on LCOE estimates, the mandate should establish the development be completed by 2030 or 2035 to receive the most cost-efficient results, as the LCOE is likely to decrease significantly by commercial operation date

250. *See* Cory & Swezey, *supra* note 82, at 5.

251. Portland Gen. Elec., *supra* note 51, at 113. However, PGE is still planning new generation. *See supra* text accompanying note 236.

252. An Act to Advance Clean Energy, Mass. Acts Ch. 277 § 20 (2018).

253. *See Offshore Wind Renewable Energy Certificates*, *supra* note 105.

254. Musial et al., *supra* note 25, at 48 (discussing a "maximum offshore wind build scenario").

255. McClellan et al., *supra* note 94, at 37 n.78.

2032 to $54/MWh–$73/MWh.[256] These target dates would also likely match well with proposed increased RPS and clean energy standards for 2030 or 2040.

Oregon should also increase investment and development in the infrastructure and ports needed to support offshore wind. One model for Oregon to follow is that of Massachusetts, which first invested in research to identify a port location for the development of offshore wind infrastructure.[257] After determining that New Bedford would be the best location, the state invested $113 million in developing the port for offshore wind capabilities.[258] New York took a different path by first identifying a list of potential port locations, and then taking applications from those ports.[259] Connecticut used a public/private partnership with wind developers to redevelop the necessary infrastructure for New London State Pier.[260] Maryland spurred infrastructure investment by private actors by adding conditions of infrastructure funding to approval of offshore wind projects.[261] Although there are different models, all share the same general framework of directly investing in infrastructure project or incentivizing private public partnerships that Oregon should follow in creating the necessary port infrastructure for offshore wind.

Oregon should also invest in education and workforce training. To develop offshore wind resources, a workforce capable of planning, constructing, deploying, and servicing offshore wind farms is required.[262] In order to address the workforce problem, Massachusetts commissioned a report analyzing the workforce needs of the emerging offshore industry.[263] The state then dedicated government funds to establish training programs at local educational institutions and provide grants to local organizations.[264] New York also created a similar program to fund offshore wind education and workforce training.[265] Oregon should follow a similar path and first research the workforce needs, and then create and fund programs that can provide the requisite training and education.

Another tool that Oregon should implement is investment in research and development of offshore wind. As part of the process of developing offshore wind, Massachusetts funded extensive research on environmental impacts,

256. Musial et al., *supra* note 25, at ix (discussing a "maximum offshore wind build scenario").

257. Mass. Clean Energy Ctr., *New Bedford Marine Commerce Terminal: About*, *supra* note 143.

258. *Id.*; Reed & Penn, *supra* note 142.

259. *Ports and Infrastructure*, *supra* note 146.

260. *See* Governor Lamont Announces Major Development Plan That Will Establish New London as a Central Hub of the Offshore Wind Industry, *supra* note 148.

261. Md. Pub. Serv. Comm'n, *supra* note 151.

262. Mass. Clean Energy Ctr., 2018 Massachusetts Offshore Wind Workforce Assessment, *supra* note 154, at III.

263. *Id.*

264. Mass. Clean Energy Ctr., *supra* note 163.

265. *Announcements and Events: Offshore Wind Technical and Training Workshop*, *supra* note 167.

meteorological and oceanic information, transmission, and technology.[266] In order to fund some of this research, Oregon could pass a public benefit fund, a surcharge on electricity that customers buy from their retail providers, similar to the one in Massachusetts.[267] The funds can then be used for research and development of the offshore industry. By investing in research and development, Oregon can provide additional support to the formation of offshore wind.

The last policy tool that Oregon should adopt is state tax incentives. Tax credits can help drive private capital investment and employment growth.[268] New Jersey has established a program that provides tax credits up to 100 percent of qualified investments in offshore wind-related facilities.[269] Rhode Island has also adopted tax incentives to promote offshore wind development through the state's general Qualified Jobs Tax Credit program.[270] The program is designed to attract high paying jobs to the state and has been used to encourage the establishment of offshore wind.[271] Adopting either an offshore wind-specific tax credit or a general tax credit is another tool for Oregon to promote offshore wind development.

Conclusion

Offshore Wind is a renewable energy source that is growing across the world and is becoming an important resource that nations are using to reduce greenhouse gas emissions. Oregon has a unique opportunity to take advantage of this resource as the state has significant offshore wind resources. Oregon must use floating wind technology as its offshore depth is greater than on the East Coast. This Comment highlighted some of the barriers to floating offshore wind development. Drawing upon lessons from policies that East Coast states have used to promote offshore wind development, this Comment outlined tools that Oregon can use to overcome barriers to development. Creating comprehensive offshore wind planning, adopting an ambitious RPS combined with an offshore wind mandate; investing in port infrastructure, workforce training and education, and research and development; and developing tax incentives are all tools that East Coast states have used to encourage offshore wind development. Using these state policies as models, Oregon can implement similar programs to promote the development of offshore wind projects, thereby benefiting from this important renewable energy resource.

266. *See Offshore Wind Marine Wildlife Surveys*, *supra* note 173 (environmental impacts); *MassCEC Metocean Data Initiative*, *supra* note 175 (meteorological and oceanic information); *Massachusetts Offshore Wind Transmission*, *supra* 177 (transmission); *Wind Technology Testing Center*, *supra* note 178 (technology).

267. Database of State Incentives for Renewables & Efficiency, *supra* note 181.

268. N.J. Econ. Dev. Auth., *supra* note 191.

269. N.J. Econ. Dev. Auth., *supra* note 192.

270. Gheorghiu, *supra* note 196.

271. *Id.*