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Wind Turbine Regulations in Vermont and the United States

Wind turbines are a way to harness wind to generate electricity for power grids. The purpose of this report is to give an overview of the current wind turbine regulations in Vermont and compare them to other states. We begin with an overview and background on wind turbines, and move into analyzing Vermont, Maine, Rhode Island, New Hampshire, and Oregon.

Background on Wind Turbines

Wind power, a byproduct of solar energy, can be converted to energy with wind turbines.¹ Three concurrent events create wind: the uneven heating of our atmosphere, the irregular and uneven surface of the planet, and the rotation of the Earth around the Sun. Wind turbines have three main components: the blades, the rotor, and the generator. Wind spins the blades around the rotor, which spins the generator, and that motion creates electricity.² Wind turbines perform best in areas where the annual average wind speed is 13 miles per hour or 5.8 meters per second (m/s) for large utility scale turbines.³

Wind turbines are produced on large and small scales. The larger the blades are the more electricity it produces. The typical onshore wind turbine generates approximately 2.5-3 megawatts.⁴ These are found on wind farms which produce electricity for power grids. Electricity can be measured in watts. A kilowatt is 1,000 watts, and a megawatt (MW) is 1,000,000 watts.⁵ According to US Energy Information Administration Data (EIA) data, in 2022

¹ US Department of Energy, *How Do Wind Turbines Work?* accessed October 9, 2024. <https://www.energy.gov/eere/wind/how-do-wind-turbines-work>

² US Department of Energy, *How Do Wind Turbines Work?*

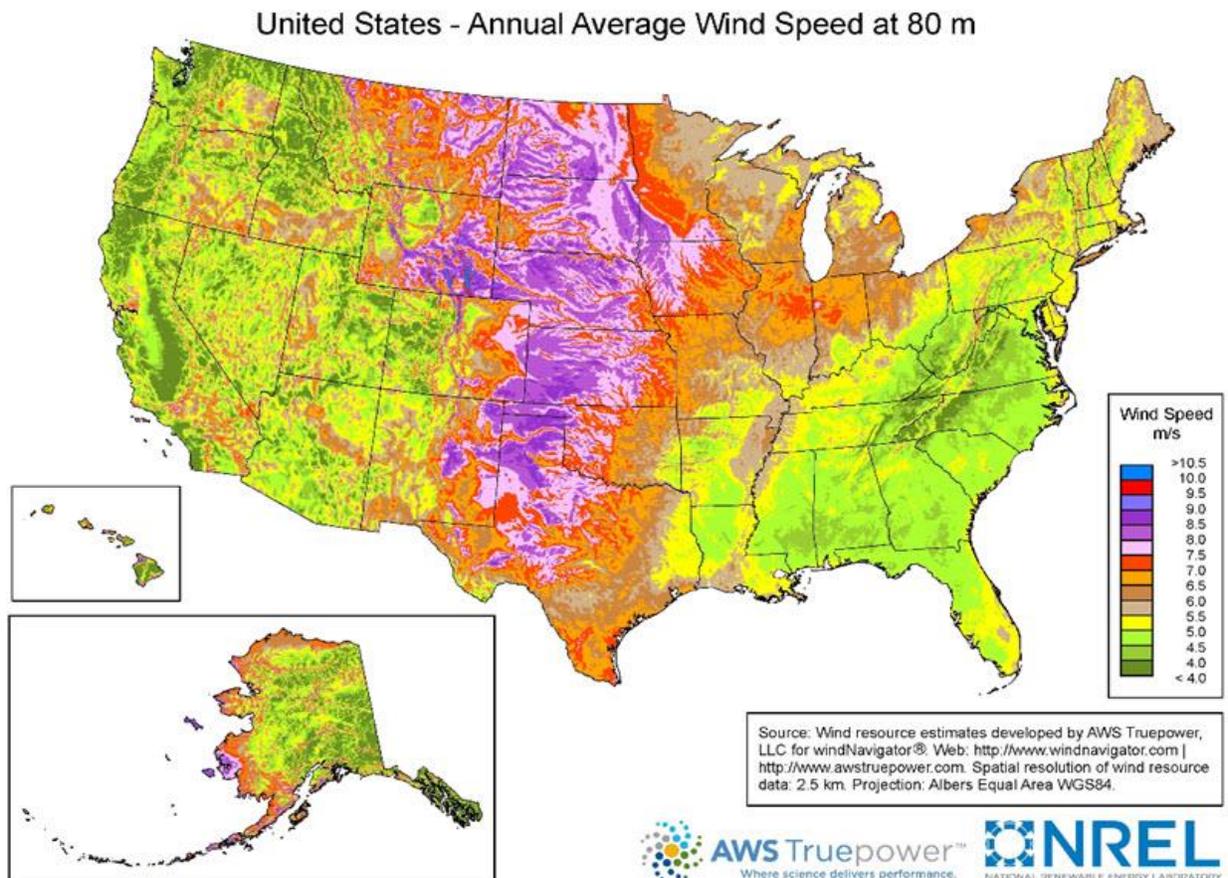
³ US Energy Information Administration, *Wind Explained, Where Wind Power is Harnessed*, accessed October 9, 2024. <https://www.eia.gov/energyexplained/wind/where-wind-power-is-harnessed.php>

⁴ US Energy Information Administration, *Wind Explained, Types of Wind Turbines*.

⁵ Nuclear Regulatory Commission, *What is a Megawatt?* accessed November 5th, 2024. <https://www.nrc.gov/docs/ML1209/ML12060701.pdf>

the average US household consumed 899 kilowatt hours a month.⁶ Wind turbines with horizontal blades are the most common because they generate electricity with more efficiency.⁷

According to data from the US Energy Information Administration as of October 2024, 21.4% of the electricity generation in the US comes from renewable energy, with half of that renewable electricity being generated by wind power.⁸ The top states for wind power generation measured in megawatts produced are Texas, Iowa, Oklahoma, Kansas and Illinois (see Figure 1 for reference). Iowa produces the largest share of wind power in percentage of their total energy generation at 59%, while 14.6% of the electricity generated in Vermont is from wind power.⁹



⁶ US Energy Information Administration, *Frequently Asked Questions*, accessed December 3, 2024.

<https://www.eia.gov/tools/faqs/faq.php?id=97&t=3>

⁷ US Energy Information Administration, *Wind Explained, Types of Wind Turbines*, accessed October 9, 2024.

<https://www.eia.gov/energyexplained/wind/types-of-wind-turbines.php>

⁸ US Energy Information Administration, *Frequently Asked Questions*, accessed October 9, 2024.

<https://www.eia.gov/tools/faqs/faq.php?id=427&t=3>

⁹ Berkeley Lab, “Land Based Wind Market Report,” *US Department of Energy*, August 2024.

https://emp.lbl.gov/sites/default/files/2024-08/Land-Based%20Wind%20Market%20Report_2024%20Edition.pdf

Figure 1: Average Annual Wind Speed in the US in meters per second (m/s).¹⁰ Vermont Wind Turbines

As documented in The U.S. Wind Turbine Database, Vermont has 11 wind turbine projects in the state with a total of 73 turbines.¹¹ The 73 turbines have a total rated capacity of 150 megawatts (MW). Out of the 11 projects, six of them consist of only one wind turbine. The remaining five projects are:

- Georgia Mountain Project near Milton, VT. This project has been online since 2012 and has four turbines. The total rated capacity of this project is 10 MW.
- Green Mountain Power Project near Searsburg, VT. This project has been online since 1997 and has 11 turbines. The total rated capacity of this project is six MW.
- Deerfield Wind Project near Searsburg, VT. This project has been online since 2017 and has 15 turbines. The total rated capacity of this project is 30 MW.
- Sheffield Project near Sheffield, VT. This project has been online since 2011 and has 16 turbines. The total rated capacity of this project is 40 MW.
- Kingdom Community Wind Project near Lowell, VT. This project has been online since 2012 and has 21 turbines. The total rated capacity of this project is 63 MW.¹²

Vermont Wind Turbine Regulations

Wind turbine regulations in Vermont vary among towns. Town ordinances outline zoning traffic, consumer protection, and building codes. Zoning regulates the physical development of land and an owner's right to use private land to protect public health and safety, including whether an individual can install a wind turbine. Permitting manages the installation of wind turbines and varies in price by location.¹³

Prior to the development of a new wind energy facility, the Vermont Public Service Board must grant a Certificate of Public Good to confirm the project's environmental, economic, and social impacts. Additional regulations stated in 24 V.S.A. § 442 cover sound, height, and visual analysis. Height regulations do not apply to small-scale wind turbines with blades less than 20 ft in diameter, unless specific regulatory standards are provided. All large-scale wind farms in Vermont follow permitting for land-based wind farm protocol, since there are no offshore turbines.¹⁴

¹⁰ US Energy Information Administration, *Wind Explained, Where Wind Power is Harnessed*, accessed October 9, 2024. <https://www.eia.gov/energyexplained/wind/where-wind-power-is-harnessed.php>

¹¹ U.S. Geological Survey, *U.S. Wind Turbine Data Base*, accessed October 9, 2024. <https://eerscmap.usgs.gov/uswtodb/viewer/#6.26/43.782/-72.934>

¹² U.S. Geological Survey, *U.S. Wind Turbine Data Base*.

¹³ The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, "Small community wind handbook," accessed October 9, 2024. <https://windexchange.energy.gov/small-community-wind-handbook#siting>

¹⁴ National Conference of State Legislatures, *State Approaches to Wind Facility Siting*, accessed October 9, 2024. <https://www.ncsl.org/energy/state-approaches-to-wind-facility-siting>

New wind turbine developments in Vermont also require a visual impact analysis. Radar-controlled obstruction lights must be installed on all wind turbines as the Federal Aviation Administration requires. This type of lighting is part of an Aircraft Detection Lighting System that automatically turns off obstruction lights in the presence of aircraft using sensor-based radars. They are required if the wind farm contains four or more turbines and if the administration allows the use of radar technology. The purpose of this regulation is to reduce the visual impact of obstruction lights. The General Assembly of Vermont finds that obstruction lights that stay on throughout the night create light pollution and disturbance to nearby properties. The use of radar-controlled lights limits the time in which they are illuminated, therefore decreasing these negative impacts.¹⁵

Sound Standards

In May 2017, the Vermont Department of Health concluded that noise produced from wind turbines does not cause any direct public health threats; however, there is sound annoyance related to dizziness, sleep issues, and stress.¹⁶ In November 2017, Vermont Public Utility Commission established new sound standards including:

- Facilities with a capacity of up to 50 kilowatts must keep sound levels below 42 decibels (dBA) more than 5% of the time at a distance of 100 ft from the residence of non-participating landowners.
- Facilities with a capacity from 50 to 150 kilowatts must keep sound pressure levels at or below 42 dBA at a distance of 100 ft from the residence of non-participating landowners.
- Facilities with a capacity greater than 150 kilowatts must not exceed sound pressure levels of 42 dBA between 7 A.M. and 9 P.M. or 32 dBA between 9 P.M. and 7 A.M. at a distance of 100 ft from the residence of non-participating landowners.¹⁷

Figure 2 from the U.S. Department of Energy provides a comparative basis for understanding the sound regulation decibel levels.

¹⁵ Vermont General Assembly, *Vermont Laws*, accessed October 9, 2024. <https://legislature.vermont.gov/statutes/section/30/005/00248>

¹⁶ William Bress, “Wind Turbine Noise and Human Health: A Review of the Scientific Literature,” Vermont Department of Health, May 2017: pg. 2.

¹⁷ Vermont Public Utility Commission, *5.700 RULE ON SOUND LEVELS FROM WIND GENERATION FACILITIES*, November 22, 2017. https://puc.vermont.gov/sites/psbnew/files/doc_library/PSBRule5.700.pdf

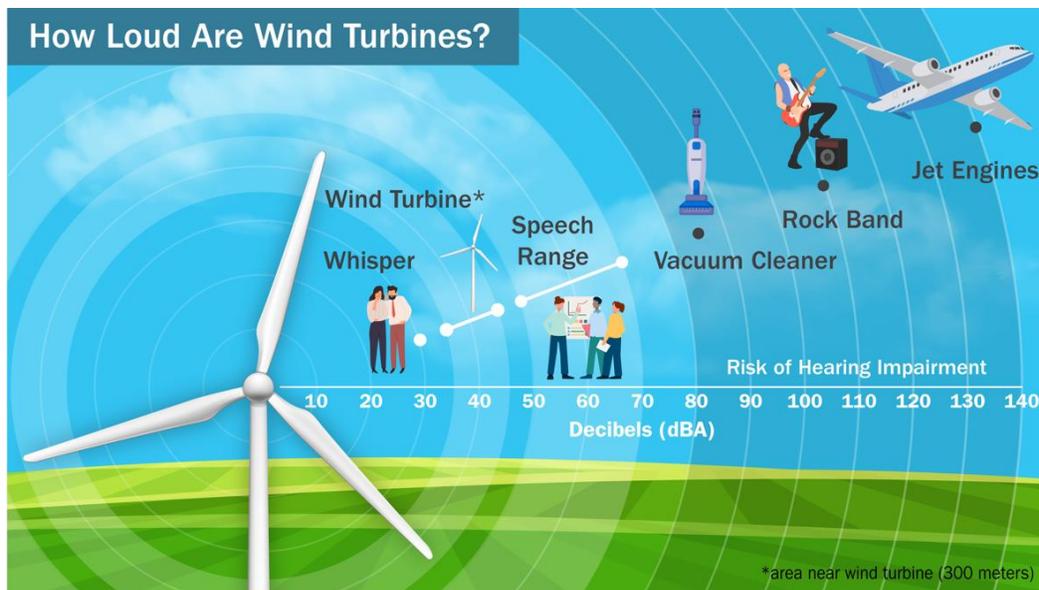


Figure 2: Chart demonstrating range of sound in decibels (dB).¹⁸

Wind Turbine Regulations in States

Maine

As of 2024, there are a total of 430 wind turbines from 25 projects across the state of Maine.¹⁹ The *Maine Wind Energy Act* (2003) was enacted in 2003 to regulate wind energy development. This act created two types of wind energy developments, grid-scale and small-scale projects. Grid-scale developments are those that trigger the thresholds for a *Site Location of Development Act* (1970) permit. These projects typically create more than three acres of impervious area, meaning they occupy more space than small-scale projects. Small-scale developments, regulated by the *Natural Resources Protection Act* (1988), have more than 100 kilowatts of generating capacity.²⁰ These projects typically have three to five wind turbines but do not exceed three acres of impervious area.²¹

Wind energy developments in Maine require visual impact assessments to demonstrate that the proposed project will not compromise scenic resources of state or national significance. The

¹⁸ The U.S. Department of Energy, *Wind Turbine Sound*, accessed October 9, 2024.

<https://windexchange.energy.gov/projects/sound>

¹⁹ The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, “Wind Energy in Maine,” accessed October 9, 2024. <https://windexchange.energy.gov/states/me>

²⁰ Maine Department of Environmental Protection, *Wind Energy Developments*, accessed October 9, 2024.

<https://www.maine.gov/dep/land/sitelaw/wind/index.html#selected>

²¹ Maine Department of Environmental Protection, *Wind Energy Developments*.

Maine Wind Energy Act (2003) defines compromised scenic resources of state or national significance as rivers, certain ponds, scenic turnouts, national/state parks, and other resources.²² Wind facilities in Maine must also comply with noise standards and minimize flicker effects.²³ Flicker effects are the result of the sun shining through wind turbine blades, causing a flickering shadow that can be a visual concern for nearby communities.²⁴

Four Largest ME Wind Farms			
Project	# of Turbines	Total Rated Capacity	Year Built
Bingham Wind Project	56	184.8 MW	2016
Oakfield Wind Project	48	147.6 MW	2015
Rollins Project	40	60.0 MW	2011
Stetson Project	38	57 MW	2009

Table 1: Table of the four largest wind farms in Maine. ²⁵

Rhode Island

In Rhode Island, local governments regulate wind turbine projects unless the project produces over 40 MW of energy.²⁶ In this case, the licensing authority falls under Rhode Island's Energy Facility Siting Board.²⁷ There are no land-based wind farms that produce more than 4.5 MW so all wind farms fall under their local governments in Rhode Island.²⁸ Due to this, the Office of Energy Resources created a document titled “Rhode Island Land-Based Wind Siting Guidelines.” This document is to help local governments with the development of new land-based wind turbines and revisions to existing land-based wind turbines. The document is not a required mandate but is meant to inform local governments interested in land-based wind

²² Maine Department of Environmental Protection, *Wind Energy Developments*.

²³ National Conference of State Legislatures, *State Approaches to Wind Facility Siting*, accessed October 9, 2024. <https://www.ncsl.org/energy/state-approaches-to-wind-facility-siting>

²⁴ The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, "Wind Energy Projects and Shadow Flicker," accessed November 5, 2024. <https://windexchange.energy.gov/projects/shadow-flicker>

²⁵ U.S. Geological Survey, *U.S. Wind Turbine Data Base*, accessed October 9, 2024. <https://eerscmap.usgs.gov/uswtodb/viewer/#3.63/45.46/-62.48>

²⁶ National Conference of State Legislatures, *State Approaches to Wind Facility Siting*, accessed October 9, 2024. <https://www.ncsl.org/energy/state-approaches-to-wind-facility-siting>

²⁷ National Conference of State Legislatures, *State Approaches to Wind Facility Siting*.

²⁸ U.S. Geological Survey, *U.S. Wind Turbine Data Base*, accessed October 9, 2024. <https://eerscmap.usgs.gov/uswtodb/viewer/#6.26/43.782/-72.934>

turbines.²⁹ It provides recommendations based on other wind farms in Rhode Island and in New England.³⁰

Four Largest RI Wind Farms			
Project	# of Turbines	Total Rated Capacity	Year Built
Field’s Point Wastewater Treatment Facility Project	3	4.5 MW	2012
WED Coventry 2 Project	3	4.5 MW	2016
WED Coventry 6 Project	3	4.5 MW	2016
Green Providence Wind II Project, RI	2	3.0 MW	2021

Table 2: Table of the four largest wind farms in Rhode Island.³¹

New Hampshire

In New Hampshire wind turbine projects producing over 30 MW fall under the jurisdiction of the New Hampshire Siting Evaluation Committee (SEC).³² The SEC was established by the New Hampshire General Court “for the review, approval, monitoring and enforcement of compliance in the planning, siting, construction and operation of energy facilities.”³³ The committee is responsible for addressing the visual, health, safety, sound, and environmental impacts of wind farms. The SEC also oversees fire protection planning, site decommissioning, and measures to “avoid, minimize, or mitigate adverse effects.”³⁴ The SEC also conducts investigations into official complaints as they occur. The exact criteria and processes are outlined in the official rules of the committee.³⁵

²⁹ State of Rhode Island Office of Energy Resources, *Wind Siting*, accessed October 9, 2024.

<https://energy.ri.gov/renewable-energy/wind/wind-siting#:~:text=Siting%20wind%20energy%20projects%20involves,pose%20to%20the%20surrounding%20area>

³⁰ Rhode Island Office of Energy Resources, *Rhode Island Land-Based Wind Siting Guidelines*, January 2017. https://energy.ri.gov/sites/g/files/xkgbur741/files/documents/landwind/WindSitingGuidelines_1-31-2017_FINAL.pdf

³¹ U.S. Geological Survey, *U.S. Wind Turbine Data Base*, accessed October 9, 2024.

<https://eerscmap.usgs.gov/uswtdb/viewer/#6.52/41.682/-71.569>

³² National Conference of State Legislatures, *State Approaches to Wind Facility Siting*, accessed October 9, 2024.

<https://www.ncsl.org/energy/state-approaches-to-wind-facility-siting>

³³ New Hampshire Site Evaluation Committee, “New Hampshire Site Evaluation Committee,” accessed October 9, 2024. <https://www.nhsec.nh.gov/>

³⁴ NH Title XII, 162-H:10-a. <https://www.gencourt.state.nh.us/rsa/html/XII/162-H/162-H-10-a.htm>

³⁵ New Hampshire Site Valuation Committee, Site 100 #9182, eff 6-17-08; ss by #10993, eff 12-16-15.

https://www.gencourt.state.nh.us/rules/state_agencies/site100-300.html

Wind farms in New Hampshire have to go through an application process with the SEC to get approved. This includes identifying the individuals or corporations that are planning on building the facility and documents relating to the site of construction including maps, leases, permits, or any proof of permission to build on the land in question. The application process also requires performing a “visual impact assessment” that is held to the standards of a professional or done by a professional.³⁶ There is a sound impact assessment that is also done as part of the portion of the application pertaining to the health and safety effects of the proposed energy development.³⁷

In 2022, the New Hampshire Department of Energy released its 10-year State Energy Strategy. The strategy claims that, historically, it was government tax incentives that have grown the use of renewables (solar and wind) in the state while allowing them to be cost competitive. Now new technology has made renewables cost competitive on their own.³⁸ The plan acknowledges wind power potential, but it also acknowledges that implementation of wind power “would necessitate extensive land use and shareholder input concerning the impact on our state’s scenery and natural resources.”³⁹

NH Wind Farms			
Project	# of Turbines	Total Rated Capacity	Year Built
Antrim	9	28.8 MW	2019
Lempster	12	24 MW	2008
Groton	24	48 MW	2012
Jericho Mountain	5	14.3 MW	2015
Granite Reliable Power	33	99 MW	2012

Table 3: Table of all wind farms in New Hampshire.⁴⁰

³⁶ New Hampshire Site Evaluation Committee Site 301.5 #9183-B, eff 6-17-08; ss by #10994, eff 12-16-15. https://www.gencourt.state.nh.us/rules/state_agencies/site100-300.html

³⁷ New Hampshire Site Evaluation Committee Site 301.18 #10994, eff 12-16-15. https://www.gencourt.state.nh.us/rules/state_agencies/site100-300.html

³⁸ New Hampshire Department of Energy, *New Hampshire 10 Year Energy Strategy*, July 2022. <https://www.energy.nh.gov/sites/g/files/ehbemt551/files/2022-07/2022-state-energy-strategy.pdf>

³⁹ New Hampshire Department of Energy, *New Hampshire 10 Year Energy Strategy*.

⁴⁰ U.S. Geological Survey, *U.S. Wind Turbine Data Base*, accessed October 9, 2024. <https://eerscmap.usgs.gov/uswtdb/viewer/#6.52/41.682/-71.569>

Oregon

In Oregon, wind turbine projects that produce more than 50 MW are overseen by Oregon’s Energy Facility Siting Council. Projects less than 50 MW fall under the local government.⁴¹ Each local government has different regulations they enforce when a wind turbine project falls under their authority.⁴²

In Oregon, there is a set application process for state level wind turbine projects. Before applying the applicant must issue a Notice of Intent that announces their intent to apply. The Notice of Intent allows for all relevant and affected parties to be aware of the incoming application and submit any concerns to the applicant, which the applicant must include in their application. From there the applicant works closely with the Oregon Department of Energy. Throughout the process there are three opportunities for the public to provide feedback. The public can range from people affected by the project to agencies that are interested in it. Depending on the feedback from the first opportunity, the Oregon Department of Energy tells the applicant what they must address in their Application for a Site Certificate.⁴³ There are a total of 30 possible areas that an applicant might have to address. These exhibits can range from soil conditions to historic, cultural, and archaeological resources.⁴⁴ At the end of the process, Oregon’s Energy Facility Siting Council decides whether to approve or deny the application.⁴⁵

Four Largest OR Wind Farms			
Project	# of Turbines	Total Rated Capacity	Year Built
Stateline Wind Project	184	121.4 MW	2001, 2002
Klondike III Project	124	221.2 MW	2007
Wheatridge Wind Project	120	299.5 MW	2020
Leaning Juniper II Project	117	201.3 MW	2011

Table 4: Table of the four largest wind farms in Oregon.⁴⁶

⁴¹ National Conference of State Legislatures, *State Approaches To Wind Facility Siting*, accessed October 9th, 2024. <https://www.ncsl.org/energy/state-approaches-to-wind-facility-siting>

⁴² National Conference of State Legislatures, *State Approaches To Wind Facility Siting*.

⁴³ Oregon Department of Energy, *Siting of Energy Facilities in Oregon EFSC Process Flowchart*, August 2018. <https://www.oregon.gov/energy/facilities-safety/facilities/Documents/Fact-Sheets/EFSC-Process-Flowchart.pdf>

⁴⁴ Oregon Department of Energy, *Application Requirements and Council Standards*, December 2022. <https://www.oregon.gov/energy/facilities-safety/facilities/Documents/Fact-Sheets/EFSC-Application-Requirements-and-Council-Standards.pdf>

⁴⁵ Oregon Department of Energy, *Siting of Energy Facilities in Oregon EFSC Process Flowchart*, August 2018. <https://www.oregon.gov/energy/facilities-safety/facilities/Documents/Fact-Sheets/EFSC-Process-Flowchart.pdf>

⁴⁶ U.S. Geological Survey, *U.S. Wind Turbine Data Base*, accessed October 9, 2024. <https://eerscmap.usgs.gov/uswtdb/viewer/#6.52/41.682/-71.569>

Conclusion

In this report we discussed the different regulations, regulatory bodies, and laws in different US states governing wind power. A common concern among the New England states is the visual impact of wind turbines on their landscapes. Sound is also an aspect that is regulated across all the states. The states reviewed also have different mechanisms to include public feedback regarding wind turbine impacts.

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