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Wind Energy & Wind Park Siting and Zoning Best Practices and Guidance for States

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Put It There! –
Wind Energy & Wind-Park Siting and Zoning
Best Practices and Guidance for States

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Any inaccuracies, mistakes, or omissions are my responsibility. Comments, corrections, editorial guidance, and new information to update this report and the survey results are welcome. Comments can be submitted to:

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Online Access

This paper can be accessed online via the National Regulatory Research Institute website at http://www.nrri.org/pubs/electricity/NRRI_Wind_Siting_Jan12-03.pdf.

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Executive Summary

Siting and zoning of new utility-scale wind energy facilities (called "wind parks" in this report) can be complicated and is often contentious, due to local opposition. Citizens are frequently worried about the changes to the landscape that will occur if utility-scale wind turbines are sited nearby. Such wind turbines are tall, rather imposing structures. Their construction often represents a significant change to what were previously open rural and agricultural landscapes.

Wind siting and zoning are influenced by preexisting laws and administrative rules, renewable energy support policies, and public acceptance. But often, planning and zoning officials with no previous expertise in wind energy systems have to develop the rules and regulations that will ultimately guide local wind power siting and zoning decisions. Those rules then, for better or worse, directly affect the planning, design, development, construction, and operations of wind parks.

Development of wind parks in areas with promising wind resources is economically favorable when compared with other types of renewable energy sources. In part because 37 states have adopted policies that set either mandates or goals for increasing the use of renewable energy, wind-park development in the U.S. has been growing steadily. The growth continues, despite controversy in specific jurisdictions. By late 2011, the U.S. had 42,432 MW of installed wind energy capacity and 14 states had more than 1,000 MW each.

This report summarizes the wind energy siting and zoning practices in all 50 states and the District of Columbia. Part I briefly reviews the current status of wind energy development in the U.S.

Part I.A reports on a survey conducted of each state's wind energy siting and zoning practices. The completed surveys are presented in Appendix A. Table ES-1 (pp. ES-3–7) summarizes the survey data. Specific data reviewed and reported in Part I.A includes:

- What agencies have responsibility for wind siting and zoning decisions, and are they state or local government agencies, or both?

Summary data is shown in Table ES-1, columns 3, 4, and 5. The primary decision-making authority, as reported in column 3, resides with local governments in 26 states and state governments in 22 states. Florida and Iowa have shared local and state responsibility. Column 4 includes a "(P)" to indicate that a state agency has primary siting authority. Many states have a clearly defined secondary authority, as indicated by "(S)" in Column 4. In six states plus the District of Columbia the public utility commission (generically, the PUC) is responsible for siting and zoning utility-owned wind parks. Altogether, 23 states and the District of Columbia require a certificate to be issued by the PUC prior to wind park construction. Eleven other states, indicated with a "Y" in column 5, have an energy facility siting authority that is separate from the PUC. Data reported in columns 3 or 4 reports if the state-level jurisdiction is contingent upon the size of the wind park.

- Which overriding rule, established by the state's constitution, governs the division between state and local government jurisdiction in the state? Is it "Home Rule," where local governments retain all decision-making authority except that explicitly granted to the state? Or is it "Dillon's Rule," where the state government retains all decision-making authority except that explicitly granted to the local governments?

That data is reported in Table ES-1, column 6. A general expectation might be that Home Rule states would tend to have local authority and Dillon's Rule states would tend to have state authority for wind siting and zoning. In practice, though, Home Rule states are evenly split in terms of local versus state authority, but more Dillon's Rule states (20 of 31) have already delegated wind siting and zoning

authority to local units of government.

- How many and which states have developed mandatory evaluation criteria, voluntary guidelines, model ordinances, and setback or sound standards for wind parks? How many local governments in each state have already adopted wind siting and zoning ordinances?

These data are shown in Table ES-1, columns 7 through 12. Slightly more than half the states have published lists of the criteria that are used to evaluate wind siting and zoning conditions. Ten states have published voluntary guidelines for wind parks. Table ES-2 (p. ES-8) reports on the major factors included in each state's guidelines.

Five states, labeled "Y" in Table ES-1, column 9, have published model ordinances intended to guide local governments. As shown in Table ES-1, columns 10 and 11, a handful of states have published setback standards, sound standards, or both. Both of these columns differentiate between mandatory standards, indicated as "Y," and recommended or advisory standards for local government consideration, indicated as "Model." Table ES-1, column 12, reports the number of local ordinances that have been discovered and included in a database being assembled by the National Renewable Energy Laboratory.

- How many and which states have supporting policies, such as clean energy portfolio standards and goals, policies promoting the development of in-state wind energy facilities, and renewable energy zones?

These data are shown in Table ES-1, columns 13, 14, and 15. As shown in column 13, 29 states and the District of Columbia have renewable energy portfolio standard (RPS) mandates (M), and eight states have renewable energy goals (G). Of those 37 states with RPS mandates or goals, 29 have enacted policies that are specifically intended to promote the development of in-state renewable resources, including wind parks. Those policies are encoded with one, two, or three letter codes. In column 14: "B" means a "bonus" credit for at least some in-state facilities; "D" means electricity must be delivered into the state (or "DR" means delivered into the region) in order to qualify as eligible to count for RPS compliance; "L" means a maximum limit on energy from out-of-state facilities or conversely a minimum limit (often called a "carve-out") on energy from particular kinds of in-state resources; "M" means a mandate for in-state generators; "R" means a mandate for regional generators (usually, in the territory served by a regional transmission organization, RTO); "S" means qualifying facilities must be in the service territory of a utility providing retail service in the state; and "U" means a mandate for a utility serving the state to own or contract for the qualifying renewable energy.

Another policy that indirectly supports wind-park siting and zoning is the development of renewable energy zones. This is reported in Table ES-1, column 15. Typically, a renewable energy zone (REZ) is identified through a planning process that includes a general review of wind resources and broad-based, regional land-use compatibility with wind-park development, combined with electric transmission system modeling and planning. In most REZ processes, once specific zones are identified, transmission will be built to interconnect the zone to electricity loads, in anticipation that wind-park development will follow. States with explicit state-level REZ processes include California, Colorado, Michigan, and Texas. These are indicated with a "Y" in column 15. Many other states and utilities are participating in REZ-like transmission modeling and planning under the auspices of regional transmission organizations. These include the Midwest Independent [Transmission] System Operator Regional Generation Outlet Studies (RGOS), and the Western Renewable Energy Zone (WREZ) initiative.

Table ES-1: Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed**[1]	**Primary Authority (Limit)**[2]	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting**[4]	**Primary Rule**[3]	**Evaluation Criteria**[5]	**Voluntary Guidelines**[5]	**Model Ordinance**	**Setback Standard**[6]	**Sound Standard**[6]	**Local Ordinances**[7]	**RPS**[8]	**RPS In-State "Tilt"**[9]	**REZ**[10]
Alabama	0	State	CPCN from PSC (P)		Dillon's									
Alaska	10	State	CPCN from RCA (P)		Home						1			
Arizona	128	Local			Dillon's	Y	W				1	M	BD	WREZ
Arkansas	0	Local	CPCN from PSC (S)		Home									
California	3,599	Local	California Environmental Quality Act (S)		Dillon's	Y					6	M	L	Y, WREZ
Colorado	1,299	Local	CPCN from PUC (>2MW) (S), PUC consults with Division of Wildlife (S)		Dillon's	Y						M	BL	Y, WREZ
Connecticut	0	State (>1 MW)	CECPN from Siting Council (>1 MW) (P), DEEP checks congruence with IRP (S)	Y	Home	Y						M	LR	
Delaware	2	Local	Certification from PSC (S)		Dillon's	Y			Y	Y		M	B	
District of Columbia	0	PUC	Approval from PSC (P)		n/a							M	DL	
Florida	0	State (<75MW)	DOT, FAW (<75MW) (P)	Y[12]		Y								
Georgia	0	Local			Dillon's		YW	Y	Model	Model				
Hawaii	93	Local	Permit from PUC (S)		Dillon's							M	M	
Idaho	471	Local			Dillon's						1			WREZ
Illinois	2,436	Local	DNR (S)		Home						5	M	LR	RGOS
Indiana	1,339	Local	CON from URC (S)		Home						13	G	L	RGOS

[1] See all table notes at the end of the table, on page ES-7. See Appendix A for more detailed information about each state's practices.

Table ES-1 (Continued): Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed[1]**	**Primary Authority (Limit)[2]**	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting[4]**	**Primary Rule[3]**	**Evaluation Criteria[5]**	**Voluntary Guidelines[5]**	**Model Ordinance**	**Setback Standard[6]**	**Sound Standard[6]**	**Local Ordinances[7]**	**RPS[8]**	**RPS In-State "Tilt"[9]**	**REZ[10]**
Iowa	3,675	Both (>25MW)	Certification from Iowa Utilities Board (>25MW)		Home	Y					5	M	U	RGOS
Kansas	1,074	Local			Dillon's		YW				3	M	B	
Kentucky	0	State	Siting Board Approval (>10MW) (P)		Dillon's									RGOS
Louisiana	0	Local	Permit from DEQ (S)		Dillon's									
Maine	266	State (>20 acres)[13]	Permit from DEP (>20 acres) (P), Permit from LURC (for "unorganized" areas)[13] (P)		Dillon's	Y					8	M	BL	
Maryland	120	State (≥70MW)	CPCN from PSC (≥70MW) (P), 7 state agencies notified (S)	Y	Dillon's	Y	W				15	M	LR	
Massachusetts	38	State (≥100MW)	Permit from Energy Facilities Siting Board (≥100MW) (P)		Home	Y		Y	Model	Model	2	M	L	
Michigan	164	Local	PSC checks utility-owned and PPA projects for compliance with a utility's renewable energy plans (S)	Y	Home		Y	Y			11	M	BS	Y, RGOS
Minnesota	2,518	State (>5MW)	Permit from PUC (>5MW) (P)		Dillon's	Y		Y		Y	2	M		RGOS
Mississippi	0	State	CPCN from PUC (P)		Dillon's									
Missouri	459	Local			Dillon's						1	M		RGOS
Montana	386	Local			Home	Y						M	D	RGOS, WREZ

Table ES-1 (Continued): Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed[1]**	**Primary Authority (Limit)[2]**	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting[4]**	**Primary Rule[3]**	**Evaluation Criteria[5]**	**Voluntary Guidelines[5]**	**Model Ordinance**	**Setback Standard[6]**	**Sound Standard[6]**	**Local Ordinances[7]**	**RPS[8]**	**RPS In-State "Tilt"[9]**	**REZ[10]**
Nebraska	294	State (>80MW)[12]	Approval from Nebraska Power Review Board (>80MW)[12] (P)		Dillon's	Y					4			
Nevada	0	Local	Permit from PUC (≥70MW) (S)	Y	Dillon's							M		Y, WREZ
New Hampshire	26	State (≥30 MW)	COSF from Site Evaluation Committee (≥30MW) (P)		Dillon's	Y						M	DR	
New Jersey	8	Both	Interconnection authority falls to PJM RTO (S) (see New Jersey survey)	Y	Home	Y					10	M	DLR	
New Mexico	700	State (>300MW)	CPCN from PRC (P)		Home	Y	W					M		WREZ
New York	1,349	Local	CPCN from PUC (>25MW) (S)		Dillon's	Y	YW	Y	Model	Model	1	M	L	
North Carolina	0	Local	CPCN from NCUC (S)		Dillon's	Y		Y			9	M	L	
North Dakota	1,424	State (>0.5MW)	CSC from PSC (P), 21 State Agencies notified (S)		Dillon's	Y					3	G		RGOS
Ohio	67	State (≥5MW)	CECPN from Power Siting Board (≥5MW) (P)		Home	Y						M		RGOS
Oklahoma	1,482	Local		Y	Dillon's							G	M	
Oregon	2,305	State (>105MW)	Certification from Energy Facility Siting Council (>105MW) (P)		Home	Y					1	M	BR	GBS, WREZ
Pennsylvania	751	Local		Y	Dillon's	Y		Y	Model	Model	4	M	LR	
Rhode Island	2	State (≥40 MW)	Approval from Energy Facility Siting Board (≥40 MW) (P)		Home	Y	Y		Y	Y		M		

Table ES-1 (Continued): Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed[1]**	**Primary Authority (Limit)[2]**	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting[4]**	**Primary Rule[3]**	**Evaluation Criteria[5]**	**Voluntary Guidelines[5]**	**Model Ordinance**	**Setback Standard[6]**	**Sound Standard[6]**	**Local Ordinances[7]**	**RPS[8]**	**RPS In-State "Tilt"[9]**	**REZ[10]**
South Carolina	0	State (>75MW)	CPCN from PSC (>75MW) (P)	Y	Dillon's									
South Dakota	784	Local	Permit from PUC (>100 MW) (S)	Y	Dillon's	Y	Y	Y	Y		4	G		RGOS
Tennessee	29	Local			Dillon's									
Texas	10,135	Local	Projects must register with PUC (S)		Dillon's				Model	Model	2	M	M	Y
Utah	325	Local	CCN from PSC (S)		Home	Y		Y	Model	Model	3	G	R	Y, WREZ
Vermont	6	State	COPG from PSB (P)		Dillon's		Y					G	M	
Virginia	0	Local	Permit from DEQ ≤100 MW (S), SCC >100 MW (S)		Dillon's			Y	Y	Y	3	G		
Washington	2,356	State (>350MW)	Site Certification Agreement from Energy Facility Site Evaluation Council (>350MW) (P)		Dillon's	W						M	DR	GBS, WREZ
West Virginia	431	State	CPCN from PSC (P)	Y	Dillon's							G	BR	
Wisconsin	469	Local	CPCN from PSC (>100MW) (S)		Dillon's			Y[10]			4	M	D	RGOS
Wyoming	1,412	State (±30 turbines)	Permit from Industrial Siting Council (±30 turbines) (P)		Dillon's	Y			Y					WREZ

Table ES-1 (Continued): Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed**[1]	**Primary Authority (Limit)**[2]	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting**[4]	**Primary Rule**[3]	**Evaluation Criteria**[5]	**Voluntary Guidelines**[5]	**Model Ordinance**	**Setback Standard**[6]	**Sound Standard**[6]	**Local Ordinances**[7]	**RPS**[8]	**RPS In-State "Tilt"**[9]	**REZ**[10]

Table Notes: See also the individual survey reports for each state, presented in alphabetical order by state name, in Appendix A.

[1] Source data for Column 2 is Figure 1 (p. 3).

[2] Column 3 indicates "Local" when the primary siting authority rests with the local (county or municipal) government or "State" when primary authority is with the state. Any "Limit" means that a wind-park size criterion (number of turbines in Wyoming, acres in Maine, or capacity – number of MW – in 14 states) determines jurisdiction. In those circumstances, wind parks larger than the expressed limit trigger state authority. "Both" applies to Iowa and New Jersey, where siting authority is held by both the state and local units of government.

[3] Column 5: "Y" for yes indicates there is a state energy facility siting council or board separate from the state public utility commission.

[4] Column 6 distinguishes between "Home Rule" states and "Dillon's Rule" states. See p. 10 for the discussion.

[5] Columns 7 and 8: "Y" means yes, the state does have mandatory evaluation criteria (Column 7) or voluntary guidelines (Column 8). A "W" in either column means primarily or exclusively for wildlife. States with both Y and W in either column means multiple documents exist, one focused explicitly on wildlife.

[6] Columns 10 and 11: "Y" indicates that standards are included in evaluation criteria. "Model" means that criteria are included in a model ordinance.

[7] Column 12: The number in Column 12 represents the ordinances included in a database being assembled by the National Renewable Energy Laboratory, available from http://www.windpoweringamerica.gov/policy/ordinances.asp, retrieved 22 Dec 2011.

[8] Column 13: "M" means the state has a mandatory renewable energy portfolio standard. "G" means the state has a voluntary goal for renewable energy. See Database of State Incentives for Renewables & Efficiency, 2011, *Portfolio Standards/Set Asides for Renewable Energy* [web page] and *RPS Policies* [map], http://www.dsireusa.org/incentives/index.cfm?SearchType=RPS&&EE=0&RE=1, retrieved 22 Dec 2011.

[9] Column 14: Many state RPS programs include provisions to promote in-state renewable energy facilities, such as wind parks. A recent NRRI Report (Grace, Donovan, & Melnick, 2011) calls this a "tilt" policy (intended to tilt the playing field towards certain technologies). In Column 14: "B" means a "bonus" credit for at least some in-state facilities; "D" means electricity must be delivered into the state (or "DR" means delivered into the region) in order to qualify; "L" means a maximum limit on energy from out-of-state facilities or conversely a minimum limit on energy from particular kinds of in-state resources; "M" means a mandate for in-state generators; "R" means a mandate for regional generators; "S" means qualifying facilities must be in the service territory of a utility providing retail service in the state; and "U" means a mandate for a utility serving the state to own or contract for the qualifying renewable energy. Source: Database of State Incentives for Renewables & Efficiency, 2011, http://www.dsireusa.org/incentives/index.cfm?SearchType=RPS&&EE=0&RE=1, retrieved 5 Jan 2012.

[10] Column 15: REZ means Renewable Energy Zone(s). Coding indicates "Y" if there is a specific state process for determining zones (in Texas, Colorado, Utah, Michigan, and Nevada). Other codes include: "WREZ" for the Western Renewable Energy Zones process for 5 states); "RGOS" for the Regional Generation Outlet Study process at the Midwestern Independent [Transmission] System Operator (MISO) for parts or all of 12 states; "GBS" for the Gorge Bi-State Renewable Energy Zone, which includes six counties near the Columbia River in both Oregon and Washington.

[11] Wisconsin's Model Ordinance applies only for small wind systems, <100kW in capacity.

[12] Nebraska's >80MW limit applies only if the planned capacity would cause the utility's total renewable energy production to exceed the company's goal.

[13] Maine's state authority applies if the proposed wind park involves more than 20 acres of land, or if the wind park will be sited in an "unorganized" area.

Table ES-2: Factors Included in State Wind Siting and Zoning Guidelines

State	Wildlife	Aesthetics	Birds	Bats	Noise	Setbacks	Mitigation	Decommissioning
Arizona	Y							
Georgia	Y	Y	Y	Y	Y			
Kansas	Y	Y	Y				Y	Y
Maryland	Y		Y	Y				
Michigan	Y	Y	Y	Y	Y	Y	Y	Y
New Mexico	Y		Y	Y				
New York	Y	Y	Y		Y	Y		Y
Rhode Island					Y	Y		
South Dakota	Y				Y	Y		Y
Vermont	Y		Y	Y				

Part I.B briefly reviews the nature of wind-park opposition and lists the major concerns that are usually raised. When engaging in siting and zoning procedures, anti-wind groups and individuals arm themselves with information obtained from anti-wind web sites. Examples include AWEO (www.aweo.org), Industrial Wind Action Group (www.windaction.org), and National Wind Watch (www.wind-watch.org).[1]

Ubiquitous internet access among local activists facilitates the dissemination of anti-wind documents and thereby tends to focus all local anti-wind groups on the same basic issues and concerns. Table ES-3 summarizes many of the objections raised by opposition groups. In Table ES-3, *italic font* denotes recommendations for the role that each set of objections ought to play in siting and zoning decisions.

Part II summarizes best practices for the procedures used to manage wind energy siting and zoning. The report recognizes that best practices are subject to refinement over time, as more knowledge is gained and as wind generator technologies change and improve. These recommendations are based on data reported from the survey of state policies and procedures, literature review, and the knowledge and experience of the author. The recommendations are summarized in Table ES-4.

Part III presents guidelines for wind power development, including recommended approaches to critical issues: noise; shadow flicker; ice throw; wildlife; aesthetics; competing land uses; permit requirements for meteorological (met) towers, construction, and facility safety; and decommissioning. Table ES-5 summarizes recommended approaches towards and applying setback distances in response to each of those major criteria.

[1] Website home pages retrieved 12 Dec 2011.

Table ES-3: Typology of Anti-Wind Park Arguments

Topics and Subtopics	Example of anti-wind characterization. *Siting and Zoning Relevance.*
Human Health, Nuisance, and Annoyance Factors Noise Infrasound Shadow flicker	"[W]ind farms produce a noise that's hard to comprehend and even more dangerous to live close to. The beating of the blades have not only their own throbbing sounds, but beat harmonically together to create a cacophony of audible confusion…" (Brougher, 2008). "[B]ased on our knowledge of the harmful effects of noise on children's health and the growing body of evidence to suggest the potential harmful effects of industrial wind turbine noise, it is strongly urged that further studies be conducted…before forging ahead in siting industrial wind turbines." (Bronzaft, 2011). "Dizziness (specifically, vertigo) and anxiety are neurologically linked phenomena. Hence the anxiety and depression seen in association with other symptoms near wind installations are not a neurotic response to symptoms, but rather a neurologically linked response to the balance disturbances people experience from shadow flicker or low-frequency noise... . Based on these health effects and hazards, turbines should not be placed within 1700 feet of any road or dwelling. Those living within 1/2 mile (2640 ft) should be apprised that they are likely to experience very bothersome levels of noise and flicker, which continue (though to a lesser degree) to a mile or more from the turbines." (Pierpont, 2005). *Windparks should not be singled out for special noise criteria. Siting and zoning can apply noise criteria, but noise limits should apply equally to all sources. Separate consideration should be given to construction noise.* *It is a simple matter to calculate the precise locations and maximum annual duration of shadow-flicker effects. A siting standard can limit shadow flicker.* *Both noise and shadow-flicker complaints can be amenable to mitigation, and an escrow account subject to independent management by an objective, disinterested arbitrator can be established for this purpose.* *Neighbors should have the right to waive noise and shadow-flicker standards.*
Safety Ice-throw Blade failure Tower failure	"The bottom line is that ice, debris or anything breaking off the wind turbine blades (including the blades themselves) can impact a point almost 1,700 feet away from the base of the turbine" (Matilsky, 2011). "Especially in the mountainous sites or in the northern areas icing may occur frequently and any exposed structure – also wind turbines – will be covered by ice under special meteorological conditions. This is also true if today's Multi Megawatt turbines with heights from ground to the top rotor blade tip of more than 150 m can easily reach lower clouds with supercooled rain in the cold season, causing icing if it hits the leading edge." (Siefert, Westerhellweg, & Kroning, 2003). "[W]ind turbines are being whipsawed and hammered to pieces constantly, and the public is not being made aware of this real and present danger, for fear there will be a grass-roots uprising against it before they are saddled with [wind parks] and don't have any more say-so in the matter." (Brougher, 2008). *Tower failure for utility-scale turbines is characterized by vertical collapse (like a beverage can crushing when stepped on), rather than tipping over from the base. Tower construction standards should guide setback distances, rather than the remote possibility of tower tip-over.* *Ice throw and blade failure resulting in parts hurtling through the air are increasingly rare. Modern turbines are continuously monitored in real time and will shut themselves down if ice accumulates on blades. Ice shedding is thus almost exclusively limited to the zone directly underneath the turbine.*

Table ES-3 (Continued): Typology of Anti-Wind Park Arguments

Topics and Subtopics	Example of anti-wind characterization. *Siting and Zoning Relevance.*
Safety (continued) Ice-throw Blade failure Tower failure	*Setback distances of 1.5 times turbine height (tower plus blade) should be considered maximal. Neighbors should have the right to waive setback distances from "participating" buildings and property lines. Wind-park owners (and insurers) should be liable for damages caused by ice throw, blade failure, and tower failure. An escrow account should cover potential liability and decommissioning costs.*
Property Values Visual amenity Sense of place, of community Industrial appearance Tourism impacts	"The days on market was more than double for those properties inside the windmill zones. The sold price was on average $48,000 lower inside the windmill zones than those outside. The number of homes not absorbed (not sold) was 11% vs. 3%." (Luxemburger, n.d.). "There are people who can't sell their homes and are forced to rent other living accommodation and people who sell their homes to the wind energy companies at much reduced prices and then are 'gagged' from talking about any of the negative health effects" (Chevalier, n.d.). "The degradation these enormous sprawling industrial complexes bring to our cultural and visual resources is least understood. Our colleagues… describe West Texas today as an alien landscape where one can drive for miles and miles and miles (and miles) and see nothing but wind turbines. The nighttime experience is even more surreal with the blinking red lights." (Industrial Wind Action Group, 2005). *An escrow account should cover potential liability and decommissioning costs.*
Wildlife and Natural Features Avian mortality (birds and bats) Habitat destruction, fragmentation	"Where'd all the animals go? My guess is as far away from those things as they can get." (Brougher, 2008). "Save the Eagles International wishes to warn the international community about the threat that windfarms and their power lines represent for biodiversity. Unlike cars, buildings, and domestic cats, wind turbine blades and high tension lines often kill protected or endangered birds like eagles, cranes, storks, etc. Cumulatively and over the long term, 3.5 million wind turbines to be installed worldwide will cause the extinction of many bird species, some of them emblematic." (Duchamp, 2011). *Exclusion zones should be identified in concert with state and federal wildlife agencies based on the best available scientific information and pre- and post-construction monitoring. Mitigation measures should be identified and included in siting stipulations. Mitigation funds should be included in escrow accounts as necessary to ensure compliance.*
Energy Policy Capacity factor Emissions effects Integration costs Reliability	"The erratic nature of the wind means that turbines simply cannot supply the base load that other forms of generation do. Those other generators will continue to be needed to back up the wildly variable output of wind turbines, with the probability that in so doing these plants will actually emit more pollution for each kilowatt-hour they generate than if they were allowed to operate normally." (Roberson, 2004). "[S]ome reliable, dispatchable generating unit(s) must be immediately available at all times -- and operating at less than peak efficiency and capacity -- to "back up" the unreliable wind generation. The reliable, backup unit(s) must ramp up and down to balance the output from the wind turbines. … Wind turbines have virtually no 'capacity value.' Thus, electric customers pay twice: once for the wind energy and again for reliable capacity." (Schleede, 2005).

Table ES-3 (Continued): Typology of Anti-Wind Park Arguments

Topics and Subtopics	Example of anti-wind characterization. *Siting and Zoning Relevance.*
Energy Policy (continued) Capacity factor Emissions effects Integration costs Reliability	"Peak power… during the hottest summer months… [is] far more demanding on the power grid, yet the wind power available in the winter months… is on average greater than in the summer. That's a huge contradiction… . Nor can we store wind power… . So for the most part, winter winds and spring storms must either be wasted, or they will create surges which blow out the transformers, power equipment, and burn up their own generators, and set the grid back hundreds of millions of dollars, as has happened by wind surges in Oregon, and many times in Denmark, Germany, and other nations… ." (Brougher, 2008). "In high winds, ironically, the turbines must be stopped because they are easily damaged." (Brougher, 2008). "A nuclear plant is tens of times cheaper and thousands of times safer per [terawatt-hour] than gigantic air turbines will ever be – even if we learn someday how to prevent them from burning up, blowing the grid, and folding in half under a high wind load, and blending our birds with the landscape." (Brougher, 2008). *The only relevance to siting and zoning might be for substations and transmission facilities, which also need approvals. None of these other issues are siting and zoning issues, per se.*
Economic Development Subsidies Employment	"Tax avoidance – not environmental and energy benefits – has become the prime motivation for building 'wind farms.' … 'Wind farms' produce few local economic benefits and such benefits are overwhelmed by the higher costs imposed on electric customers through their monthly bills. … When the expected contribution of wind energy toward supplying US energy requirements is taken into account, wind energy is among the most heavily subsidized of all energy sources." (Schleede, 2005). "[I]nvestment dollars going to "renewable" energy sources would otherwise be available… for other purposes that would produce greater economic benefits. 'Wind farms' have very high capital costs and relatively low operating costs compared to generating units using traditional energy sources. They also create far fewer jobs, particularly long-term jobs, and far fewer local economic benefits. 'Wind farms' are simply a poor choice if the goals are to create jobs, add local economic benefits, or hold down electric bills." (Schleede, 2011). "[B]illions of [federal grant] dollars… – all of it exempt from federal corporate income taxes – is being used to fatten the profits of some of the world's biggest companies" (Bryce, 2011). *These are not relevant siting and zoning concerns.*

Table ES-4: Best Practices for Procedures

Recommendation	Description
1. Develop procedures that result in clarity, predictability, and transparency	Jurisdictions with locations suitable for commercial wind development should anticipate interest and proceed to develop and publish siting and zoning procedures, principles, and guidelines.
2. Establish a one-stop, pre-submission consultation	Provide basic information for applicants in a single meeting, identifying and explaining the basics of all necessary permits and approvals.
3. Identify and map constrained and preferred wind energy development zones	Make available and accessible to the interested public GIS maps of exclusion, avoidance, and preferred development zones.
4. Include preferred development zones in transmission plans	Begin modeling and planning for wind power interconnections in preferred development zones as soon as the zones are identified.
5. Prepare and make available guidelines for participants	Explain procedures and timelines for when, where, and how to participate in public hearings. Provide information about decisions already completed through rulemaking.
6. Prepare and make available for local siting and zoning officials guidelines, checklists, and model ordinances	Support local government decision makers by providing the best available technical resources.
7. Ensure the sequence for obtaining permits and approvals meets requirements to allow development of suitable projects	The sequence of events leading to approval or rejection of an application should entail a logical progression through the planning and design stages, prior to siting and zoning approval that allows construction to begin.

Table ES-5: Wind-Park Siting and Zoning Criteria, Recommended Approaches and Setback Distances

Criterion	Recommended approach
Noise, sound, and infrasound	• Noise standards should allow some flexibility. • Noise standards should vary depending on the area's existing and expected land uses, taking into account the noise sensitivity of different areas (e.g., agricultural, commercial, industrial, residential). • Determine pre-construction compliance using turbine manufacturer's data and best available sound modeling practices. • Apply a planning guideline of 40 dBA as an ideal design goal and 45 dBA as an appropriate regulatory limit (following Hessler's proposed approach, 2011). • Allow participating land owners to waive noise limits. • Establish required procedures for complaint handling. • Identify circumstances that will trigger, and techniques to be used for: (a) mandatory sound monitoring; (b) arbitration; and (c) mitigation. • Do not regulate setback distance; regulate sound.
Shadow flicker	• Restrict to not more than 30 hours per year or 30 minutes per day at occupied buildings. • Allow participating land owners to waive shadow-flicker limits. • Allow the use of operational practices and mitigation options for compliance. • Do not regulate setback distance; regulate the duration of shadow flicker.

Table ES-5 (Continued): Wind Park Siting and Zoning Criteria, Recommended Approaches and Setback Distances

Criterion	Recommended approach
Ice throw	• Authorize demonstrated ice control measures. • Require wind-park to provide insurance and escrow funds to ensure compensation for proven damages resulting from ice throw. • Do not regulate setback distance; regulate ice throw.
Wildlife and habitat exclusion zones	• Responsible wildlife protection agencies should use the best available scientific knowledge and data to determine exclusion and avoidance zones and appropriate buffers (that is, setback distances) beyond those zones. • Permits should specify required pre-, during-, and post-construction monitoring. • Permits should specify how mitigation requirements will be determined and what mitigation techniques will be considered. • Regulate setback distances as required by responsible wildlife protection agencies and do not authorize siting in exclusion and buffer zones.
Aesthetic requirements	• Require neutral paint color and minimal signage. • Require the minimum of nighttime lighting necessary to achieve FAA compliance. • Require that realistic visual impact assessments, accessible to the public, be included in wind park planning and applications. • Manage visual impact through setbacks and exclusions from critical competing land uses.
Critical competing land uses	• Map as excluded zones any special cultural, anthropological, "sacred" lands, and highly valued scenic vistas. • Apply reasonable setbacks from non-participating property lines, occupied buildings, scenic vistas, and transportation and utility rights-of-way. • Allow participating properties to at least partially waive setback requirements from property lines and occupied buildings, in writing.
Permit requirements for met towers, construction, and facility safety	• Predetermine requirements and simplify procedures for approving meteorological (met) towers. • Regulate heavy construction requirements the same as any other heavy construction project, using the regulatory permitting system (e.g., for stormwater, surface water, transportation, noise, and wetlands permits). • Check for all required approvals for potential interference with radio and TV reception or radar. Provide for testing and mitigation of radio and TV interference problems that do occur. • Regulate structural safety (against, e.g., tower tip-over or blade failure) through construction codes, combined with minimal setback requirements. • Regulate facility safety (e.g., preventing climbing towers, ensuring electrical safety, providing fencing around electrical gear).
Decommissioning	• Set clear requirements for what triggers and what constitutes decommissioning and restoration or reclamation. • Establish a decommissioning escrow fund, to ensure adequate resources will be available at the end of a project's useful life or in the event the development fails.
Dispute resolution and mitigation	• Establish procedures for dispute resolution and mitigation.

The report ends with a **summary and conclusions.** This part reviews important literature on wind siting and zoning and asks: (1) Is there a middle ground that does not require compromises where everyone loses? and (2) Are there opportunities for improvement in wind-park siting and zoning procedures that are most likely to lead to a more rapid accumulation of the information and wisdom needed to guide future decisions?

Among researchers studying wind-park siting, there is at least some optimism regarding finding answers to these questions. For example: Wolsink (2007a) suggests that better solutions will be found through collaborative, community-based planning; Upham (2009) proposes that solutions might be found through focused attention on the field of environmental psychology; Sovacool (2009) advises attention to a broader research agenda about both social and technical aspects of decision making; and Sengers, Raven, & Van Venrooij (2010) recommend a concentrated study of news media and the potential role of news media in public education regarding decisions about our energy future. Any and all of these paths might prove advantageous.

For the time being, the most sensible recommendation is for communities to work together to make decisions about future energy systems development, not only wind energy development, in their local area. There are multiple paths to this goal, insofar as wind energy development is concerned. Some developers work extensively with host communities, prior to seeking siting and zoning approval, to create macro- and micro-siting plans that engender little, if any, public opposition. Some land owners form associations and hire their own developers, so that the owners can directly guide decisions about setback distances and micro-siting. Some governments simultaneously develop specific plans that identify both areas where wind parks will be excluded or should be avoided and also those areas where wind parks will be welcomed. Hindmarsh (2010, p. 560) holds that making good decisions about wind turbine siting requires "collaborative approaches," including "the technical mapping of wind resources… [and] community qualifications and boundaries for wind farm location." He argues that community-based decision making is likely to result in "improved problem framing and decision making concerning wind farm location, and thus development." The goal, as Hindmarsh notes, is a process that will be perceived as legitimate and fair, and thus sustainable. Reaching that goal might be considered overly optimistic, but at least some communities have shown a willingness to give it a try. There is at least a good prospect that these approaches can reduce contentiousness and move towards consensus on how to guide wind-park siting and zoning.

Introduction

Wind-park siting and zoning present serious challenges. Modern utility-scale wind turbines are tall, rather imposing structures. Their construction often represents a significant change to what were previously open rural and agricultural landscapes. In many circumstances, modern wind turbine towers, which are roughly 25 stories tall, are by far the tallest structures being constructed in landscapes that have previously been rural and agricultural in character, containing no structures taller than silos.

Wind-park siting and zoning is frequently contentious, due to a variety of concerns regarding public acceptance and opposition. Already, wind siting and zoning cases have been heard in courts of appeals and supreme courts in multiple states.[2]

Often, officials with no previous expertise in wind energy systems have been tasked with developing the rules and regulations that ultimately guide wind power siting and zoning decisions, which then directly affect the planning, design, development, construction, and operations of wind parks.

It is axiomatic that all energy sources known today come with some unintended consequences, and perhaps also unanticipated consequences, and cause some negative side effects. Thus, the siting and zoning of any new energy facility is likely to raise concerns among potential neighbors. Local opposition groups form and try to influence siting and zoning for practically all new power plants, transmission lines, and substations. Thus, public officials who are charged with the task of recommending and making siting and zoning decisions often face competing, widely divergent views of the benefits and costs, pros and cons associated with new energy facilities. Wind generators and wind parks are a prominent example, perhaps *the* prominent example, of this local opposition phenomenon.

Is the ideal siting and zoning hearing one that has no controversy, where full consensus is reached on the part of all stakeholders? That goal can be impossible to achieve. The goal of the siting and zoning decision maker should be fact finding to support objective decision making, in keeping with the enabling siting and zoning laws and rules.

The purpose for this report is to provide guidelines about how best to manage the siting and zoning process and apply siting and zoning principles to wind-park decision making. Part II.A covers the siting and zoning process, and Part III covers recommendations about the specific criteria and principles used in making wind-park siting and zoning decisions. Applying best practices will enable policymakers to accelerate as much as practical the time requirements for siting and zoning procedures, while simultaneously helping to develop the full potential of wind energy and minimizing project risks.

This paper summarizes knowledge about the state of the art in wind-park[3] and wind-turbine siting and zoning, to support decisionmakers' efforts to develop and implement good siting and zoning practices. It draws on a survey of practices in all 50 states plus some U.S. territories and protectorates to explicate and report on current practices and principles. The survey results are presented in Appendix A.

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[2] Wind siting and zoning cases have already appeared in state supreme courts in Kansas, New York, Texas, Vermont, Washington, and West Virginia, and in state appeals courts in California, Indiana, Maryland, Minnesota and Wisconsin (Google Scholar, Advanced Scholar Search for legal opinions, retrieved 7 Dec 2011; Minnesota Appeals Court, Cases Nos. A112228 and A112229, http://macsnc.courts.state.mn.us/ctrack/publicLogin.jsp, retrieved 5 Jan 2012).

[3] In this document, the term "wind park" is used to refer to installations of multiple utility-scale wind turbines. Frequently used synonyms are "wind development," "wind farm," or "wind project." "Utility-scale" does not have any certain definition. For the purposes of this paper, "utility-scale" can be understood to mean wind generators that are typically about 1.5 megawatts (1,500 kilowatts) or larger, mounted on towers that average about 80 meters (roughly 250 feet) in height or taller.

As Ellenbogen et al. (Jan 2012, p. ES-8) explain,

> Implicit in the term ["best practice"] is that the practice is based on the best information available at the time of its institution. A best practice may be refined as more information and studies become available.

Though this research has been informed by the survey of states, the goal was not to determine best practices simply by popularity. As much as possible: (a) best practices for procedures are determined by a review of literature about public decision-making processes, with particular focus on procedural justice and public participation; and (b) best practices for the criteria and principles involved are determined by a review of the literature about siting and zoning law and the best available information about the relationships between wind parks and siting and zoning.

The focus for this project is almost exclusively on utility-scale wind turbines and wind parks for siting and zoning on the land. A few of the state survey reports (California, Minnesota, New Hampshire, Oregon, and Wisconsin) include information specifically about siting and zoning for small wind turbines.[4] Those states provide detailed information about siting and zoning standards and procedures exclusively for small wind. Off-shore wind energy development is not included in this study either, though it is a topic of interest in Atlantic, Gulf Coast, Pacific, and Great Lakes states.

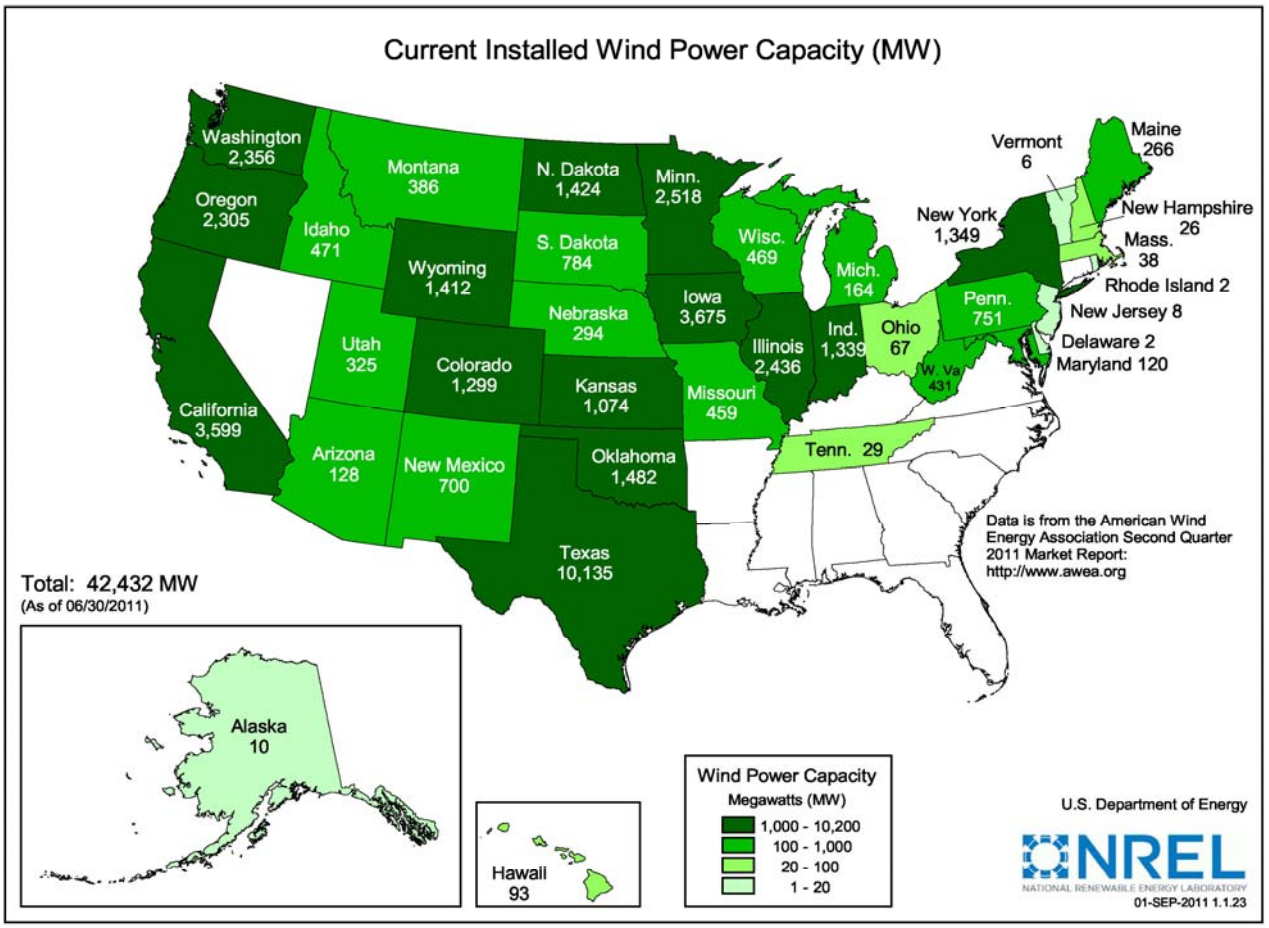
Part I of this paper reports on the current status of wind siting and zoning, based on a survey of states and other jurisdictions and information gleaned from a review of published literature about wind siting and zoning. Part II reviews and identifies best practices for the procedures used in wind energy siting and zoning. Part III presents guidelines for addressing the specific criteria used to determine wind-park siting and zoning. That part of the report identifies the criteria commonly used and includes the best available information about applying those criteria to determine siting and zoning practices. That discussion is followed by a brief summary and conclusions.

[4] "Small wind" does not have a certain definition. Generally, small wind systems are those that might be installed in a residential or commercial area to produce electricity for on-site use by a single residence, farm, or commercial facility. Typical small-scale wind generators produce less than a few hundred kilowatts, sometimes as few as one to ten kW, and they are mounted on towers no taller than about 150 feet. For more information see http://www.windpoweringamerica.gov/small_wind.asp, retrieved 7 Jan 2012.

I. Current Status

Taken as a whole, the experience with wind-park development has been quite positive. Given the large numbers of turbines installed and operating, and experience in some locations totaling 20 years and more, there have been relatively few complaints. As shown in Figure 1, 42,432 MW of wind generation had already been installed in the U.S. by late 2011.[5]

Figure 1: NREL Map of Currently Installed Wind Capacity by State



Source: http://www.windpoweringamerica.gov/images/windmaps/installed_capacity_current.jpg.
See also http://www.windpoweringamerica.gov/wind_installed_capacity.asp.

By September 2011, 14 U.S. states had more than 1,000 MW of installed wind capacity (California, Colorado, Iowa, Illinois, Indiana, Kansas, Minnesota, North Dakota, New York, Oklahoma, Oregon, Texas, Washington, and Wyoming). Survey data from these states is summarized in Table 1, with the states ranked installed capacity (as reported in Figure 1). Among the 14 states with over 1,000 MW of installed capacity, only Wyoming has neither a mandatory renewable portfolio standard nor a voluntary

[5] Data sources used to generate Figure 1 focus almost exclusively on commercial, utility-scale wind generators. Small-scale (residential or small commercial) wind generators are typically not included. This map's data for each state is copied into Table 1, Column 2.

renewable portfolio goal. Indiana, North Dakota, and Oklahoma have voluntary goals. The other ten states that are leaders in installed capacity have mandatory standards. Eleven of these 14 states have RPS policies that promote in-state facility development.

Another 14 states had between 100 and 1,000 MW (Arizona, Idaho, Maine, Maryland, Michigan, Missouri, Montana, Nebraska, New Mexico, Pennsylvania, South Dakota, Utah, Wisconsin, and West Virginia). Five states had between 20 and 100 MW (Hawaii, Massachusetts, New Hampshire, Ohio, and Tennessee). Five states had between one and 20 MW (Alaska, Delaware, New Jersey, Rhode Island, and Vermont). A dozen states, notably many in the Southeast, had no commercial wind development at the time (Alabama, Arkansas, Connecticut, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Nevada, South Carolina, and Virginia).

In many areas, wind parks have been developed with little controversy, resulting in few if any reported problems. Where problems have occurred, though, they have attracted significant news media and public attention, sometimes followed by litigation. In particular places, wind parks have been responsible for bird and bat kills that concern wildlife conservation agencies. In others, relatively small numbers of wind-park neighbors report persistent, acute, and chronic problems and concerns.

Because of the reported problems, in many jurisdictions siting and zoning hearings become a major focal point for opposition groups, who are intent on protecting themselves and their communities from what they believe is a land-use intrusion that will result in irreversible negative effects. Although typically relatively small numbers or percentages of the population come out against wind-park development, public opposition, when it does arise, tends to be vocal and intense. It is also common that citizens who generally favor wind-park development represent what could be called a "silent majority" of people who are less motivated to participate in siting and zoning hearings.

Wind energy siting and permitting practices in the U.S. are mainly influenced by three factors in each state: (1) preexisting siting and permitting practices for other kinds of energy facilities; (2) renewable-energy support policies, especially renewable portfolio standard (RPS) or broader clean energy standard (CES) policies; and (3) public acceptance.

State-level wind siting and zoning responsibility is more likely where preexisting policies have already vested energy facility siting responsibility with a state agency. In those circumstances, state authorities are most likely to be charged with weighing applications for wind parks larger than some particular, legislated minimum capacity.

State renewable-energy support policies have focused some attention on wind-park development, especially in the 37 states that have adopted policies setting either mandates or goals for increasing the use of renewable energy.[6] Most U.S. states' renewable energy support policies use quota systems that rely on auctions to select renewable energy projects to receive power purchase agreement (PPA) contracts for the sale of electricity. Those auctions tend to favor wind parks, because the price of energy from wind parks in locations with commercially viable wind resources is generally lower than that for other renewable energy options.

Also, many state renewable energy support policies favor in-state electricity generation, one way or another.[7] These policies, especially those that focus on in-state renewable resources, have encouraged

[6] See RPS Policies at Database of State Incentives for Renewables & Efficiency, Dec 2011, *Summary maps* [web page], http://www.dsireusa.org/summarymaps/index.cfm?ee=1&RE=1, retrieved 8 Dec 2011.

[7] Various policies promote in-state renewable energy production and use. These are briefly summarized in Table 1. For details, see: Database of State Incentives for Renewables & Efficiency, http://www.dsireusa.org/rpsdata and http://www.dsireusa.org/incentives/index.cfm?SearchType=RPS&&EE=0&RE=1, retrieved 22 Dec 2011. See also the discussion about "tilt" policies in Grace, Donovan, and Melnick, 2011, especially pp. iii, 10-12.

wind prospectors to investigate opportunities in practically all of the windiest areas in the country, even areas with more potential siting and zoning obstacles.

Public acceptance, broadly speaking, depends on features of the landscapes where wind developments are proposed, such as housing density or the lack thereof, the perceived existence and importance of scenic beauty, and whether the areas are considered to be natural or already disturbed by human activity. The current status of public acceptance varies widely in different regions of the country and even in different jurisdictions within states. In states where local authorities have responsibility for wind-park siting and zoning, it is not at all unusual to find some townships or counties adopting ordinances intended to restrict or prevent development, while others are adopting development-friendly ordinances.

Unsurprisingly, wind-park developers have generally focused first on those areas with fewer obstacles to siting and zoning. The tendency is for wind parks to be built first in the windiest areas (where the economics are most favorable) and in landscapes with the fewest environmental and political obstacles to development. Barriers to development are varied, though, depending on factors such as population density and suburbanization, as well as concerns about potential negative effects on wildlife and special habitats. Barriers can also include cumbersome or uncertain and unpredictable state and local siting and zoning procedures and practices.

Part I.A of this report briefly summarizes state wind-park siting and zoning procedures and principles, based on information gleaned from the state survey data that is presented in Appendix A. Part I.B summarizes the nature of wind-park opposition, and lists the major concerns raised by opposition groups.

A. Summary information from the survey of state practices

This part of the report summarizes information gleaned from the survey of state wind energy siting and zoning practices and principles. The surveys were completed beginning in the summer of 2011. NRRI student interns and staff searched the Internet to find references about practices in each state. Once that data was compiled, preliminary surveys were circulated to in-state contacts deemed as most likely to be knowledgeable about the state's practices. The in-state contacts were asked to review and help edit the survey data and the contacts were always invited to forward the survey data to others who were likely to be familiar with the state's practices. Surveys are considered complete only after they have been reviewed and accepted as accurate by one or more in-state experts.[8]

The completed surveys are attached in Appendix A. Findings from the surveys are summarized in Table 1 (pages 6-10). The rest of Part I.A (pages 11-14) reports on the data presented in Table 1 and presents some additional summary information gathered from the survey reports. Table 2 (pages 11-12) shows a copy of the same data as Table 1, but only for those 14 states identified in Figure 1 as having more than 1,000 installed MW of wind capacity. In Table 2, the 14 states are ranked in descending order, based on installed wind capacity.

[8] Names of the individuals responsible for the original data collection and in state reviewers are shown at the end of each state's survey record. As of this publication date, reviews are yet to be completed for 12 states. The authors intend to continue efforts to update the survey reports, as needed, to keep them up to date. The most current survey data will be published on the NRRI website, in the area devoted to wind energy information.

Table 1: Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed**[1]	**Primary Authority (Limit)**[2]	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting**[4]	**Primary Rule**[3]	**Evaluation Criteria**[5]	**Voluntary Guidelines**[5]	**Model Ordinance**	**Setback Standard**[6]	**Sound Standard**[6]	**Local Ordinances**[7]	**RPS**[8]	**RPS In-State "Tilt"**[9]	**REZ**[10]
Alabama	0	State	CPCN from PSC (P)		Dillon's									
Alaska	10	State	CPCN from RCA (P)		Home						1			
Arizona	128	Local			Dillon's	Y	W				1	M	BD	WREZ
Arkansas	0	Local	CPCN from PSC (S)		Home									
California	3,599	Local	California Environmental Quality Act (S)		Dillon's	Y					6	M	L	Y, WREZ
Colorado	1,299	Local	CPCN from PUC (>2MW) (S), PUC consults with Division of Wildlife (S)		Dillon's	Y						M	BL	Y, WREZ
Connecticut	0	State (>1 MW)	CECPN from Siting Council (>1 MW) (P), DEEP checks congruence with IRP (S)	Y	Home	Y						M	LR	
Delaware	2	Local	Certification from PSC (S)		Dillon's	Y			Y	Y		M	B	
District of Columbia	0	PUC	Approval from PSC (P)		n/a							M	DL	
Florida	0	State (<75MW)	DOT, FAW (<75MW) (P)	Y[12]		Y								
Georgia	0	Local			Dillon's		YW	Y	Model	Model				
Hawaii	93	Local	Permit from PUC (S)		Dillon's							M	M	
Idaho	471	Local			Dillon's						1			WREZ
Illinois	2,436	Local	DNR (S)		Home						5	M	LR	RGOS
Indiana	1,339	Local	CON from URC (S)		Home						13	G	L	RGOS

[1] See all table notes at the end of the table, on page 10. See Appendix A for more detailed information about each state's practices.

Table 1 (Continued): Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed**[1]	**Primary Authority (Limit)**[2]	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting**[4]	**Primary Rule**[3]	**Evaluation Criteria**[5]	**Voluntary Guidelines**[5]	**Model Ordinance**	**Setback Standard**[6]	**Sound Standard**[6]	**Local Ordinances**[7]	**RPS**[8]	**RPS In-State "Tilt"**[9]	**REZ**[10]
Iowa	3,675	Both (>25MW)	Certification from Iowa Utilities Board (>25MW)		Home	Y					5	M	U	RGOS
Kansas	1,074	Local			Dillon's		YW				3	M	B	
Kentucky	0	State	Siting Board Approval (>10MW) (P)		Dillon's									RGOS
Louisiana	0	Local	Permit from DEQ (S)		Dillon's									
Maine	266	State (>20 acres)[13]	Permit from DEP (>20 acres) (P), Permit from LURC (for "unorganized" areas)[13] (P)		Dillon's	Y					8	M	BL	
Maryland	120	State (≥70MW)	CPCN from PSC (≥70MW) (P), 7 state agencies notified (S)	Y	Dillon's	Y	W				15	M	LR	
Massachusetts	38	State (≥100MW)	Permit from Energy Facilities Siting Board (≥100MW) (P)		Home	Y		Y	Model	Model	2	M	L	
Michigan	164	Local	PSC checks utility-owned and PPA projects for compliance with a utility's renewable energy plans (S)	Y	Home		Y	Y			11	M	BS	Y, RGOS
Minnesota	2,518	State (>5MW)	Permit from PUC (>5MW) (P)		Dillon's	Y		Y		Y	2	M		RGOS
Mississippi	0	State	CPCN from PUC (P)		Dillon's									
Missouri	459	Local			Dillon's						1	M		RGOS
Montana	386	Local			Home	Y						M	D	RGOS, WREZ

Table 1 (Continued): Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed[1]**	**Primary Authority (Limit)[2]**	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting[4]**	**Primary Rule[3]**	**Evaluation Criteria[5]**	**Voluntary Guidelines[5]**	**Model Ordinance**	**Setback Standard[6]**	**Sound Standard[6]**	**Local Ordinances[7]**	**RPS[8]**	**RPS In-State "Tilt"[9]**	**REZ[10]**
Nebraska	294	State (>80MW)[12]	Approval from Nebraska Power Review Board (>80MW)[12] (P)		Dillon's	Y					4			
Nevada	0	Local	Permit from PUC (≥70MW) (S)	Y	Dillon's							M		Y, WREZ
New Hampshire	26	State (≥30 MW)	COSF from Site Evaluation Committee (≥30MW) (P)		Dillon's	Y						M	DR	
New Jersey	8	Both	Interconnection authority falls to PJM RTO (S) (see New Jersey survey)	Y	Home	Y					10	M	DLR	
New Mexico	700	State (>300MW)	CPCN from PRC (P)		Home	Y	W					M		WREZ
New York	1,349	Local	CPCN from PUC (>25MW) (S)		Dillon's	Y	YW	Y	Model	Model	1	M	L	
North Carolina	0	Local	CPCN from NCUC (S)		Dillon's	Y		Y			9	M	L	
North Dakota	1,424	State (>0.5MW)	CSC from PSC (P), 21 State Agencies notified (S)		Dillon's	Y					3	G		RGOS
Ohio	67	State (≥5MW)	CECPN from Power Siting Board (≥5MW) (P)		Home	Y						M		RGOS
Oklahoma	1,482	Local		Y	Dillon's							G	M	
Oregon	2,305	State (>105MW)	Certification from Energy Facility Siting Council (>105MW) (P)		Home	Y					1	M	BR	GBS, WREZ
Pennsylvania	751	Local		Y	Dillon's	Y		Y	Model	Model	4	M	LR	
Rhode Island	2	State (≥40 MW)	Approval from Energy Facility Siting Board (≥40 MW) (P)		Home	Y	Y		Y	Y		M		

Table 1 (Continued): Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed**[1]	**Primary Authority (Limit)**[2]	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting**[4]	**Primary Rule**[3]	**Evaluation Criteria**[5]	**Voluntary Guidelines**[5]	**Model Ordinance**	**Setback Standard**[6]	**Sound Standard**[6]	**Local Ordinances**[7]	**RPS**[8]	**RPS In-State "Tilt"**[9]	**REZ**[10]
South Carolina	0	State (>75MW)	CPCN from PSC (>75MW) (P)	Y	Dillon's									
South Dakota	784	Local	Permit from PUC (>100 MW) (S)	Y	Dillon's	Y	Y	Y	Y		4	G		RGOS
Tennessee	29	Local			Dillon's									
Texas	10,135	Local	Projects must register with PUC (S)		Dillon's				Model	Model	2	M	M	Y
Utah	325	Local	CCN from PSC (S)		Home	Y		Y	Model	Model	3	G	R	Y, WREZ
Vermont	6	State	COPG from PSB (P)		Dillon's		Y					G	M	
Virginia	0	Local	Permit from DEQ ≤100 MW (S), SCC >100 MW (S)		Dillon's			Y	Y	Y	3	G		
Washington	2,356	State (>350MW)	Site Certification Agreement from Energy Facility Site Evaluation Council (>350MW) (P)		Dillon's	W						M	DR	GBS, WREZ
West Virginia	431	State	CPCN from PSC (P)	Y	Dillon's							G	BR	
Wisconsin	469	Local	CPCN from PSC (>100MW) (S)		Dillon's			Y[10]			4	M	D	RGOS
Wyoming	1,412	State (±30 turbines)	Permit from Industrial Siting Council (±30 turbines) (P)		Dillon's	Y			Y					WREZ

Table 1 (Continued): Summary of State Wind Siting and Zoning Practices

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed**[1]	**Primary Authority (Limit)**[2]	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting**[4]	**Primary Rule**[3]	**Evaluation Criteria**[5]	**Voluntary Guidelines**[5]	**Model Ordinance**	**Setback Standard**[6]	**Sound Standard**[6]	**Local Ordinances**[7]	**RPS**[8]	**RPS In-State "Tilt"**[9]	**REZ**[10]

Table Notes: See also the individual survey reports for each state, presented in alphabetical order by state name, in Appendix A.

[1] Source data for Column 2 is Figure 1 (p. 3).

[2] Column 3 indicates "Local" when the primary siting authority rests with the local (county or municipal) government or "State" when primary authority is with the state. Any "Limit" means that a wind-park size criterion (number of turbines in Wyoming, acres in Maine, or capacity – number of MW – in 14 states) determines jurisdiction. In those circumstances, wind parks larger than the expressed limit trigger state authority. "Both" applies to Iowa and New Jersey, where siting authority is held by both the state and local units of government.

[3] Column 5: "Y" for yes indicates there is a state energy facility siting council or board separate from the state public utility commission.

[4] Column 6 distinguishes between "Home Rule" states and "Dillon's Rule" states. See p. 10 for the discussion.

[5] Columns 7 and 8: "Y" means yes, the state does have mandatory evaluation criteria (Column 7) or voluntary guidelines (Column 8). A "W" in either column means primarily or exclusively for wildlife. States with both Y and W in either column means multiple documents exist, one focused explicitly on wildlife.

[6] Columns 10 and 11: "Y" indicates that standards are included in evaluation criteria. "Model" means that criteria are included in a model ordinance.

[7] Column 12: The number in Column 12 represents the ordinances included in a database being assembled by the National Renewable Energy Laboratory, available from http://www.windpoweringamerica.gov/policy/ordinances.asp, retrieved 22 Dec 2011.

[8] Column 13: "M" means the state has a mandatory renewable energy portfolio standard. "G" means the state has a voluntary goal for renewable energy. See Database of State Incentives for Renewables & Efficiency, 2011, *Portfolio Standards/Set Asides for Renewable Energy* [web page] and *RPS Policies* [map], http://www.dsireusa.org/incentives/index.cfm?SearchType=RPS&&EE=0&RE=1, retrieved 22 Dec 2011.

[9] Column 14: Many state RPS programs include provisions to promote in-state renewable energy facilities, such as wind parks. A recent NRRI Report (Grace, Donovan, & Melnick, 2011) calls this a "tilt" policy (intended to tilt the playing field towards certain technologies). In Column 14: "B" means a "bonus" credit for at least some in-state facilities; "D" means electricity must be delivered into the state (or "DR" means delivered into the region) in order to qualify; "L" means a maximum limit on energy from out-of-state facilities or conversely a minimum limit on energy from particular kinds of in-state resources; "M" means a mandate for in-state generators; "R" means a mandate for regional generators; "S" means qualifying facilities must be in the service territory of a utility providing retail service in the state; and "U" means a mandate for a utility serving the state to own or contract for the qualifying renewable energy. Source: Database of State Incentives for Renewables & Efficiency, 2011, http://www.dsireusa.org/incentives/index.cfm?SearchType=RPS&&EE=0&RE=1, retrieved 5 Jan 2012.

[10] Column 15: REZ means Renewable Energy Zone(s). Coding indicates "Y" if there is a specific state process for determining zones (in Texas, Colorado, Utah, Michigan, and Nevada). Other codes include: "WREZ" for the Western Renewable Energy Zones process for 5 states); "RGOS" for the Regional Generation Outlet Study process at the Midwestern Independent [Transmission] System Operator (MISO) for parts or all of 12 states; "GBS" for the Gorge Bi-State Renewable Energy Zone, which includes six counties near the Columbia River in both Oregon and Washington.

[11] Wisconsin's Model Ordinance applies only for small wind systems, <100kW in capacity.

[12] Nebraska's >80MW limit applies only if the planned capacity would cause the utility's total renewable energy production to exceed the company's goal.

[13] Maine's state authority applies if the proposed wind-park involves greater than 20 acres of land, or if the wind-park will be sited in an "unorganized" area.

Table 2: Summary of State Wind Siting and Zoning Practices
(Top Ten States, Ranked by 2011 Installed Commercial Wind Generating Capacity in MW)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed**[1]	**Primary Authority (Limit)**[2]	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting**[4]	**Primary Rule**[3]	**Evaluation Criteria**[5]	**Voluntary Guidelines**[5]	**Model Ordinance**	**Setback Standard**[6]	**Sound Standard**[6]	**Local Ordinances**[7]	**RPS**[8]	**RPS In-State "Tilt"**[9]	**REZ**[10]
Texas	10,135	Local	Projects must register with PUC (S)		Dillon's				Model	Model	2	M	M	Y
California	3,599	Local	California Environmental Quality Act (S)		Dillon's	Y					6	M	L	Y, WREZ
Iowa	3,675	Both (>25MW)	Certification from Iowa Utilities Board (>25MW)	Y	Home	Y					5	M	U	RGOS
Minnesota	2,518	State (>5MW)	Permit from PUC (>5MW) (P)		Dillon's	Y		Y		Y	2	M		RGOS
Illinois	2,436	Local	DNR (S)		Home						5	M	LR	RGOS
Washington	2,356	State (>350MW)	Site Certification Agreement from Energy Facility Site Evaluation Council (>350MW) (P)	Y	Dillon's	W						M	DR	GBS, WREZ
Oregon	2,305	State (>105MW)	Certification from Energy Facility Siting Council (>105MW) (P)	Y	Home	Y					1	M	BR	GBS, WREZ
Oklahoma	1,482	Local			Dillon's							G	M	
North Dakota	1,424	State (>0.5MW)	21 State Agencies notified (S)		Dillon's	Y					3	G		RGOS
Wyoming	1,412	State (±30 turbines)	Permit from Industrial Siting Council (±30 turbines) (P)	Y	Dillon's	Y			Y					WREZ

[1] See all table notes at the end of Table 1, on page 10. See Appendix A for more detailed information about each state's practices.

Table 2 (Continued): Summary of State Wind Siting and Zoning Practices
(Top Ten States, Ranked by 2011 Installed Commercial Wind Generating Capacity in MW)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
State	**MW Installed[1]**	**Primary Authority (Limit)[2]**	**Primary (P) or Secondary (S) State Authority**	**State Energy Siting[4]**	**Primary Rule[3]**	**Evaluation Criteria[5]**	**Voluntary Guidelines[5]**	**Model Ordinance**	**Setback Standard[6]**	**Sound Standard[6]**	**Local Ordinances[7]**	**RPS[8]**	**RPS In-State "Tilt"[9]**	**REZ[10]**
New York	1,349	Local	CPCN from PUC (>80MW) (S)		Dillon's	Y	Y	Y	Model	Model	1	M	L	
Indiana	1,339	Local	CON from URC (S)		Home						13	G	L	RGOS
Colorado	1,299	Local	CPCN from PUC (>2MW) (S), PUC consults with Division of Wildlife (S)		Dillon's	Y						M	BL	Y, WREZ
Kansas	1,074	Local			Dillon's		YW				3	M	B	

1. Responsibility for siting and zoning and certificates of necessity: state, local, or both

The factors summarized here are entered in Table 1, columns 3, 4, and 5. Column 3 indicates whether the primary wind siting and zoning authority in the state rests with the local government, state government, or both. The primary decision-making authority resides with local governments in 26 states and state governments in 22 states. Florida and Iowa have shared local and state responsibility. Column 4 includes a "(P)" to indicate a state agency has primary siting authority. Many states have a clearly defined secondary authority, as indicated by "(S)" in column 4. Often the secondary authority is responsible for determining whether a proposed wind-park meets the standards necessary to be granted a certificate of public convenience and necessity, or the equivalent. Secondary authority is frequently not explicitly for siting or zoning, but approvals from a primary siting and zoning authority can be one criterion needed to obtain approval from a secondary authority. If there is a state agency responsible for energy facility siting other than the state's public utility commission (PUC),[9] column 5 includes a "Y."

In six states plus the District of Columbia the PUC is responsible for siting and zoning utility-owned wind parks. The states include Kentucky, Minnesota, New Mexico (for facilities >300MW in capacity), North Dakota, Virginia (for facilities >100MW), and West Virginia.

Twenty-three states and the District of Columbia require a certificate from the PUC. This is typically called a "certificate of public convenience and necessity" (CPCN). It represents a determination by the PUC that the public good will be served by the construction and operation of a particular facility. CPCN hearings can include information about siting and zoning, and siting and zoning approval can be a prerequisite to a CPCN, but in many cases the CPCN approval is separate from siting and zoning approval. In those circumstances, a developer must obtain both siting and zoning approval from one agency and a CPCN from another. States requiring a CPCN from the PUC include: Alabama, Alaska, Arkansas, Colorado, Delaware, Hawaii, Indiana, Maryland, Minnesota, Mississippi, Nevada, New Mexico, New York, North Carolina, North Dakota, South Carolina, South Dakota, Texas, Utah, Vermont, Virginia, West Virginia, and Wisconsin. CPCN requirements are sometimes triggered only when a facility will be owned by a public utility, or when a facility is larger than some specific size (as indicated in Table 1, columns 3 and 4).

Eleven other states, indicated with a "Y" in column 5, have an energy facility siting authority that is separate from the PUC. These include: Connecticut, Florida, Maine, Massachusetts, Nebraska, New Hampshire, Ohio, Oregon, Rhode Island, Washington, and Wyoming. It is common for state energy facility siting to apply only to larger-capacity projects, but the limits triggering state authority range from as small as 1 MW in Connecticut and 5 MW in Ohio to as large as 300 MW in New Mexico and 350 MW in Washington. The limits are listed in columns 3 and 4. Commercial wind parks are most likely to be much larger than those smallest limits, but are often smaller than the largest limits.

No matter what criteria determine the dividing line between state and local authority, developers are prone to selecting the state or local government venue that they believe offers the greatest chance of siting and zoning success. Development plans for project size and location are quite likely to be adjusted to meet particular criteria. This issue has been addressed in a few states already, with policymakers reducing the project size limit that will trigger state review for wind projects (in Appendix A, see the *History of siting authority* reported for North Dakota and Ohio).

[9] Different states use different names for the state agency that is the public utility regulatory authority. The most common names used are "public service(s) commission" (PSC) and "public utility commission" (PUC), but several states use other names. In this paper, the generic term, PUC, is used to represent the relevant commission or board.

Whether or not it is stated explicitly in the state summaries in Appendix A, all relevant federal laws apply to wind siting and zoning decisions. Various federal agencies will have some authority, depending on the specific locations being considered. These include the following: Army Corps of Engineers (COE), Bureau of Land Management (BLM), Federal Aviation Administration (FAA), Federal Communications Commission (FCC), Environmental Protection Agency (USEPA), Fish and Wildlife Service (USFWS), and U.S. Military. In many circumstances, USEPA requirements are delegated to state (or sometimes local government) agencies. Illinois publishes this list of federal agency requirements, which is a good example for all the states:

(1) Federal Aviation Administration (FAA): (a) Determination of No Hazard to Air Navigation; (b) Notice of proposed construction (form FAA 7460-1); (c) Lighting plan; (d) Post-construction form (form FAA 7460-2).

(2) U.S. Fish and Wildlife Services (USFWS): Threatened and Endangered Species Act, Section 7 Consultation and Migratory Bird Act.

(3) U.S. Army Corps of Engineers (COE): (a) Clean Water Act: Section 404 - Discharge of Fill Materials; (b) Rivers and Harbors Act: Section 10.

(4) Federal Communications Commission (FCC): Microwave Studies.

(5) U.S. Environmental Protection Agency (USEPA): Spill Prevention, Control and Countermeasures Plan (SPCC Plan, 40 CFR112).

(6) U.S. Military: Determination of non-interference with flight operations and radar.

It is also common for state and county departments of transportation to have some oversight regarding wind-park construction, including plans for the delivery of components to the construction site, road use during construction, and the disposition of temporary roads after construction is completed.

2. A primary rule about local authority: Home Rule versus Dillon's Rule

In Table 1, Column 6 differentiates states into one of two types, according to the primary rule that governs state versus local authority: Home Rule and Dillon's Rule. The original difference would be found in the state constitution.

Home Rule states grant broad authority and autonomy to local governments. The essence of home rule is that local governments hold all authority that has not been ceded explicitly to the state or federal governments, through either the federal or state constitutions or by legislation. Alternatively, Dillon's rule generally holds that all authority not explicitly residing in the federal government is held by the state government, unless explicitly delegated to local governments through the state constitution or through state legislation. Therefore, Dillon's rule reinforces that some powers should be reserved by states in order to ensure equality for all.

In practice, though, Dillon's rule and home rule are not mutually exclusive. Legislatures in some Dillon's Rule states have explicitly authorized limited home rule for some local governments, usually counties but sometimes municipalities. Those states include Colorado, Illinois, Kansas, North Dakota, and Washington.[10] A general expectation might be that Home Rule states would tend to have local authority and Dillon's Rule states would tend to have state authority for wind siting and zoning. In practice, though,

[10] Richardson, undated; Sellers, 2010; USLEGAL.COM, *Dillon's rule law & legal definition* and *Home rule law & legal definition*, retrieved 22 Dec 2011 from http://definitions.uslegal.com/d/dillons-rule/ and http://definitions.uslegal.com/h/home-rule/.

Home Rule states are evenly split in terms of local versus state authority, but more Dillon's Rule states (20 of 31) have already delegated wind siting and zoning authority to local units of government.

3. Mandatory evaluation criteria, voluntary guidelines, model ordinances, setback and sound standards, and local ordinances

Data on these factors is included in Table 1, Columns 7 through 12. As shown in Column 7, 27 of the 50 states have published lists of the criteria that are used to evaluate wind siting and zoning decisions. Washington's criteria cover only wildlife protection concerns. For the other 23 states and District of Columbia, the survey did not discover any clear list of evaluation criteria.

Ten states have published voluntary guidelines for wind siting and zoning. Those states are indicated with a "Y" in Table 1, column 8, meaning general guidelines, a "W" meaning guidelines explicitly for addressing wildlife concerns, or both letters. The ten states include Arizona (explicitly for wildlife), Georgia, Kansas (including both a general guidelines and wildlife guidelines), Maryland (explicitly for wildlife), Michigan, New Mexico (explicitly for wildlife), New York (including both a general guidelines and wildlife guidelines), Rhode Island, South Dakota (including "natural and biological resources"), and Vermont. Table 3 indicates with a "Y" the major factors included in each state's guidelines. Michigan is the only state with guidelines for all the identified topics, but some (e.g., mitigation) are bare mentions, with no details about how the guideline might be implemented.

Table 3: Factors Included in State Wind Siting and Zoning Guidelines

State	Wildlife	Aesthetics	Birds	Bats	Noise	Setbacks	Mitigation	Decommissioning
Arizona	Y							
Georgia	Y	Y	Y	Y	Y			
Kansas	Y	Y	Y				Y	Y
Maryland	Y		Y	Y				
Michigan	Y	Y	Y	Y	Y	Y	Y	Y
New Mexico	Y		Y	Y				
New York	Y	Y	Y		Y	Y		Y
Rhode Island					Y	Y		
South Dakota	Y				Y	Y		Y
Vermont	Y		Y	Y				

Five states, labeled "Y" in Table 1, Column 9, have published model ordinances intended to guide local governments. They include Massachusetts, Minnesota, New York, Pennsylvania, Utah, and Virginia.

As shown in Table 1, columns 10 and 11, a handful of states have published setback standards, sound standards, or both. Both of these columns differentiate between mandatory standards, indicated "Y," and recommended or advisory standards for local government consideration, indicated "Model." As shown in Table 1, with the exceptions of Minnesota (mandatory sound standard only) and Wyoming (mandatory setback standard only), all of the other states identified in Table 1, columns 10 and 11, have either both mandatory or both model setback and sound criteria. Mandatory setback and sound standards are found in Delaware, Rhode Island, and Virginia. It is interesting to note that these are three states with little commercial wind energy activity. Model setback and sound standards exist for Georgia, Massachusetts, New York, Pennsylvania, Texas, and Utah.

Table 1, column 12, reports the number of local ordinances that have been discovered and included in a database being assembled by the National Renewable Energy Laboratory.

In addition to that information that is tabulated in Table 1, the survey reports in Appendix A identify two states that have published clear procedural steps for wind siting and zoning (Maine and North Dakota) and two that have published explicit standards for determining wind siting and zoning (Maine and Minnesota). The Maine and Minnesota standards are more than just lists of the criteria to be considered; they list both the criteria and how compliance with the criteria will be determined.

Also, six states report that efforts to better define wind siting and zoning practices are presently underway but incomplete. Connecticut is developing new regulations and presently prohibits acting on pending wind siting requests until the new regulations are adopted. Iowa and New York are developing new regulations based on each state's respective June 2011 legislation. Maryland has drafted but not yet implemented new voluntary guidelines that will cover more than the existing guidelines for wildlife only. Rhode Island is updating its guidelines and reports it might develop a model ordinance as a part of that effort. Texas, which presently has none, is developing guidelines.

4. Supporting policies: clean energy portfolio standards and goals, promoting in-state wind energy facilities, and renewable energy zones

As shown in Table 1, Column 13, 29 states and the District of Columbia have renewable energy portfolio standard (RPS) mandates (M), and eight states have renewable energy goals (G).[11]

Column 14 summarizes how 29 of the 37 states with RPS mandates or goals have policies intended to promote the development of in-state renewable resources, including wind parks.[12] Those policies are encoded with one, two, or three letter codes. In Column 14: "B" means a "bonus" credit for at least some in-state facilities; "D" means electricity must be delivered into the state (or "DR" means delivered into the region) in order to qualify as eligible to count for RPS compliance; "L" means a maximum limit on energy from out-of-state facilities or conversely a minimum limit (often called a "carve-out") on energy from particular kinds of in-state resources; "M" means a mandate for in-state generators; "R" means a mandate for regional generators (usually, in the territory served by a regional transmission organization, RTO); "S" means qualifying facilities must be in the service territory of a utility providing retail service in the state; and "U" means a mandate for a utility serving the state to own or contract for the qualifying renewable energy.

Only two states, Connecticut and Michigan, explicitly require utilities to demonstrate that their renewable energy procurement plans conform with their approved integrated resource plan (IRP) or renewable energy plan.

Another policy that indirectly supports wind-park siting and zoning is the development of renewable energy zones. This is reported in Table 1, column 15. Typically, a renewable energy zone (REZ) is identified through a planning process that includes a general review of wind resources and broad-based, regional land-use compatibility with wind-park development, combined with electric transmission system

[11] The distinctions between mandatory and voluntary RPSs are not always completely black and white. Many so-called mandatory programs include legislated circuit breakers or off ramps. See the details for each program at http://www.dsireusa.org/summarymaps/index.cfm?ee=1&RE=1, http://www.dsireusa.org/rpsdata/index.cfm, and http://www.dsireusa.org/summarytables/rrpre.cfm.

[12] RPS tilt policies are not the only means that states use to promote in-state renewable energy facility development. In addition to specific RPS rules or standards, all states offer at least some financial incentives for renewable energy. See: Database of State Incentives for Renewables & Efficiency, 2011, *Financial Incentives for Renewable Energy* [web page], http://www.dsireusa.org/summarytables/finre.cfm, retrieved 5 Jan 2012; and Hempling, Stanton, and Porter, 2011.

modeling and planning. In most REZ processes, once specific zones are identified, transmission will be built to interconnect the zone to electricity loads, in anticipation that wind-park development will follow.

States with explicit state-level REZ processes include California, Colorado, Michigan, and Texas. These are indicated with a "Y" in column 15. Many other states and utilities are participating in REZ-like transmission modeling and planning under the auspices of regional transmission organizations. The Midwest Independent [Transmission] System Operator (MISO) Regional Generation Outlet Studies (RGOS) have included Indiana, Illinois, Iowa, Michigan, Minnesota, North Dakota, Ohio, South Dakota, and Wisconsin, plus the Canadian province of Manitoba (MISO, 2011). The Western Renewable Energy Zone (WREZ) initiative includes Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming, the part of Texas near El Paso, the Canadian provinces of Alberta and British Columbia, and a small portion of northern Mexico in Baja California (Western Governors Association, 2009). In addition, the Gorge Bi-State Renewable Energy Zone is an initiative for six counties near the Columbia River in both Oregon and Washington (www.cgbrez.org/). The U.S. Eastern Interconnection States' Planning Council also includes a workgroup presently working on state energy zones modeling, for all of the states and Canadian provinces east of the Rocky Mountains (see http://communities.nrri.org/web/eispc/share-and-view-files-members/-/document_library/view/195538).

B. The nature of wind-park opposition and list of major concerns

But for public opposition, there would be little controversy about wind-park siting and zoning; technical best practices would determine siting and zoning decisions, and that would be that. Because of strongly held local concerns, though, public input frequently becomes an important or perhaps the most important factor in siting and zoning decisions. This is true for both macro- and micro-siting.[13]

It should be noted that when decisions are made by local siting and zoning authorities, the decisionmakers are most likely the neighbors of those who might be opposed. Those local decisionmakers are often elected officials, too, and there have already been experiences in some jurisdictions where voting for local officials turns on public sentiment about wind-park siting and zoning decisions. Therefore, the democratic process, with public input influencing the outcome, is of serious importance.

Wind-park siting opposition is sometimes characterized by pro-wind advocates and developers as a "not in my backyard" (NIMBY) attitude held by a small number of area residents who are most likely aggrieved because they are not going to benefit financially from land-lease payments. Although there can be a kernel of truth in this observation, academic researchers fault the NIMBY label for multiple reasons and find that anti-wind sentiments are more nuanced and complex (Devine-Wright, 2004, 2009; Devine-Wright & Howes, 2010; Eltham, Harrison, & Allen, 2008; Jegen & Audet, 2011; Jones & Eiser, 2009; Musall & Kuik, 2011; Hindmarsh, 2010; Mooney, 2010; and Wolsink, 2007a, 2007b).

Critiques of the NIMBY label are that it is overly simplistic and "pejorative" (Musall & Kuik, 2011, p. 3252). A precise definition of NIMBY "refer[s] to a situation in which someone has a positive attitude towards something in general but accompanies this with a motivation to oppose its installation locally, due to reasons of self-interest" (Wolsink, 2007, cited in Jones and Eiser, 2009, p. 4605). As Jones and Eiser (2011, p. 4605) explain, though,

> Many researchers have found that when defined strictly in these terms, NIMBYism is relatively rare and certainly is too simplistic to be used as a sole explanation for *all* local opposition to

[13] Macro-siting means the general location of a wind park. A macro-site can be thought of as the boundary that defines the overall areas that are inside and outside an area considered for wind-park construction. Micro-siting involves the detailed decisions about the placement of each wind turbine, the required access roads, and the necessary interconnections to the transmission or distribution grid. Micro-siting depends on many factors, including prevailing winds, technical features of the selected wind turbines, and the precise locations of homes and other buildings, property lines, exclusion zones, and setbacks around avoidance zones.

> proposed development [emphasis in original; references omitted]. … [A]n often incorrect and indiscriminate usage of the term has infused NIMBY with derogatory connotation and left it outdated and lacking explanatory value.

In the context of decisions about wind parks, such NIMBY self-interests most notably could include concerns about effects on property values, negative perceptions of visual impacts, and fears about noise and shadow flicker. Countervailing hypotheses about public opposition, however, identify a more complex "set of influential factors… [that] include [the] national political environment, local perception of economic impacts, social influences such as trust and institutional factors such as fairness and inclusiveness of the planning and execution of the project" (Musall & Kuik, 2011, p. 3253). In a public survey in Cardiff, Wales, Demski (2001, pp. 3-4) found that "opinions around wind farms were more complex and diverse compared to other technologies… [and] the majority of people… should not be classified as either *strong supporters* or *strong resisters* (of wind farms) and instead can be found somewhere in between these two positions." As Pasqualetti (2000, p. 385) explains, all kinds of energy facility developments can "encounter public resistance, especially where land is sacred, protected, scenic, or otherwise sensitive." In particular, he notes, siting a modern wind park changes the "out of sight, out of mind" relationship between people and energy production. Thus, researchers are finding that citizen concerns and opposition is guided by deep-seated issues involving competing land uses and attachment to place. These issues are most acute in circumstances where wind parks are proposed for areas with sufficient housing density that potential neighbors' concerns are heightened by the prospect of fairly close proximity among wind turbines and houses. These concepts and the associated lessons for public engagement and consultation are briefly explored in Part II.E of this report and revisited in the Summary and Conclusions.

When engaging in siting and zoning procedures, anti-wind groups and individuals arm themselves with information obtained from anti-wind web sites. Examples include AWEO (www.aweo.org), Industrial Wind Action Group (www.windaction.org), and National Wind Watch (www.wind-watch.org).[14]

Ubiquitous internet access among local activists facilitates the dissemination of anti-wind documents and thereby tends to focus all local anti-wind groups on the same basic issues and concerns. Table 4 summarizes many of the objections raised by opposition groups. In Table 4, *italic font* denotes recommendations for the role that each set of objections ought to play in siting and zoning decisions. Some of the concerns are not directly relevant to siting and zoning procedures, but experience with groups opposed to all kinds of locally unwanted land uses (LULUs) demonstrates that opposition groups typically raise every possible objection (Cockerill, Groothuis, & Groothuis, 2011, p. 10).

[14] Website home pages retrieved 12 Dec 2011.

Table 4: Typology of Anti-Wind-Park Arguments

Topics and Subtopics	Example of anti-wind characterization. *Siting and Zoning Relevance.*
Human Health, Nuisance, and Annoyance Factors Noise Infrasound Shadow flicker	"[W]ind farms produce a noise that's hard to comprehend and even more dangerous to live close to. The beating of the blades have not only their own throbbing sounds, but beat harmonically together to create a cacophony of audible confusion…" (Brougher, 2008). "[B]ased on our knowledge of the harmful effects of noise on children's health and the growing body of evidence to suggest the potential harmful effects of industrial wind turbine noise, it is strongly urged that further studies be conducted…before forging ahead in siting industrial wind turbines." (Bronzaft, 2011). "Dizziness (specifically, vertigo) and anxiety are neurologically linked phenomena. Hence the anxiety and depression seen in association with other symptoms near wind installations are not a neurotic response to symptoms, but rather a neurologically linked response to the balance disturbances people experience from shadow flicker or low-frequency noise... . Based on these health effects and hazards, turbines should not be placed within 1700 feet of any road or dwelling. Those living within 1/2 mile (2640 ft) should be apprised that they are likely to experience very bothersome levels of noise and flicker, which continue (though to a lesser degree) to a mile or more from the turbines." (Pierpont, 2005). *Wind parks should not be singled out for special noise criteria. Siting and zoning can apply noise criteria, but noise limits should apply equally to all sources. Separate consideration should be given to construction noise.* *It is a simple matter to calculate the precise locations and maximum annual duration of shadow-flicker effects. A siting standard can limit shadow flicker.* *Both noise and shadow-flicker complaints can be amenable to mitigation, and an escrow account subject to independent management by an objective, disinterested arbitrator can be established for this purpose.* *Neighbors should have the right to waive noise and shadow-flicker standards.*
Safety Ice-throw Blade failure Tower failure	"The bottom line is that ice, debris or anything breaking off the wind turbine blades (including the blades themselves) can impact a point almost 1,700 feet away from the base of the turbine" (Matilsky, 2011). "Especially in the mountainous sites or in the northern areas icing may occur frequently and any exposed structure – also wind turbines – will be covered by ice under special meteorological conditions. This is also true if today's Multi Megawatt turbines with heights from ground to the top rotor blade tip of more than 150 m can easily reach lower clouds with supercooled rain in the cold season, causing icing if it hits the leading edge." (Siefert, Westerhellweg, & Kroning, 2003). "[W]ind turbines are being whipsawed and hammered to pieces constantly, and the public is not being made aware of this real and present danger, for fear there will be a grass-roots uprising against it before they are saddled with [wind parks] and don't have any more say-so in the matter." (Brougher, 2008). *Tower failure for utility-scale turbines is characterized by vertical collapse (like a beverage can crushing when stepped on), rather than tipping over from the base. Tower construction standards should guide setback distances, rather than the remote possibility of tower tip-over.* *Ice throw and blade failure resulting in parts hurtling through the air are increasingly rare. Modern turbines are continuously monitored in real time and will shut themselves down if ice accumulates on blades. Ice shedding is thus almost exclusively limited to the zone directly underneath the turbine.*

Table 4 (Continued): Typology of Anti-Wind Park Arguments

Topics and Subtopics	Example of anti-wind characterization. *Siting and Zoning Relevance.*
Safety (continued) Ice-throw Blade failure Tower failure	*Setback distances of 1.5 times turbine height (tower plus blade) should be considered maximal. Neighbors should have the right to waive setback distances from "participating" buildings and property lines. Wind-park owners (and insurers) should be liable for damages caused by ice throw, blade failure, and tower failure. An escrow account should cover potential liability and decommissioning costs.*
Property Values Visual amenity Sense of place, of community Industrial appearance Tourism impacts	"The days on market was more than double for those properties inside the windmill zones. The sold price was on average $48,000 lower inside the windmill zones than those outside. The number of homes not absorbed (not sold) was 11% vs. 3%." (Luxemburger, n.d.). "There are people who can't sell their homes and are forced to rent other living accommodation and people who sell their homes to the wind energy companies at much reduced prices and then are 'gagged' from talking about any of the negative health effects" (Chevalier, n.d.). "The degradation these enormous sprawling industrial complexes bring to our cultural and visual resources is least understood. Our colleagues… describe West Texas today as an alien landscape where one can drive for miles and miles and miles (and miles) and see nothing but wind turbines. The nighttime experience is even more surreal with the blinking red lights." (Industrial Wind Action Group, 2005). *An escrow account should cover potential liability and decommissioning costs.*
Wildlife and Natural Features Avian mortality (birds and bats) Habitat destruction, fragmentation	"Where'd all the animals go? My guess is as far away from those things as they can get." (Brougher, 2008). "Save the Eagles International wishes to warn the international community about the threat that windfarms and their power lines represent for biodiversity. Unlike cars, buildings, and domestic cats, wind turbine blades and high tension lines often kill protected or endangered birds like eagles, cranes, storks, etc. Cumulatively and over the long term, 3.5 million wind turbines to be installed worldwide will cause the extinction of many bird species, some of them emblematic." (Duchamp, 2011). *Exclusion zones should be identified in concert with state and federal wildlife agencies based on the best available scientific information and pre- and post-construction monitoring. Mitigation measures should be identified and included in siting stipulations. Mitigation funds should be included in escrow accounts as necessary to ensure compliance.*
Energy Policy Capacity factor Emissions effects Integration costs Reliability	"The erratic nature of the wind means that turbines simply cannot supply the base load that other forms of generation do. Those other generators will continue to be needed to back up the wildly variable output of wind turbines, with the probability that in so doing these plants will actually emit more pollution for each kilowatt-hour they generate than if they were allowed to operate normally." (Roberson, 2004). "[S]ome reliable, dispatchable generating unit(s) must be immediately available at all times -- and operating at less than peak efficiency and capacity -- to "back up" the unreliable wind generation. The reliable, backup unit(s) must ramp up and down to balance the output from the wind turbines. … Wind turbines have virtually no 'capacity value.' Thus, electric customers pay twice: once for the wind energy and again for reliable capacity." (Schleede, 2005).

Table 4 (Continued): Typology of Anti-Wind Park Arguments

Topics and Subtopics	Example of anti-wind characterization. *Siting and Zoning Relevance.*
Energy Policy (continued) Capacity factor Emissions effects Integration costs Reliability	"Peak power… during the hottest summer months… [is] far more demanding on the power grid, yet the wind power available in the winter months… is on average greater than in the summer. That's a huge contradiction… . Nor can we store wind power… . So for the most part, winter winds and spring storms must either be wasted, or they will create surges which blow out the transformers, power equipment, and burn up their own generators, and set the grid back hundreds of millions of dollars, as has happened by wind surges in Oregon, and many times in Denmark, Germany, and other nations… ." (Brougher, 2008). "In high winds, ironically, the turbines must be stopped because they are easily damaged." (Brougher, 2008). "A nuclear plant is tens of times cheaper and thousands of times safer per [terawatt-hour] than gigantic air turbines will ever be – even if we learn someday how to prevent them from burning up, blowing the grid, and folding in half under a high wind load, and blending our birds with the landscape." (Brougher, 2008). *The only relevance to siting and zoning might be for substations and transmission facilities, which also need approvals. None of these other issues are siting and zoning issues, per se.*
Economic Development Subsidies Employment	"Tax avoidance – not environmental and energy benefits – has become the prime motivation for building 'wind farms.' … 'Wind farms' produce few local economic benefits and such benefits are overwhelmed by the higher costs imposed on electric customers through their monthly bills. … When the expected contribution of wind energy toward supplying US energy requirements is taken into account, wind energy is among the most heavily subsidized of all energy sources." (Schleede, 2005). "[I]nvestment dollars going to "renewable" energy sources would otherwise be available… for other purposes that would produce greater economic benefits. 'Wind farms' have very high capital costs and relatively low operating costs compared to generating units using traditional energy sources. They also create far fewer jobs, particularly long-term jobs, and far fewer local economic benefits. 'Wind farms' are simply a poor choice if the goals are to create jobs, add local economic benefits, or hold down electric bills." (Schleede, 2011). "[B]illions of [federal grant] dollars… – all of it exempt from federal corporate income taxes – is being used to fatten the profits of some of the world's biggest companies" (Bryce, 2011). *These are not relevant siting and zoning concerns.*

II. Best Practices for Wind Siting and Zoning Procedures

Table 5 briefly summarizes the best practices for wind siting and zoning procedures. The recommendations are influenced by practices in those states and several foreign countries where wind energy resources have been developed with what appears to be a minimum of regrets.

Of course to some extent, progress in wind energy development can reflect simply an abundance of wide-open spaces where turbines can be placed without affecting many citizens at all. As shown in Table 2, many of the states that are leading in installed wind energy capacity are in the Great Plains and West and have an abundance of rangeland and farmland, large land parcels, and sparse population density. Prominent examples include Iowa, North Dakota, Oklahoma, Texas, and Wyoming. On the other hand, there are several states that do have greater population density and more urban and suburban lands where wind development is also already substantial and growing. Prominent examples of those include Illinois, Indiana, Minnesota, and New York.

In any case, the recommendations presented here and in Part III reflect what has been gleaned from the survey of the states, a review of the literature, and the author's experience and best judgment.

Table 5: Best Practices for Procedures

Recommendation	Description
1. Develop procedures that result in clarity, predictability, and transparency	Jurisdictions with locations suitable for commercial wind development should anticipate interest and proceed to develop and publish siting and zoning procedures, principles, and guidelines.
2. Establish a one-stop, pre-submission consultation	Provide basic information for applicants in a single meeting, identifying and explaining the basics of all necessary permits and approvals.
3. Identify and map constrained and preferred wind energy development zones	Make available and accessible to the interested public GIS maps of exclusion, avoidance, and preferred development zones
4. Include preferred development zones in transmission plans	Begin modeling and planning for wind power interconnections in preferred development zones as soon as the zones are identified.
5. Prepare and make available guidelines for participants	Explain procedures and timelines for when, where, and how to participate in public hearings. Provide information about decisions already completed through rulemaking.
6. Prepare and make available for local siting and zoning officials guidelines, checklists, and model ordinances	Support local government decision makers by providing the best available technical resources.
7. Ensure the sequence for obtaining permits and approvals meets requirements to allow development of suitable projects	The sequence of events leading to approval or rejection of an application should entail a logical progression through the planning and design stages, prior to siting and zoning approval that allows construction to begin.

A. Develop procedures that result in clarity, predictability, and transparency

All involved parties benefit from procedures that are clear and predictable and lead to transparency in decision making. Procedures need to be spelled out in ample detail so that all participants can understand how to participate, and when and where participation is expected. Applicants should understand their responsibilities. This all sounds obvious, but experience shows that in too many circumstances procedures are not spelled out. Applicants and other participants often find it difficult to learn what is expected, the sequence of events and venues, and time frames needed to progress through the siting and zoning process.

At the outset, a lack of clarity can be blamed on the novelty of siting and zoning for a wind park. However, all siting and zoning officials can quickly learn about the general attractiveness of their jurisdiction for commercial wind energy development. Wind resource maps are readily available that are accurate enough for making general determinations about good, better, and best areas for commercial development (Wind Powering America, 2011). Jurisdictions with locations suitable for commercial wind development should anticipate interest and proceed to develop and publish siting and zoning procedures, principles, and guidelines.

B. Establish one-stop, pre-submission consultation for applicants

A best practice for siting and zoning is to establish a one-stop procedure for applicants, in the form of a pre-submission consultation (Rosenberg, 2008, p. 681). This means applicants will have an opportunity to meet once, with one or more of the responsible agencies. The goal is for the applicant to come away from the one meeting with a clear understanding of all the necessary permits and approvals needed. One-stop procedures can be difficult when coordination involves multiple levels of government, but good communications can still work towards this goal. If nothing else, at least the organization with lead responsibility for wind-park siting and zoning can have available for applicants a list of all permits and approvals, which specifies the criteria that trigger each requirement. For each permit or approval, the one-stop agency should be able to communicate all the basic information about each requirement, including the contact persons, procedures, sequence of approvals required, timelines, and where and how to obtain complete, detailed information.

Delaware, Florida, and Oregon have provisions for one-stop meetings with applicants. Florida and Oregon both have state level siting (although Florida's applies to other kinds of power plants, not wind parks). Delaware has primarily local siting and zoning for wind parks, but a one-stop state agency helps applicants understand all required permits.

C. Identify and map constrained and preferred wind energy development zones

Siting and zoning authorities should identify and communicate about constrained and preferred development zones; in preferred areas development would be encouraged, and in constrained areas, the opposite. Information about these zones should be available in geographic information system (GIS) format. Examples of constrained zones include areas already identified as important to the life-cycle of endangered species, areas of particular historical or archeological importance, and wetlands, and can take two forms: exclusion zones and avoidance zones. Exclusion zones are known to be off limits, and avoidance zones are places where development deserves extra caution. Many government agencies that have what is effectively veto power over siting and zoning already have maps in GIS format, showing areas that are either exclusion or avoidance zones. Basic mapping information should be available, identifying constrained zones and the relevant buffers around the constraints (Great Lakes Wind Collaborative, 2011, *Best Practice #11*).

Such maps will not be a complete substitute for ground-truth assessments of specific locations, but they can go a long way towards helping all parties to avoid wasting time and resources on the evaluation of locations that will ultimately prove to be unavailable for development. Where jurisdictions have made

determinations about setback (i.e., buffer) distances, those can also be clearly communicated. All interested parties should be able to use the available maps to understand both macro- and micro-siting. As Rosenberg (2008, p. 681) explains, such maps serve to "highlight actual and potential conflicts between wind power projects and listed sensitive lands." "Hopefully," he notes, "projects could be planned to avoid these areas and if [wind power projects] were proposed for sites in the vicinity of such areas, potential adverse impacts could be mitigated through careful project planning."

Preliminary examples of this type of mapping capability are available from the Great Lakes Wind Collaborative (GLWC, http://erie.glin.net/wind/, retrieved 9 Jan 2012) and Vermont Energy Atlas (www.vtenergyatlas.org, retrieved 20 Jan 2012). The GLWC GIS system for eight states and two Canadian provinces assembles many different GIS map layers already available from various sources. It demonstrates a system that can facilitate identifying areas of concern. The Vermont atlas system does not yet include information about constrained zones, but it does demonstrate excellent ease of use and presents much practical information.

Similarly, if state or local jurisdictions have identified preferred development zones, information about those areas can be made available in map form. For example, several states are engaged in identifying renewable energy zones to receive special treatment for transmission expansion (see Table 1, Column 15). Also, some states have identified renewable energy resource development as a priority use for brownfield redevelopment (for example, New Jersey Statute § 40:55D-66.11, 31 Mar 2009, *Wind and solar facilities permitted in industrial zones*, www.dsireusa.org/documents/Incentives/NJ17R.htm). Colorado enabling legislation encourages county master plans to consider both "methods for assuring access to appropriate conditions for solar, wind, or other alternative energy sources… [and avoiding] areas containing endangered or threatened species" (Colorado Revised Statutes 30-28-106(3)(a)(VI)–(XI), www.michie.com/colorado). Similarly, Denmark directs its county governments to identify wind development zones (Danish Energy Agency, 2009, pp. 12-14).

Procedures for identifying areas for preferred development should ensure meaningful public participation and input, but once preferred development areas are selected, then information about those zones should be readily available to help guide developers.

D. Include preferred development zones in transmission plans

As discussed above, mapping preferred (and constrained) zones is recommended. With preferred zones, the mapping should, ideally, go one step further. Depending on the estimated wind power production from preferred development zones, the areas should be linked to and coordinated with transmission development plans (see Great Lakes Wind Collaborative, 2011, *Best Practices* #4 and #5). If the estimated production in a preferred development zone is substantial, wind parks will need to be interconnected to the electric transmission, rather than distribution, system. The determination of what capacity level is too big for the local distribution system needs to be done on a case-by-case basis: It depends on the design and operation of the existing distribution and transmission systems, and on nearby loads and generation.

Whatever interconnections will be required, whether to the distribution or transmission system or both, modeling and planning for interconnections in the preferred development zones should begin as soon as the zones are identified. The reason is that the entire process for transmission planning, design, and construction – including the transmission siting and zoning process – will often take much more time than the process for planning, designing, obtaining approvals, and constructing a wind park. As shown in Table 1, Column 15, 23 states are already engaged in procedures to identify wind energy resource zones, with those procedures linked to transmission planning. That includes 9 of the top 10, 16 of the top 20, and 21 of the top 30 states, in terms of wind capacity development.

E. Prepare and make readily available guidelines for participants

All participants need clearly understandable guidelines, so they can know ahead of time when to expect public hearings, what will be the substance of those hearings, and how to participate. Many participants will not be frequent participants in planning and zoning hearings. It certainly helps if they learn what is expected.

As shown in Table 4, wind-park opponents frequently raise issues that are not germane to siting and zoning hearings. It is best for everyone concerned if clear, complete information is provided, prior to public hearings, to explain which venues will be addressing which subjects. Where guidance or regulations exist, those should be made clear. For example, California legislation establishes restrictions for tower height, parcel size, setbacks, and noise level, and prescribes practices for public notice of applications and hearings (Assembly Bill 45 of 2009; see Database of State Incentives for Renewables & Efficiency, *California – County Wind Ordinance Standards*, retrieved 22 Dec 2011 from www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA61R&re=1&ee=1).

Maine has spelled out the sequence of procedures that apply to wind siting and zoning but does not include the expected timelines.

Ohio mandates public information meetings prior to "filing an application to build a new facility." These are not formal public hearings, which take place after an application is filed. The purpose for a public information meeting is "to inform stakeholders about plans to file an application… [and] as an opportunity to gather public input and hear the public's concerns, which the company considers in developing its application." (Ohio Power Siting Board, 2010, http://www.puco.ohio.gov/emplibrary/files/OPSB/Presentations_Manuals/OPSBbrochure2010.pdf).

There is no conclusive evidence that educational meetings will reduce public concerns or opposition. On the other hand, there is reason to believe that public opposition increases and festers if people feel, rightly or wrongly, that procedures do not provide adequate opportunities for public concerns to be aired and addressed. (See, for example, English, pp. 307-08, and Huber & Horbaty, 2010, pp. 50-51.) In fact, there is extensive literature about public engagement and participation in all kinds of land use and technology decisions, and explicitly about wind parks (see, for example: Agterbosch, Meertens, & Vermeulen, 2009; Hindmarsh, 2010; Koebel, 2011; Jones & Eiser, 2009; Mazur, 2007; Sovacool, 2009; Toke, Breukers, & Wolsink, 2008; and Wilson & Grubler, 2011).

F. Prepare and make available for local siting and zoning officials guidelines, checklists, technical resources, and model ordinances

States should consider providing technical documents to help support local government decision makers. This is important for states that have a shared or exclusive local government responsibility for wind siting and zoning, and wherever state rules do not supersede or at least constrain local authority.

It is important to recognize that local authorities might not be familiar with wind siting and zoning. It is certainly not likely that any particular local authority will come to their job with a background in wind siting and zoning. As with many issues facing local governments, specialized education is often needed to arm local governments with the tools necessary to guide decisionmaking.

As Rosenberg (2008, pp. 674-75) notes, there is a concern that "[l]ocal zoning decisions can be little more than project 'popularity contests' driven by the prevalent popular sentiment." And, he points out, the generally rural local governments that are most likely to receive proposals "often have limited resources" and can be lacking the "extensive planning resources or personnel… to evaluate wind power siting proposals." Therefore, Rosenberg (2008, pp. 675-76) prescribes "an attitude of 'shared responsibility'" between state and local governments. He recommends "provid[ing] local governments, planners and

citizens with expert state-level guidance… .” This approach can include “voluntary guidelines, checklists, and technical resources… to aid [local governments] in their evaluation of siting wind projects.”

As shown in Table 1, columns 7 through 11 report on the kinds of information discussed here. Twenty-seven states have published evaluation criteria that support wind siting and zoning. Those are frequently environmental protection criteria, though, rather than explicit wind siting and zoning criteria, and apply to all construction projects. Ten states have published voluntary guidelines for wind parks, but three of those are exclusively guidelines for wildlife and habitat protection. Ten states have model ordinances and six states have model standards for setback and sound. Although many states have one or more of these documents available, only Georgia, Michigan, and New York have provided both voluntary guidelines and model ordinances. Only three states (Delaware, Rhode Island, and Virginia) have published mandatory rules about both setback and sound. Minnesota has a sound standard and Wyoming has a setback standard.

G. Ensure that the sequence for obtaining permits and approvals meets requirements to allow development of suitable projects

Procedures should allow for suitable projects to obtain all required approvals. The sequence of events leading to approval or rejection of an application should entail a logical progression through the planning and design stages, prior to siting and zoning approval that allows construction to begin.

For example, at least one state agency requires a project application to include certification that the project complies with all applicable land-use ordinances and a copy of a final interconnection agreement. At least some developers might hesitate to spend as much as sometimes can be required to obtain a final interconnection agreement, unless and until they are certain the project is approved.

Also, power purchase agreements (PPAs) could require developers to demonstrate that a project has the requisite control over the property planned for development (that is, land leases), siting and zoning approval, sufficient progress towards obtaining an interconnection agreement, and the financial wherewithal to complete construction and enter into commercial operation in a reasonable time period. If those are requirements for the sale of wind-generated electricity, then the siting and zoning approval cannot be contingent upon obtaining the PPA.

III. Guidelines for Implementing Wind-Park Siting and Zoning Criteria and Setback Distances

This part of the report reviews the many criteria that are addressed in wind-park siting and zoning, and provides guidelines based on the best available information about each criterion. As already mentioned (see p. 2), best practices are subject to refinement over time, as more knowledge is gained and as wind generator technologies change and improve. Table 6 summarizes the recommendations included in Part III.

Table 6: Wind-Park Siting and Zoning Criteria, Recommended Approaches and Setback Distances

Criterion	Recommended approach
Noise, sound, and infrasound	• Noise standards should allow some flexibility. • Noise standards should vary depending on the area's existing and expected land uses, taking into account the noise sensitivity of different areas (e.g., agricultural, commercial, industrial, residential). • Determine pre-construction compliance using turbine manufacturer's data and best available sound modeling practices. • Apply a planning guideline of 40 dBA as an ideal design goal and 45 dBA as an appropriate regulatory limit (following Hessler's proposed approach, 2011). • Allow participating land owners to waive noise limits. • Establish required procedures for complaint handling. • Identify circumstances that will trigger, and techniques to be used for: (a) mandatory sound monitoring; (b) arbitration; and (c) mitigation. • Do not regulate setback distance; regulate sound.
Shadow flicker	• Restrict to not more than 30 hours per year or 30 minutes per day at occupied buildings. • Allow participating land owners to waive shadow-flicker limits. • Allow the use of operational practices and mitigation options for compliance. • Do not regulate setback distance; regulate the duration of shadow flicker.
Ice throw	• Authorize demonstrated ice control measures. • Require wind park to provide insurance and escrow funds to ensure compensation for proven damages resulting from ice throw. • Do not regulate setback distance; regulate ice throw.
Wildlife and habitat exclusion zones	• Responsible wildlife protection agencies should use the best available scientific knowledge and data to determine exclusion and avoidance zones and appropriate buffers (that is, setback distances) beyond those zones. • Permits should specify required pre-, during-, and post-construction monitoring. • Permits should specify how mitigation requirements will be determined and what mitigation techniques will be considered. • Regulate setback distances as required by responsible wildlife protection agencies and do not authorize siting in exclusion and buffer zones.
Aesthetic requirements	• Require neutral paint color and minimal signage. • Require the minimum of nighttime lighting necessary to achieve FAA compliance. • Require that realistic visual impact assessments, accessible to the public, be included in wind park planning and applications. • Manage visual impact through setbacks and exclusions from critical competing land uses.

Table 6 (Continued): Wind Park Siting and Zoning Criteria, Recommended Approaches and Setback Distances

Criterion	Recommended approach
Critical competing land uses	• Map as excluded zones any special cultural, anthropological, "sacred" lands, and highly valued scenic vistas. • Apply reasonable setbacks from non-participating property lines, occupied buildings, scenic vistas, and transportation and utility rights of way. • Allow participating properties to at least partially waive setback requirements from property lines and occupied buildings, in writing.
Permit requirements for met towers, construction, and facility safety	• Predetermine requirements and simplify procedures for approving meteorological (met) towers. • Regulate heavy construction requirements the same as any other heavy construction project, using the regulatory permitting system (e.g., for stormwater, surface water, transportation, noise, and wetlands permits). • Check for all required approvals for potential interference with radio and TV reception or radar. Provide for testing and mitigation of radio and TV interference problems that do occur. • Regulate structural safety (against, e.g., tower tip-over or blade failure) through construction codes, combined with minimal setback requirements. • Regulate facility safety (e.g., preventing climbing towers, ensuring electrical safety, providing fencing around electrical gear).
Decommissioning	• Set clear requirements for what triggers and what constitutes decommissioning and restoration or reclamation. • Establish a decommissioning escrow fund, to ensure adequate resources will be available at the end of a project's useful life or in the event the development fails.
Dispute resolution and mitigation	• Establish procedures for dispute resolution and mitigation.

A. Avoiding or mitigating public health and safety, nuisance and annoyance issues

Ellenbogen et al. (Jan 2012, p. ES-5) report, based on their independent review of the best available literature, that a "self-reported 'annoyance' response appears to be a function of some combination of the sound itself, the sight of the turbine, and attitude towards the wind turbine project."

The Ellenbogen et al. study (Jan 2012, p. ES-7) concludes:

> There is no evidence for a set of health effects, from exposure to wind turbines that could be characterized as a "Wind Turbine Syndrome." … [T]he weight of the evidence suggests no association between noise from wind turbines and measures of psychological distress or mental health problems. … None of the limited epidemiological evidence reviewed suggests an association between noise from wind turbines and pain and stiffness, diabetes, high blood pressure, tinnitus, hearing impairment, cardiovascular disease, and headache/migraine.

But the same researchers (Jan 2012, p. ES-11) recommend "an ongoing program of monitoring and evaluating the sound produced by wind turbines… [including] more comprehensive assessment of wind turbine noise in populated areas." "Such assessments," they report, "would be useful for refining siting guidelines and for developing best practices… ."

In any case, some people really do get upset by the idea of, or the actual fact of, wind turbines being built nearby. As opponents in a siting and zoning process, they have a tendency to raise every argument they can think of to help dissuade officials from approving projects. (See Table 4).

The following materials address the significant concerns that are raised about public health, safety, nuisance, and annoyance issues. Not included in this list are electromagnetic field (EMF) effects and stray voltage. Those subjects should be regulated by other agencies, typically the PUC, and are not germane to siting and zoning decisions.

Some research suggests that wind-park opponents are affected by a "nocebo" effect, which is essentially the opposite of a placebo effect (see the Skeptic's Dictionary, http://skepdic.com/nocebo.html, retrieved 27 Dec 2011). One widely cited study (Pedersen, Bouma, Bakker, & van den Berg, 2008) finds evidence of a nocebo reaction, among neighbors with no financial interest and an anti-wind-park predisposition. Ellenbogen et al. (Jan 2012, p. ES-8) state somewhat the reverse of this assessment. They find:

> Effective public participation in and direct benefits from wind energy projects (such as receiving electricity from the neighboring wind turbines) have been shown to result in less annoyance in general and better public acceptance overall.

The next few sections of this report: (1) address noise, sound, and infrasound; (2) shadow flicker; (3) ice throw; and (4) pre- and post-construction monitoring of noise, sound, and infrasound.

1. Noise, sound, and infrasound

As can be inferred from dictionary definitions: (a) "noise" means sound that humans perceive as generally loud, unpleasant, unexpected, or undesired; "noise" means sounds that are disturbing; (b) "sound" means simply the sensations that can be perceived by the sense of hearing; and (c) "infrasound" means "a wave phenomenon of the same physical nature as sound but with the frequencies below the range of human hearing" (*Merriam-Webster Dictionary*, retrieved 24 Jan 2012 from http://www.m-w.com/dictionary/). Sound pressure is measured in decibels (dB), using a device called a sound level meter. Decibels are measured using either an "A-weighted" scale (dBA, sometimes written "dB(A)") or "C-weighted" scale (dBC, or "dB(C)"). The A-weighted scale is intended to measure the sounds as they are subjectively perceived by the human ear. The C-weighted scale is highly sensitive to low-frequency sound and is therefore normally used to evaluate sources where the low-frequency content of the sound is prominent or dominant. The C-weighted scale was developed to assess sound levels more commonly associated with occupational exposures. Environmental noise limits are commonly expressed solely in terms of A-weighted decibels.

Ellenbogen et al. (Jan 2012, p. ES-6) reviewed the best available reports on noise, sound, and infrasound. They conclude:

> [I]t is possible that noise from some wind turbines can cause sleep disruption. … A very loud wind turbine could cause disrupted sleep, particularly in vulnerable populations, at a certain distance, while a very quiet wind turbine would not likely disrupt even the lightest of sleepers at that same distance. But there is not enough evidence to provide particular sound-pressure thresholds at which wind turbines cause sleep disruption. Further study would provide these levels. … Claims that infrasound from wind turbines directly impacts the vestibular system have not been demonstrated scientifically. Available evidence shows that the infrasound levels near wind turbines cannot impact the vestibular system.

Hessler (2011, pp. 11-12) reports:

> [A]ny noise limit on a new project must try to strike a balance that reasonably protects the public from exposure to a legitimate noise nuisance while not completely standing in the way of economic development and project viability. It is important to realize that regulatory limits for other power generation and industrial facilities never seek or demand inaudibility but rather they endeavor to limit noise from the source to a reasonably acceptable level either in terms of an absolute limit (commonly 45 dBA at night) or a relative increase over the pre-existing environmental sound level (typically 5 dBA19). … [T]he rate of adverse reaction comes down to a handful of individuals or very roughly about 4 to 6% when residences are exposed to project sound levels in the 40 to 45 dBA range. … [T]he vast majority of residents living within or close to a wind farm have no substantial objections to project noise, particularly if the mean sound level is below 40 dBA. …While the possibility of annoyance, if not serious disturbance, can almost never be completely ruled out, it appears that the total number of complaints would be fairly small as long as the mean project level does not exceed 40 dBA.

The inconsistency in reactions to wind turbine and wind-park noise makes it difficult to establish any absolute criteria that siting and zoning officials could use in all circumstances. Hessler (2011, p. 21) explains:

> [T]he exact reaction to any project can never be predicted with certainty because project noise is often audible to some extent, at least intermittently, far from the project. However, the studies of response to wind turbine noise… suggest that the threshold between a mild or acceptable impact and a fairly significant adverse reaction is a gray area centered at 40 dBA.

However, observations of neighbors' reactions to newly operational wind farms suggest that it is not necessary to rigidly impose a maximum noise level of 40 dBA in order to avoid complaints. Hessler (2011, p. 12) recommends 40 dBA as an *ideal* design goal, if it can reasonably be achieved, but 45 dBA as an appropriate regulatory limit. Adverse reactions to wind turbine noise between 40 and 45 dBA are still quite low, at roughly 2 percent of wind-park neighbors, even in rural environments with low background levels.

As with siting and zoning for other activities, the social good produced from the activity needs to be weighed against any local disturbances, including annoyances and nuisances. As with the siting and zoning of any other legal activity, the appearance of complaints, even more so the potential for complaints, is not reason enough for denial. From a legal standpoint, the preponderance of available evidence leads to the conclusion that noise requirements for wind turbines should be the same as those applied to any other legal activity that could be sited or zoned in the same jurisdiction.

Noise standards should also allow some flexibility because of the highly variable nature of both background noise and wind turbine noise. No single incursion beyond the noise standard should force abandonment of a wind park. The wide variability in wind turbine sound propagation makes it impractical to require absolute compliance with this kind of limit. Hessler (2011, pp. 35-63) provides detailed guidance for post-construction testing procedures.

The noise standard should allow micro-siting and construction based on the best available data on noise generated by the turbines planned for installation and modeling of the local conditions. It is also important to allow participating property owners to waive noise limits, in writing.

In approving wind-park construction, the siting and zoning permit should establish clear procedures to be invoked if there are complaints about noise. The wind-park owners and operators should have the opportunity to mitigate any confirmed problems, using any combination of operational and technical changes. For example, Leung & Yang (2012, p. 1037) identify opportunities to "significantly" reduce wind turbine noise "by putting obstacles in the [sound] propagation path." These researchers also report a promising experiment where an "optimized… or serrated blade" noticeably reduced wind turbine noise.

As Ellenbogen et al. (2012, p. ES-11) propose, "If noise control measures are to be considered, the wind turbine manufacturer must be able to demonstrate that such control is possible."

Ellenbogen et al. (2012, p. ES-11) also recommend "an ongoing program of monitoring and evaluating the sound produced by wind turbines… [including] more comprehensive assessment of wind turbine noise in populated areas… ." They elaborate:

> These assessments should be done with reference to the broader ongoing research in wind turbine noise production and its effects, which is taking place internationally. Such assessments would be useful for refining siting guidelines and for developing best practices… .

North Dakota Department of Transportation (NDDOT, 2011, pp. 1, 6-7), as the state's policy for "implementation of the requirements of the Federal Highway Administration (FWHA) Noise Standard at 23 Code of Federal Regulations (CFR) Part 772," identifies and categorizes lists of specific, "noise sensitive land uses." These cover everything from areas where "serenity and quiet are of extraordinary significance and serve an important public need" to "cemeteries, day-care centers, hospitals, libraries…" to areas where noise is expected and land uses are presumed to be "not sensitive to highway traffic noise" such as "agriculture, airports, … industrial, logging, … manufacturing, [and] mining… ." Similar guidelines could be produced for wind parks, or perhaps the guidelines for transportation projects could be adapted for application to wind-park siting and zoning.

2. Shadow flicker

Shadow flicker is defined as "alternating changes in light intensity that can occur at times when the rotating blades of wind turbines cast moving shadows on the ground or on structures" (Priestley, 2011, p. 2). The International Energy Agency (2010, p. 42) identifies shadow flicker as a nuisance.

The existence of shadow flicker depends on turbine micro-siting, with respect to the distance from the turbine and compass direction between the turbine and any surfaces of concern. Wind-park designers can model where shadows might fall on each day of the year (see, for example, Zephyr North, 2009).

Shadow flicker will affect any particular location only during either sunrise or sunset. The specific location is a function of the potential alignment between the sun, a wind turbine, and a receiving surface, Given the geometry of the potential alignment, and then depending on the latitude and tilt of the earth on its axis, the effect can happen for only a small number of days per year as the point in the horizon where sunrise or sunset appears changes, moving north or south by a small compass angle each day. Plus, on those several days and during the times when shadows could occur, the sky needs to be clear enough for the effect to be noticeable.

In their study, Ellenbogen et al. (2012, p. ES-7–8) determine:

> Scientific evidence suggests that shadow flicker does not pose a risk for eliciting seizures as a result of photic stimulation. … There is limited scientific evidence of an association between annoyance from prolonged shadow flicker (exceeding 30 minutes per day) and potential transitory cognitive and physical health effects.

Shadow flicker should be determined as a pre-construction activity. Reports can be provided so that the possible shadow effects on properties, buildings, and roadways can be understood. A reasonable standard can rely on micro-siting modeling to ensure that shadow flicker will not exceed 30 hours per year or 30 minutes per day at any occupied building. These are the most commonly used guidelines (Lampeter, 2011, pp. 5-14). However, the standard should also allow for property owners to waive the shadow-flicker maximum and for mitigation options, which could include changes in landscaping or window treatments to minimize concerns. It is even conceivable that a contract between a wind-park operator and property owner would provide for shadow-flicker limits through operational control, simply curtailing a particular

turbine during those times when shadow flicker would otherwise constitute a nuisance in excess of the local standard or some other agreed limit.

3. Ice throw

Ellenbogen et al. (2012, p. ES-8) report:

> In most cases, ice falls within a distance from the turbine equal to the tower height, and in any case, very seldom does the distance exceed twice the total height of the turbine (tower height plus blade length). … There is sufficient evidence that falling ice is physically harmful and measures should be taken to ensure that the public is not likely to encounter such ice.

These researchers (Ellenbogen et al. 2012, p. ES-12) also advise that any ice-control measures used to comply with permit requirements should be demonstrated by the wind turbine manufacturer.
Modern wind turbines that are planned for installation in climates where icing can be expected will have both physical characteristics and operational controls designed to minimize any concern about ice throw. Turbines are designed to stop rotating if ice builds up on blades, and some designs include blade heaters to shed ice. For siting and zoning purposes, it should be sufficient to review the plans for managing operations to minimize ice throw, and to require the wind-park owners to maintain liability insurance against the unlikely event that ice throw causes any damage or injury. Explicit setback requirements for ice throw should not be necessary.

4. Pre- and post-construction monitoring for public health and safety, nuisance, and annoyance issues

Since noise is one of the most common concerns for wind-park development, both pre- and post-construction monitoring should be considered for at least some facilities. Together, developers, communities, and siting and zoning authorities can determine which areas deserve special attention for pre-construction monitoring. Post-construction monitoring could be established only as a requirement for addressing noise complaints.

Hessler (2011, p. 25) proposes the pre-construction background-sound testing protocol:

> [A] long-term, continuous monitoring approach is needed in which multiple instruments are set up at key locations and programmed to run day and night for a period of about two weeks or more. In essence, it is necessary to cast a wide net in order to capture sound levels during a variety of wind and atmospheric conditions and provide sufficient data so that the relationship between background noise and wind speed can be quantitatively evaluated. … [I]t is highly preferable to conduct this type of survey during cool season, or wintertime, conditions to eliminate or at least minimize possible contaminating noise from summertime insects, frogs and birds. In addition, it is best for deciduous trees to be leafless at sites where they are present in quantity to avoid elevated sound levels that might not be representative of the minimum annual level. Human activity, such as from farm machinery or lawn care, is also normally lower during the winter. While summertime surveys can be successful they should, as a general rule, be avoided wherever possible because nocturnal insect noise, for instance, can easily contaminate the data and make it impossible to quantify the relationship between sound levels and wind speed.

As already mentioned, Hessler (2011, pp. 35-63) provides detailed guidance for post-construction testing procedures.

All interested parties should recognize the potential role of post-construction monitoring for at least some wind parks, to produce the information necessary to inform best practices. But it is not necessary for every wind park to be monitored. Modeling and testing are reliable enough to deduce the likely noise effects from studies of similar turbines, wind conditions, terrain, and setback distances.

B. Preventing harm to flora, fauna, and habitats

Operating wind turbines in particular locations can harm ecosystems. Of special concern has been the killing of birds and bats. Thus, siting and zoning standards typically include provisions designed to protect wildlife and wildlife habitat.

The role in siting and zoning is to require the appropriate reviews before approval is granted and before construction begins. Specific wildlife and habitat concerns will require some locations to be excluded from development. Examples include habitats known to be used by threatened or endangered species or migratory birds, and wetlands. Such exclusions or related restrictions are governed by federal and state environmental protection laws and regulatory agencies. Siting and zoning authorities should also require applicants to demonstrate compliance with and approvals granted by the relevant environmental regulatory agencies, before a siting and zoning application is considered complete.

Wildlife and environmental studies are routine but critically important components of due diligence for wind-park planning. Developers know these studies are integral to obtaining the approvals that will allow construction and operation, and lenders check the studies prior to approving wind-park financing. The last thing a developer wants is to find out, post construction, that there are problems that threaten long-term operations. In fact, a developer wants to find out about such problems as early as possible, before dedicating resources to prospecting and planning for an area that can later prove to be undevelopable.

The wind industry has taken many steps to understand wind and wildlife interactions and has already changed tower and turbine designs, operating practices, and macro- and micro-siting to avoid, prevent, or mitigate problems. The American Wind Wildlife Institute (AWWI) was formed in 2008-09, as a forum for wind developers and manufacturers to work with environmental and wildlife preservation organizations and experts "to provid[e] and shar[e] scientific information and tools to advance wind energy with respect for the environment" (www.awwi.org/about/ and www.awwi.org/about/founders.aspx [web pages], retrieved 7 Jan 2012). The National Renewable Energy Laboratory (n.d.) also maintains an on-line database of literature about wind and wildlife impacts.

Efforts to understand the nature and extent of interactions between wind turbines, wind parks, and wildlife and habitat are continuing (see Wind Powering America, 2011b). But, as Ewert, Cole, & Grman (2011, p.1) report, "much remains unknown" and there are interactions that are presently "inadequately understood." Thus, wildlife and environmental experts recommend a precautionary approach, combined with pre- and post- construction monitoring efforts, to provide the best available information that can be used to establish guidelines and perhaps translate to regulatory determinations. The U.S. Department of Interior, Fish and Wildlife Service is presently developing guidelines (www.fws.gov/windenergy and www.fws.gov/habitatconservation/wind.html [web pages], retrieved 7 Jan 2012).

These concerns are best managed by a combination of three practices: (1) identifying exclusion and avoidance zones based on the best currently available information about endangered and protected species and critical habitat; (2) requiring wildlife and habitat pre- and post-construction monitoring; and (3) mitigation requirements for circumstances where disturbance of important habitats cannot be avoided.

1. Wildlife and habitat exclusion zones

Exclusion and avoidance zones for wildlife and habitat should be determined by the state's responsible wildlife protection agency. As already mentioned, to the extent practical those zones should be identified and mapped ahead of time. In addition to any areas pre-identified, wind energy developers should consult with the appropriate wildlife protection agencies to determine whether areas targeted for development include any environmentally or culturally sensitive areas that should be avoided or buffered.

It is not important for the maps to publicly specify why each area has been identified. Exclusion and avoidance zones can be identified for a wide variety of reasons, including for example "environmental, cultural, and historic sites, which may include wildlife refuges, feeding areas of protected species, and sensitive federal, state, and private lands" (Michigan Wind Energy Resource Zone Board, 2009, p. 75). It is sufficient just to identify zones being excluded and indicate they are sensitive.

2. Wildlife and habitat pre- and post-construction monitoring

When a wildlife protection agency determines that wind-park construction will encroach on or border sensitive areas, the agency should have the ability to require pre-construction monitoring and reporting. Depending on the results of pre-construction monitoring, the agency should consider its ability to enforce any conditions on construction and operation. Among reasonable conditions, depending on the concerns identified, can be monitoring and reporting during and after construction.

For example, Kansas Department of Wildlife and Parks Wind Power Position Statement (quoted in www.fishwildlife.org/files/Kansas.pdf, retrieved 11 Nov 2011) declares:

> To support the study of and establishment of standards for adequate inventory of plant and animal communities before wind development sites are selected, during construction, and after development is completed. The resultant improvement in available knowledge of wind power and wildlife interactions obtained through research and monitoring should be used to periodically update guidelines regarding the siting of wind power facilities.

3. Mitigation and operating practices to minimize negative impacts

Kansas Renewable Energy Working Group guidelines (quoted in www.fishwildlife.org/files/Kansas.pdf, retrieved 11 Nov 2011) state:

> When it is impossible to avoid significant ecological damage in the siting of a wind power facility, mitigation for habitat loss should be considered. Appropriate actions may include ecological restoration, long-term management agreements, and conservation easements to enhance or protect sites with similar or higher ecological quality to that of the developed site.

Davis, Weis, Halsey, & Patrick (2009, p. 9) advise:

> For wind projects, as with any land development, the reality is that not all impacts can be avoided. Even with full efforts at avoidance and minimization, impacts often remain including bird and bat mortality and habitat loss and fragmentation. For this reason, it is essential to understand and evaluate impacts as well as assess the need for offsets and compensatory mitigation.

Parameters for these practices are determined by the relevant wildlife protection, environmental, and natural resources authorities, and will depend on the species impacted and the potential or actual problems identified. If problems are identified after construction, then it is appropriate to consider operational changes.

For example, some operational techniques presently being tested show promise for identifying the presence of birds or bats, or even the insects that birds or bats might feed on, thus allowing operators to control wind turbines to reduce bird or bat injuries and fatalities (see: Davis, Weis, Halsey, & Patrick, 2009; Deign, 2011; and Leung & Yang, 2012).

C. Aesthetics

Siting and zoning authorities frequently include aesthetic requirements in wind-park permits. These include factors such as the appearance of the turbines themselves, nighttime lighting, and other requirements to limit visual impact. From a siting and zoning standpoint, these requirements are not very different from those authorities impose on all kinds of decisions about signage, lighting, and setbacks for commercial properties.

An apparent consensus on best practices has been achieved on paint color and nighttime lighting. Although there could be continuing progress on both issues, the gist of the consensus is that paint colors should be neutral, so that the turbines blend into the landscape to a significant extent. FAA (Patterson, 2009, p. 9) has determined that towers painted white do not need any daytime strobe lighting to warn pilots. It is most common for permits to limit any signage or advertising. For example, Delaware (Chapter 80, Title 29, § 8060, http://delcode.delaware.gov/sessionlaws/ga145/chp147.shtml) requires:

> Wind systems shall be free from signage, advertising, flags, streamers, any decorative items or any item not related to the operation of the wind turbine. Electric wiring for the turbines shall be placed underground for non-building integrated systems.

Nighttime lighting can be minimized as much as practical while still meeting FAA requirements. Patterson (2009) explains the FAA requirements and how the FAA has worked to adjust its requirements for wind turbine lighting. Since nighttime lighting can be a nuisance for neighbors and an attractant for birds, bats, and the insects birds and bats might feed on, there has been interest on the part of wind turbine manufacturers, wind park developers, and the FAA to find the best means available to reduce negative impacts while keeping sufficient lighting to alert pilots of areas to avoid. The basic results are to limit turbine lights to the machines on the perimeter of a wind park and allow spacing of up to one-half mile between lighted turbines. Since 2009, in some circumstances and on a case-by-case basis, the FAA has even been able to approve a new obstacle collision avoidance system (OCAS) that reduces the need for lighting even further (Patterson, 2009, p. 13; PRNewswire, 2009).

Although many people might think of nighttime lighting as a minor issue, the FAA's responsiveness is a positive example of the way the wind energy industry and government regulators can work together to reduce negative impacts. As Patterson (2009, pp. 1-3) reports, FAA's goal has been "to make obstructions visible to airborne aircraft, while being as sensitive as possible to the surrounding environment." He reports that the FAA worked cooperatively with DOE to "[d]etermine the most effective and efficient technique for obstruction lighting of wind turbine farms… focused on Aviation Safety, with consideration for wildlife, surrounding communities, and industry... consistent [and] easy to implement."

Molnarova et al. (2012) surveyed residents in Central Bohemia, Czech Republic and reviewed 18 earlier studies to better understand public attitudes towards the visual impacts of wind turbines. They identify special concerns for "landscapes of high aesthetic quality." But they also note, similar to findings from other research on public responses to wind turbines, "The most important characteristic of the respondents that influenced their evaluation was their attitude to wind power" (Molnarova et al., 2012, p. 269). Their conclusion is that their survey research "provides a further argument for considerate planning of renewable energy… and for the use of public participation, factors known to improve public attitudes toward wind power" (Molnarova et al., 2012, p. 277, footnotes omitted).

State guidelines often include provisions designed to ensure that realistic visual impact assessments, accessible to the public, will be included in wind park planning and applications. Examples include Kansas guidelines (Kansas Energy Council, 2005, pp. 7-8) and those of Maine, New York, Vermont, and West Virginia (Vissering, Sinclair, & Margolis, 2011, p. 6). Completing visual impact assessments and making them accessible to the public should be considered a best practice. The required level of detail can be adjustable, though, to reflect the particular landscape, population density, and proximity to especially

valued scenic vistas. To some extent, the retention of high-concern scenic vistas will be managed by exclusion zones and setback criteria (discussed in Part III.D, which follows).

D. Critical competing land uses and setback distances

As previously mentioned, some areas should be excluded from consideration for wind turbine placement. Some important land uses could be so difficult or even impossible to maintain in close proximity to wind turbines or wind parks, that they should be considered off-limits. As already discussed, primary examples include important anthropological and cultural resources, significant wildlife habitats and natural resource areas, and areas with preexisting land uses that are especially noise-sensitive. Mapping such areas and making that data available to developers and the public is recommended (in Part II.C).

To some degree, impacts on residential property values can serve as a proxy for the determination of the appropriateness of a wind-parks siting, because perceived adverse impacts will likely emerge in proximate home sales prices. Wind-park opponents have claimed and frequently predict that home property values have been and will be negatively affected in the area of wind parks. Therefore, they sometimes argue, any areas near homes deserve to be excluded from wind-park development.[15]

Analyzing the possible effects of wind-park proximity on home values has been difficult due to the relatively small number of transactions near the turbines (e.g., within one mile). The most thorough available studies, however (see, e.g., Hoen, Wiser, Cappers, Thayer, & Sethi, 2011, which collected 125 transactions within one mile of existing turbines), have found no evidence of an impact on selling prices due to proximity to turbines in the period after wind-parks have been constructed and begin operation. That notwithstanding, there is some emerging evidence that the period after announcement but prior to operation might coincide with significant impacts to proximate property values (see, for example: Eltham, Harrison, & Allen, 2008, p. 29; Hinman, 2010; Hoen, Wiser, Cappers, Thayer, & Sethi, 2011, pp. 280-81; Koebel, 2011, p. 9). During this period, risks to proximate property values are highest because actual impacts are difficult to ascertain, and, therefore, to the degree that home buyers and sellers take a risk-averse stance, impacts might be present.

Moreover, as with other large industrial installations, public fears can be exacerbated by perceptions of secrecy in development plans. In an effort to reduce those fears and decrease the perceived risks, a number of steps can be taken in the development process. Those include open and transparent public planning and decision-making processes that include serious attention to public sentiments and concerns, effectively engaging all interested parties in collaborative, community-based planning, and expanded efforts to accurately explain the changes to the community due to the wind-park (see Part II.E).

Setbacks from turbines for homes and property lines are a corollary to the property value impact discussion. In part because of the nascent state of research on property value impacts, reaching consensus on setback distances has been difficult across the U.S. This has been exasperated by the myriad different land uses surrounding U.S wind parks. That notwithstanding, guidelines or mandatory requirements from a handful of states do converge on 1 to 1.5 times the turbine height (that is, tower plus blade length, or more accurately tower plus rotor and blade radius) from, for example, property lines belonging to non-participating land-owners, roads, power lines, and other rights-of-way. It is also not unusual for states to require further setbacks from residences. Examples include Delaware, Massachusetts, New York, Pennsylvania, Utah and Wyoming (see survey data for these states in Appendix A).

Pennsylvania's *Model Ordinance* recommends setbacks of 1.1 times turbine height from the nearest

[15] In many areas of the country in the recent past, it could have been difficult for casual observers to isolate the possible effects of wind-park proximity because of the pervasive backdrop of major declines in home values resulting from the so-called mortgage crisis: There could have been real, observable declines in housing values that had nothing to do with wind-park proximity.

occupied building, but adds,

> For non-participating landowners, "Wind Turbines shall be set back from the nearest Occupied Building located on a Non-participating Landowner's property a distance of not less than five (5) times the Hub Height."

Wyoming's law (*Article 5 – Wind Energy Facilities, Statute 18-5-504*) requires:

- A turbine must be sited at least 110% of its height from any property line "contiguous or adjacent" to the proposed facility, unless the property owner waives the setback distance, in writing.
- A turbine must be sited at least 110% of its height from public roads.
- A turbine must be 550% of its height and no less than 1000 feet away from "platted subdivisions."
- A turbine must be 550% of its height and no less than 1000 feet away from a residential dwelling.
- A turbine must be at least half a mile from city limits.

Two versions of setback criteria are reported as being common in Nova Scotia and Ontario, one for "on-site" and one for "off-site" (that is, for participating and non-participating) residences (Watson, Betts, & Rapaport, 2011, p. 2).

As previously mentioned, appropriate wind siting and zoning requirements, exclusion zones, and avoidance areas should depend on many factors. Setback distances tend to be used by siting and zoning authorities as an administratively simple means of addressing many concerns, including, for example, noise, shadow flicker, ice throw, wildlife and habitat, and aesthetic requirements.

Setback distances are also used to address two additional concerns, tower collapse or tip-over and blade failure. Both of these are rare occurrences, at least with respect to modern utility scale wind machines, and present evidence suggests that setbacks roughly equivalent to or modestly in excess of the turbine height offer sufficient protection against such risks. As with all other kinds of buildings and towers, to some extent construction codes and standards protect the public, which makes setback provisions for these purposes somewhat redundant.

Regulating setback distances is more convenient, in many ways, compared to directly handling the underlying issues through explicit decisions on a category by category basis. One virtue of setback distances is that once they are set they are easy to measure. But wind-park opponents frequently seek excessive setback distances, which they expect will prevent developers from trying to build a project in the area. If setback distances are based on arbitrary criteria, though, they are not likely to stand up to the scrutiny of a court challenge. It is better to establish minimal setback distances based on the few criteria where setback does appear to be justified, such as ice throw, and regulate all other determinations of distances by regulating the specific concerns as mentioned earlier, such as sound, shadow flicker, exclusion and avoidance zones for wildlife and habitat, and exclusion and avoidance zones for critical competing land uses. Given all of those restrictions, developers should be encouraged to work with host communities to establish a plan for macro- and micro-siting that will respect community desires and reduce the likelihood of post-construction problems.

E. Permit requirements for met towers, construction, and decommissioning

Siting and zoning authorities are also asked to approve requests to install temporary meteorological (met) towers. It is also common and appropriate for wind-park permits to be conditioned on meeting specific terms and conditions for construction and decommissioning.

For temporary met towers, jurisdictions with commercial-quality wind resources should predetermine the requirements and simply procedures for obtaining approvals. Criteria might include, for example, the maximum height for temporary met towers, a reasonable maximum duration (such as two years for data collection, plus reasonable set-up and take-down time), setbacks of at least tip-over distance from non-waived property lines and occupied buildings, and provisions for removal or replacement after initial data collection.

For construction, developers should enter into binding agreements with the appropriate authorities, ensuring that they will meet all requirements for minimizing negative impacts during construction. That is the same as for any other major construction project, with terms covering, for example, natural resource protection (e.g., wetlands, surface and storm water), noise, dust, and traffic.

Provisions for future site decommissioning and the restoration or reclamation of the land should also be included in permit requirements, and the decommissioning plan should be adopted as a binding contract between the developer and the relevant government authorities. The plan should describe what circumstances will trigger decommissioning, and the plan should be secured by an appropriate financial instrument (e.g., performance bonds, letters of credit or other corporate guarantees).

Rosenberg (2008, p. 684) relates:

> Of particular importance in the permitting process is the closure or decommissioning phase of the project's life cycle. At the conclusion of their useful life, wind power facilities must be disassembled and the site restored to its pre-construction conditions or other conditions specified in the permit. Wind project applicants must provide financial assurance to the state that these steps are properly funded... Having this financial assurance will prevent the unfortunate situation of localities having abandoned facilities in their midst without available resources to carry out proper decommissioning.

F. Dispute resolution and mitigation

Finally, in the interest of clarity, predictability, and transparency, a wind-park siting and zoning permit should include provisions for dispute resolution and mitigation. This is no different from any other major contract, which includes fair and foreseeable provisions for complaint or dispute resolution. It is helpful for all concerned to understand their responsibilities and the procedures to be followed in the event that disputes arise.

Summary and Conclusions

The beginning of this report observes that wind-park developers have a propensity to focus their efforts first on those areas with ample wind resources and few barriers to siting and zoning. The reverse is also true; developers will avoid areas with uneconomical or marginal wind resources and where siting and zoning barriers are difficult to overcome.

Prospective wind-park neighbors who are opposed to development are likely to cheer siting and zoning ordinances that have the effect of blocking construction in their environs. But siting and zoning authorities should recognize their responsibilities both to create ordinances that meet all legal requirements, and to consider how the costs and benefits of siting decisions will affect everyone in their jurisdiction, not only those who are most vocal. And, as Ellenbogen et al. (2012, pp. ES-11–12) observe,

> The considerations should take into account trade-offs between environmental and health impacts of different energy sources, national and state goals for energy independence, potential extent of impacts, etc.

Of course there are some areas that should be excluded and reasonable setback distances should be maintained for a variety of land use types, including occupied buildings, roadways, utility rights of way, and special wildlife habitats. Leung & Yang (2012, p. 1032) report:

> Though wind power has performed well in recent years, it also creates a strong environmental impact, such as noise, visual and climatic impact. Although these impacts seem minor when compared with fossil fuels, its effect on humans should not be overlooked, due to its potential great development in usage. It is necessary to figure these potential drawbacks out, especially their potential long-term effects, and to find solutions to them in order to retain the long-term sustainability of wind energy.

Rosenberg (2008, p. 665) acknowledges:

> Although there are many advantages to wind power, disadvantages exist as well. Every energy-producing technology contains pros and cons which must be evaluated by government policymakers, the public and private investors. With regard to wind energy, some of the associated adverse effects or disadvantages are inherent in the nature of wind power itself while others relate to the use of this technology at particular sites. In the end, judgments must be made balancing and comparing the positive features with the negative ones.

Rosenberg (2008, p. 669) also points out:

> As research and experience with wind power technology become increasingly available, it is possible to separate verifiable claims of harm from those without basis in fact.

The associated hope is that increased experience, and the wisdom derived from it, will help guide future siting and zoning decisions. In the meantime, however, siting and zoning authorities, government energy policy decision makers at every level, and competitive markets that help shape energy supply and demand all have roles to play in making decisions based on the best available information.

In any case, the energy policy issues of concern to wind energy proponents also deserve some consideration in siting and zoning decisions. Those issues include, for example: diversifying energy supply; reducing reliance on fossil fuels; conserving water; and reducing or eliminating air pollutants and greenhouse gas emissions. Some weight should also be given to the prospective economic benefits for rural landowners and rural areas and from wind energy manufacturing, construction, operations and maintenance (Rosenberg, 2008, pp. 659-665).

The precautionary principle can be a useful guide to decision makers, but wind energy opponents propose siting and zoning precautions based on one set of concerns, while proponents propose another set. Sunstein (2005, p. 93) observes:

> Much of the time… what is available and salient to some is not available and salient to all. For example, many of those who endorse the Precautionary Principle focus on cases in which the government failed to regulate some environmental harm, demanding irrefutable proof, with the consequence being widespread illness and death. To such people, the available incidents require strong precautions in the face of uncertainty. But many other people, skeptical of the Precautionary Principle, focus on cases in which the government overreacted to weak science, causing large expenditures for little gain in terms of health or safety. To such people, the available incidents justify a measure of restraint in the face of uncertainty. Which cases will be available and to whom?

As Sunstein explains, applying the precautionary principle requires decisionmakers to consider "margins of safety" and both the probability and magnitude of harm that might result from their decisions. Sunstein (2005, pp. 117-118) reasons:

> Let us suppose, too, that we will learn… over time. If so, we might elect to take certain steps now, on the basis of a principle of "Act, then learn." The steps we now take would not be the same as those that we would take if the worst outcomes were more probable, but they should be designed so as to permit us to protect against the worst outcomes if we eventually learn that they are actually likely. On this view, an understanding of what we do not know means not that regulators should do little, but that they should act in stages over time, adopting precautions that amount to a kind of insurance against the chance that the harm will be higher than we currently project in light of our current knowledge of both probability and magnitude. (footnote omitted).

Everyone needs to recognize that each wind energy macro- and micro-siting decision has fairly long-term ramifications. Once a turbine location is pinpointed, that decision has the effect of preventing another turbine from being placed any closer than a few rotor diameters away. Specific distances between turbines in a wind park will be determined based on exclusion and avoidance zones, siting and zoning setback requirements, and data regarding prevailing winds and technical aspects of the particular turbine and its blades. This does mean that siting decisions will have long-lasting effects in the landscape.

By the same token, everyone also needs to realize that wind turbine technology and operating practices continue to improve, so that the potential negative impacts and concerns raised by future machines could be fewer and smaller than those of today. This implies, at least to some extent, that there could be multiple paths to mitigation for decisions made today that result in significant concerns or complaints. Future mitigation could include, for example, replacing various important wind turbine components (such as blades, gearboxes, controls), or even whole turbines, with machines that are some combination of more reliable, quieter, and safer.

The important questions decisionmakers and policymakers can ask are: (1) Is there a middle ground that does not require compromises where everyone loses? and (2) Are there opportunities for improvement in wind-park siting and zoning procedures that are most likely to lead to a more rapid accumulation of the information and wisdom needed to guide future decisions?

Among researchers studying wind-park siting, there is at least some optimism regarding finding answers to these questions. For example: Wolsink (2007a) suggests that better solutions will be found through collaborative, community-based planning; Upham (2009) proposes that solutions might be found through focused attention on the field of environmental psychology; Sovacool (2009) advises attention to a broader research agenda about both social and technical aspects of decision making; and Sengers, Raven, & Van Venrooij (2010) recommend a concentrated study of news media and the potential role of news

media in public education regarding decisions about our energy future. Any and all of these paths might prove advantageous.

For the time being, the most sensible recommendation is for communities to work together to make decisions about future energy systems development, not only wind energy development, in their own local area. There are multiple paths to this goal, insofar as wind energy development is concerned. Some developers work extensively with host communities, prior to seeking siting and zoning approval, to create macro- and micro-siting plans that engender little, if any, public opposition. Some land owners associate and hire their own developers, so that the owners can directly guide decisions about setback distances and micro-siting. Some governments simultaneously develop specific plans that identify both areas where wind parks will be excluded or should be avoided, and also those areas where wind parks will be welcomed. Hindmarsh (2010, p. 560) holds that making good decisions about wind turbine siting requires "collaborative approaches," including "the technical mapping of wind resources… [and identifying] community qualifications and boundaries for wind farm location." He argues that community-based decision making is likely to result in "improved problem framing and decision making concerning wind farm location, and thus development." The goal, as Hindmarsh notes, is a process that will be perceived as legitimate and fair, and thus sustainable. Reaching that goal might be considered overly optimistic, but at least some communities have shown a willingness to give it a try. There is at least a good prospect that these approaches can reduce contentiousness and move towards consensus on how to guide wind-park siting and zoning.

At the outset, this report noted that wind-park siting and zoning presents serious challenges and that proposals frequently attract public opposition and are therefore contentious. History does show that public attitudes about any new technology are subject to change over time, as experience is gained. History reminds us of a similar controversy, where over 300 people vigorously protested construction of a local project which they called "useless" and a "grotesque monster." It was said that building it would be "a threat to public health, safety, and well-being." Such was part of the initial reaction to constructing the Eiffel Tower. (Gipe, 1995, pp. 252-55). Only time will tell how apt that comparison might be.

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Appendix A:
State Survey Reports

The Appendix is bound separately and is available as a PDF file at the following URL:

http://www.nrri.org/pubs/electricity/NRRI_Wind_Siting_Survey_Jan12-03A.pdf

Put It There! –
Wind Energy & Wind-Park Siting and Zoning
Best Practices and Guidance for States

Appendix A:
State Wind Siting and Zoning Survey

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January 2012
12-03

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- **Kai Goldynia,** from Okemos, Michigan, a sophomore studying History and Environmental Studies at Amherst College in Amherst, Massachusetts;
- **Francis Motycka**, from East Lansing, Michigan, a junior at The College of William and Mary, planning to double major in Economics and Government;
- **Lauren Teixeira**, from Silver Spring, Maryland, a sophomore at Grinnell College in Grinnell, Iowa; and
- **Marley Ward**, from St. Clair Shores, Michigan, a sophomore at the University of Michigan – Dearborn.

In addition, more than 100 individuals from all over the U.S. helped us check our survey work, including all those who helped identify the most appropriate in-state contact persons and especially those individuals listed as reviewers on the state survey reports.

The authors alone are responsible for any errors and omissions that remain.

Online Access

These survey reports can be accessed online via the National Regulatory Research Institute website at http://www.nrri.org/pubs/electricity/NRRI_Wind_Siting_Survey_Jan12-03A.pdf

Disclaimer

Table A-1: State Wind Siting and Zoning Survey Summary Table (26 Jan 2012)

State	NRRI Review Completed	Sent to State Contact(s)	Response from Contact(s)	Followup	Additional Edits	Complete
No. of Jurisdictions:	**51**	**51**	**39**	**6**	**5**	**39**
No. of Contacts:		**106**	**47**	**6**	**5**	**44**
Alabama	x	x	x			x
Alaska	x	x	x			x
Arizona	x	x	x	x	x	x
Arkansas	x	x	x			x
California	x	x				
Colorado	x	x				
Connecticut	x	x	x			x
Delaware	x	x	x			x
District of Columbia	x	x	x			x
Florida	x	x	x			x
Georgia	x	x	x			x
Hawaii	x	x				
Idaho	x	x	x			x
Illinois	x	x	x			x
Indiana	x	x	x			x
Iowa	x	x	x			x
Kansas	x	x	x			x
Kentucky	x	x	x			x
Louisiana	x	x	x			x
Maine	x	x	x	x	x	x
Maryland	x	x	x			x
Massachusetts	x	x	x			x
Michigan	x	x	x			x
Minnesota	x	x	x			x
Mississippi	x	x				
Missouri	x	x				
Montana	x	x	x			x
Nebraska	x	x	x	x		x
Nevada	x	x	x			x
New Hampshire	x	x	x	x	x	x
New Jersey	x	x	x			x
New Mexico	x	x	x			x
New York	x	x	x			x
North Carolina	x	x				
North Dakota	x	x	x			x
Ohio	x	x	x			x
Oklahoma	x	x	x			x
Oregon	x	x				
Pennsylvania	x	x	x			x

Table A-1: State Wind Siting and Zoning Survey Summary Table (26 Jan 2012)

State	NRRI Review Completed	Sent to State Contact(s)	Response from Contact(s)	Followup	Additional Edits	Complete
Rhode Island	x	x				
South Carolina	x	x	x			x
South Dakota	x	x	x			x
Tennessee	x	x				
Texas	x	x	x	x	x	x
Utah	x	x				
Vermont	x	x	x			x
Virginia	x	x	x	x	x	x
Washington	x	x	x			x
West Virginia	x	x	x			x
Wisconsin	x	x				
Wyoming	x	x				

The authors intend to continue efforts to update the survey reports, as needed, to keep them up to date. New information to update the survey results are welcome. Comments can be submitted to:

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State: Alabama

Wind siting basics: Investor-owned utilities providing retail electric service to the public must obtain a Certificate of Public Convenience and Necessity (CPCN) from the Alabama Public Service Commission (PSC) for construction of power generation facilities intended to serve the public. During its review, the Commission considers, among other things, the proposed facility location. However, the PSC has no specific siting authority over wind generation or generation facilities proposed by a non-regulated utility.

Other state entities that may have authority include: Alabama Department of Environmental Management; Alabama Department of Conservation and Natural Resources; local zoning authorities such as counties and cities; and circuit courts of the counties.

History of siting authority: The PSC does not have any history regarding the siting of wind turbines for the generation of power.

Approvals needed: Investor-owned utilities providing retail service to the public must obtain a Certificate of Public Convenience and Necessity (CPCN) from the Alabama Public Service Commission for construction of power generation facilities (Stemler, 2007).

Evaluation criteria: As part of its consideration of a regulated utility's request for a CPCN to construct a power generation facility intended to serve the public, the PSC reviews data rom the company, including: the type, location and cost of the proposed generation facility and related transmission facilities and upgrades; the company's existing and planned resources; the company's existing and forecasted reserve levels; and various demand and cost data germane to the request.

Public input: CPCN hearings are open to the public. In addition, any person or entity granted intervenor status may participate in the proceedings.

Relationships to other important energy policies or siting and zoning decisions: Alabama is a fully regulated market for retail electric service. Utilities under the jurisdiction of the PSC have a legal duty to maintain their facilities and proper reserve levels in order to render adequate service to the public and as necessary to meet the growth and demand of the service territory.

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Citations and links:

Edison Electric Institute. (2004). *State Generation & Transmission Directory: Agencies, Contacts, and Regulations*. www.eei.org/ourissues/ElectricityTransmission/Documents/State_Generation_Transmission_Siting_Directory.pdf.

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Data gathered by Deborah Luyo, 3 Nov 2011
Reviewed by John Free, 25 Jan 2012.

State: Alaska

Wind siting basics: The Regulatory Commission of Alaska (RCA) issues a Certificate of Public Convenience and Necessity to any utilities and independent power producers in the state. The RCA is not involved in siting activities. Depending on site land ownership and environmental impacts, permits for turbine sites are handled through the Alaska Department of Natural Resources and Division of Wildlife, the U.S. Army Corp of Engineers, Federal Aviation Administration (FAA), and Fish and Wildlife Service, and local governments.

History of siting authority: RCA does not provide a siting review; however, generating facilities serving ten or more persons are required to receive a CPCN. (See: www.fws.gov/midwest/wind/guidance/AFWASitingSummaries.pdf.)

Approvals needed: No state-level approval is needed. Some cities and municipalities have specific wind generator siting and zoning procedures.

General permitting guidelines can be found at www.akenergyauthority.org/Reports%20and%20Presentations/2009WindBestPracticesGuide.pdf.

Evaluation criteria: No state-level criteria.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Alaska's Coastal Zone Management Program, run by the State Department of Natural Resources, used to serve as a one-stop shop for permitting issues involving the state's coastal zones. The program was discontinued by the Alaska legislature this year, though, and restarting it could take as long as two to three years.[1]

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[1] Rich Stromberg, 15 Aug 2011, personal communication. See www.alaskajournal.com/stories/060311/loc_sczm.shtml, www.adn.com/2011/06/20/1927031/alaska-house-rejects-special-session.html, and www.alaskapublic.org/2011/06/08/senators-warn-against-letting-coastal-zone-management-program-die/.

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Data gathered by Kai Goldynia, 7 Aug 2011.
Reviewed by Rich Stromberg, 15 Aug 2011.

State: Arizona

Wind siting basics: The state has no specific wind siting authority, codes, or regulations. Wind facilities must obtain siting and zoning approvals at the county level.

History of siting authority: The state has no specific wind siting authority.

Approvals needed: No state-level approval is needed for wind facilities. The Arizona Game & Fish Department provides *voluntary* guidelines for reducing wildlife endangerment during wind facility construction and operation.

The Arizona Power Plant and Transmission Line Siting Committee has the authority to approve a Certificate of Environmental Compatibility (CEC) for transmission lines 115kV or higher. The Arizona Corporation Commission (ACC) "must either confirm, deny or modify the certificate granted by the Committee or if the Committee refused to grant a certificate, the Commission may issue a certificate" (Arizona Corporation Commission).

Evaluation criteria: Voluntary guidelines issued by the AZ Game & Fish Department include:

(1) Place turbines, roads, power lines, and other infrastructure appropriately, avoiding high-quality wildlife habitats.
(2) Close, obliterate, and re-vegetate any roads constructed for the project that are not necessary for facility maintenance after tower construction.
(3) Control or prevent erosion, siltation, and air pollution by vegetating or otherwise stabilizing all exposed surfaces.
(4) Control or prevent damage to fish, wildlife, or their habitats.
(5) Prevent or control damage to public and/or private property.

Public input: ACC decisions are made during public meetings, with opportunities for public comment.

Relationships to other important energy policies or siting and zoning decisions: The Arizona Renewable Energy Standard (15% by 2025) includes wind as an eligible technology. Arizona electric utilities must file with the ACC biennial integrated resource plans, including analysis and discussion of how the utility will meet the state's renewable energy standard.

Pending issues: Major areas of concern are environmental and wildlife criteria, coupled with the development of a permitting process. Debate continues with regard to establishing comprehensive wind generator siting procedures. Currently, Arizona lacks any state regulation of wind facilities; however, with more facilities proposed, environmental groups worry about the increased impact on the physical and natural environment and habitats of vital plant and animal species. The Arizona Game & Fish Department is working with counties and the State Land Department to address wildlife concerns.

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Data gathered by Kai Goldynia, 17, 19 Jul 2011.
Reviewed by Ray Williamson, 10 Aug 2011, Ginger Ritter, 3 Nov 2011.

State: Arkansas

Wind siting basics: Wind siting is done at the local level of government.

History of siting authority: Arkansas Code A.C.A. §23-3-201 (1935) (www.offthemarble.com/arkcode/Title23/). Arkansas is a Home Rule State.

Approvals needed: All electricity generating facilities that provide "a public service" are required to obtain a Certificate of Public Convenience and Necessity (CPCN) from the Arkansas Public Service Commission.

Evaluation Criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

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Data collected by Francis Motycka, 6, 11 Jul, 3 August 2011.
Reviewed by J.D. Lowery, 18 Nov 2011.

State: California

Wind siting basics: Siting authority is delegated to municipalities. Every county is required to adopt a General Plan for wind development. However, they are subject to the California Environmental Quality Act (CEQA), which requires Environmental Impact Reports (EIRs) and imposes mitigation measures to reduce significant adverse impacts.

History of siting authority: The California Planning and Zoning Law was modified in 1980 to delegate land-use decisions to municipalities (http://leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sbx8_34_bill_20100322_chaptered.pdf).

The California Environmental Quality Act (CEQA), passed in 1970, requires local governments' permitting facilities to analyze wind generator environmental impacts (www.leginfo.ca.gov/cgi-bin/displaycode?section=prc&group=20001-21000&file=21000-21006).

Approvals needed: Approvals vary by municipality. It could come from the planning department, one or more planning commissions, administrative boards or hearing officers, the legislative body itself, or any combination thereof. Under CEQA, applicants are required to consult with the California Department of Fish and Game (CDFG) to meet fish and game statutes and wildlife protection laws; however, the CDFG cannot approve or disapprove of the application. If the project will occupy U.S. Bureau of Land Management (BLM) land, BLM approval is needed (www.blm.gov/ca/st/en/prog/energy/wind.html).

The applicant should first conduct an initial study of the environmental impacts of the project and prepare a document meeting the requirements of both the CEQA and the National Environmental Policy Act (NEPA). If in the initial study the county or the BLM finds potentially significant environmental impacts, the county and the BLM will hire an environmental consultant to conduct the more comprehensive Environmental Impact Report (EIR). Once this report is completed, the County Planning Commission will hold a public hearing to determine whether or not the EIR should be approved. EIR approval facilitates obtaining other necessary permits, such as a permit pursuant to the Endangered Species Act and a Conditional Use Permit (CUP), if the applicant is trying to build on certain types of land, like agricultural land. Once the applicant has acquired all the necessary permits (others include a stormwater discharge permit and a right-of-way from the BLM if the project involves BLM property), the applicant can file its application with the county.

Evaluation criteria: Required CEQA environmental impact analysis includes:

-aesthetics
-agricultural resources
-air quality
-biological resources
-geology and soils
-greenhouse gases
-hazards and hazardous materials
-hydrology and water quality
-land use and planning
-mineral resources
-noise
-population and housing
-public services
-recreation
-transportation and traffic
-utilities (meaning any required ancillary facilities, such as for wastewater or waste disposal)

For small wind generators (50kW or smaller), Assembly Bill 45 of 2009 authorizes counties to adopt siting ordinances. The Bill establishes maximum restrictions for tower height, parcel size, setbacks, public notice, and noise level (www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA61R&re=1&ee=1).

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

Pending issues: Proposed legislation, AB 13 (www.leginfo.ca.gov/pub/11-12/bill/asm/ab_0001-0050/abx1_13_bill_20110707_amended_sen_v95.pdf), seeks to expedite the wind siting process by expanding the "SB 34" (http://leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sbx8_34_bill_20100322_chaptered.pdf) process, originally conceived to facilitate solar facility siting within the state's Desert Renewable Energy Conservation Plan (DRECP). This bill would allow wind project applicants within the DRECP to pay fees to the CA Energy Commission to expedite project review and pay an in-lieu-of-mitigation fee to the state to ensure adequate wildlife and habitat protections when the project is sited.

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Data gathered by Lauren Teixeira, 22 Jun 2011.

State: Colorado

Wind siting basics: Wind facilities must be permitted by both the local and state governments. The Colorado PUC regulates: (1) "eligible renewable energy resources;" (2) facilities larger than 2 MW capacity; and (3) facilities exceeding 50 feet in height. By state law, each county must have a Master Plan, which includes information on how to make land-use decisions with respect to siting (Stemler, 2007). State enabling legislation encourages counties to consider "methods for assuring access to appropriate conditions for solar, wind, or other alternative energy sources" and "areas containing endangered or threatened species" in their plans.

History of siting authority: Colorado Statute 40-5-101 (1963, amended 2005, 2007), www.michie.com/colorado. The Local Government Land Use Control Enabling Act (General Assembly of Colorado, 1974) delegates broad land-use decision-making authority to the municipalities.

Approvals needed: In general, applicants need one of these county government permits if the proposed facility's capacity exceeds a certain threshold established by the county: a 1041 (a.k.a. Areas and Activities of State Interest) permit, special use permit, or conditional use permit. 1041 permits are generally required for the site selection and construction of transmission lines, power plants (renewable and non-renewable), and substations with capacities exceeding the county-specified limit.

The process generally includes a pre-application meeting, public notice, submittal of the permit application, public hearing, approval of the permit, and post-approval requirements, if applicable.

For more information on these permits, see Colorado Governor's Energy Office report (p. 52; www.dora.state.co.us/puc/projects/TransmissionSiting/EnvironmentSitingLanduse_REDIProject_GEO07-20-2009.pdf).

Projects also need a Certificate of Public Convenience and Necessity (CPCN) from the PUC. The PUC is required to consult with the Colorado Division of Wildlife and the U.S. Fish and Wildlife Service. Those agencies usually determine requirements for wildlife impact studies. If the project is to be on federal land or triggers the National Environmental Policy Act (NEPA) in some way, studies must be conducted according to NEPA. The applicant must provide written documentation that consultation occurred with appropriate governmental agencies. In addition, if the project receives federal funding, involves federal land, or connects to a transmission line belonging to a federal power authority, the applicant must comply with the federal Endangered Species Act (ESA). Colorado is home to 10 endangered bird species.

The PSC checks to make sure the applicant has the consent of the relevant municipalities and will comply with the applicable zoning ordinances. An applicant can appeal a county zoning decision to the Commission and request a hearing. The PSC has the right to amend the CPCN.

Evaluation criteria: The County will either require or encourage the applicant to conduct an Environmental Impact Assessment (EIA). The Colorado Division of Wildlife requires avian and bat studies. Typically required permits include:

- County Conditional or Special use Permits
- County Building Permit
- County Septic System Permit
- State of Colorado Storm Water Permit (construction)
- State of Colorado Dust Controls Permit (construction)
- State of Colorado Highway Access and Enroachment Permit (tower and blade transportation)
- State of Colorado Water Well Permit

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Colorado has a renewable portfolio standard of 30% by 2020. Transmission projects are being developed to support wind (www.eei.org/ourissues/ElectricityTransmission/Documents/Trans_Project_V-X.pdf). However, a recent report by the Governor's Energy Office found that CO might not be able to meet its RPS goal unless even more transmission lines are built (www.denverpost.com/business/ci_13913735).

Colorado Senate Bill 11-45 (June 2011) established a task force on statewide transmission siting and permitting, which will report to the governor on its recommendations for improving the state's statutory and regulatory framework (www.dora.state.co.us/puc/projects/TransmissionSiting/SB11-45/SB11-45.htm). A report by the task force, submitted on 1 Dec 2011, recommended (Colorado Public Utilities Commission, 2011):

(1) ...increased cooperation and collaboration among local governments that review transmission applications in Colorado.
(2) When local government land-use decisions on utility projects are appealed to the PUC, and the PUC's decision is subsequently appealed, cases should go directly to the Colorado Court of Appeals, rather than to a district court in order to achieve more efficient and timely review.
(3) ...establishment of processes and provision of resources to resolve transmission siting and permitting disputes between local governments and transmission operators.

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Data collected by Lauren Teixeira, 7 Jul 2011; Deborah Luyo, 20 Oct 2011.

State: Connecticut

Wind siting basics: The Connecticut Siting Council has sole jurisdiction over electric generating facilities using renewable energy sources with more than 1 MW of capacity and of PURPA non-qualifying facilities under 1 MW.

History of siting authority: Connecticut statutes Sections 16-50g, 16-50k and 16-50x(d) (1971, as amended) grant authority to the Connecticut Siting Council (www.cga.ct.gov/2011/pub/chap277a.htm#Sec16-50j.html). A new law, Connecticut Public Act 11-245 (PA 11-245), effective 1 Jul 2011, requires the Connecticut Siting Council by 1 Jul 2012, in consultation with the departments of Public Utility Control and Environmental Protection, to adopt regulations concerning the siting of wind turbines. (See **Pending Issues**.)

Approvals needed: Electric generation facilities using renewable energy sources with more than 65 MW of capacity could have a "significant adverse environmental effect" and require a certificate from the Connecticut Siting Council. Electric generation facilities using renewable energy sources with fewer than 65 MW of capacity could have a "significant adverse environmental effect" and require a declaratory ruling from the Connecticut Siting Council.

The applicant for a certificate must consult the municipality in which it wishes to build at least 60 days prior to filing the application. Within 60 days of that consultation, the municipality must issue its recommendation to the applicant. The applicant must also consult the municipal zoning and inland wetland agencies. The agencies have 65 days after the time the application is filed to issue an order restricting or regulating the proposed site. Concerned parties have 30 days after the order is issued to appeal it to the Council. The Council can affirm, revoke, or modify the zoning or wetlands order. If the Council accepts the application, it must hold a public hearing in which all parties to the proceeding may offer testimony and file evidence. The Council can reject an application if it fails to comply with certain data requirements. The Council must render a decision within 180 days of receipt of the application. The suggested form and content of the application can be found here: www.ct.gov/csc/lib/csc/guides/guidesonwebsite042010/renewableenergyfacilityapplicationguide.pdf#51365.

Only two wind facilities have been approved in the state of Connecticut: BNE filed its petition to build its Colebrook South facility on 6 Dec 2010 and its petition to build its Colebrook North facility on 13 December 2010. Their petitions were approved on 2 June 2011 and 9 June 2011, a time frame of about six months; however, including the municipal consultation beforehand, the total time was probably a few months more.

Evaluation criteria: Prior to passage of PA 11-245, criteria included:

- consultation with state agencies and municipal commissions
- Applications including reviews of:
  - hazards to air traffic;
  - health and safety;
  - justification of selection of the proposed site, including a comparison with alternative sites that are environmentally, technically, and economically practicable;
  - explanation of why this project is necessary for the reliability of electric power supply of the state or is necessary for a competitive market for electricity;
  - description of the project's proximity to certain areas (www.ct.gov/csc/lib/csc/guides/guidesonwebsite042010/renewableenergyfacilityapplicationguide.pdf#51365.)

- The applicant must include assessment of the "historic and expected availability" of necessary electric transmission infrastructure. This includes "[t]he construction type of the transmission interconnection (overhead, underground, single circuit, double circuit) and the existing and expected transmission line loadings, substation interconnection plan, and the anticipated range of dispatch based on transmission grid constraints. In addition, provide a final copy of, or a status report on, the independent system operator transmission grid interconnection study."

Public input: A public hearing will be required under Connecticut Public Act 11-245. (See **Pending issues**.)

Relationships to other important energy policies or siting and zoning decisions:

The applicant must show how its proposed facility is consistent with the approved Integrated Resource Plan. The agency in charge of IRP is the Department of Energy and Environmental Protection (DEEP).

Pending issues: Regulations promulgated under PA 11-245 must at least consider (1) setbacks, including tower height and distance from neighboring properties; (2) flicker; (3) a requirement for the developer to decommission the facility at the end of its useful life; (4) different requirements for different size projects; (5) ice throw; (6) blade shear; (7) noise; and (8) impact on natural resources. The regulations must also require a public hearing for wind turbine projects.

PA 11-245, effective date 1 Jul 2011, bars the CT Siting Council from acting on any application or petition for siting a wind turbine until the new regulations are adopted (www.cga.ct.gov/2011/SUM/2011SUM00245-R03HB-06249-SUM.htm).

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Data collected by Lauren Teixeira, 21 Jun 2011; Tom Stanton, 18 Oct 2011.
Reviewed by Melanie Bachman, 24 Oct 2011.

State: Delaware

Wind siting basics: Wind siting authority is at the local level.

History of siting authority: None identified.

Approvals needed: For an "Eligible Energy Resource," which includes wind generators, the generation unit must be certified by the Delaware Public Service Commission. The Eligible Energy Resource can then register with PJM's Environmental Information Services (EIS) Generation Attribute Tracking System (GATS; www.pjm-eis.com/getting-started/about-GATS.aspx), which tracks renewable energy credits (RECs) for compliance with state renewable portfolio standards (RPSs).

Developers should contact the Delaware Department of Natural Resources & Environmental Control, Regulatory Advisory Service (www.dnrec.delaware.gov/SBA/Pages/RegulatoryAdvisoryService.aspx). This Service will help identify all required state (and federal) permits, depending on the location of a proposed wind development. Examples include state-regulated wetlands, sediment and storm-water requirements for land disturbances, and federal coastal zone requirements.

Evaluation criteria: The following are criteria for wind siting on private property that may be used by county and municipal governments, as stated in Title 29, Chapter 80 of the Delaware Code:

(1) Historical: "Any wind energy system shall be buffered from any properties or structures included on the Historic Register."
(2) Property Setback: "Wind turbines shall be setback 1.0 times the turbine height from [the] adjoining property line. Turbine height means the height of the tower plus the length of 1 blade."
(3) Noise: "The aggregate noise or audible sound of a wind system shall not exceed 5 decibels above the existing average noise level of the surrounding area and shall be restricted to a maximum of 60 decibels measured at any location along the property line to the parcel where the wind system is located."
(4) Visual: "Wind systems shall be free from signage, advertising, flags, streamers, any decorative items or any item not related to the operation of the wind turbine. Electric wiring for the turbines shall be placed underground for non-building integrated systems."

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Delaware has a renewable portfolio standard (RPS) requiring 25% of electricity sold by utilities to come from renewable energy sources by 2025 and imposing interim annual portfolio requirements.

Research Issues: The only current commercial wind turbine is on the University of Delaware-Lewes campus. The 2 MW wind turbine was constructed without any environmental permits. The University is completing a two-year research project to measure the impact of the school's wind turbine on bird and bat mortality. The study is expected to be completed by December 2013.

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Data gathered by Francis Motycka, 6, 11, 12, Jul, 4 Aug 2011; Tom Stanton, 30 Aug 2011.
Reviewed by Courtney Stewart and Kimberly Chesser, 30 Aug 2011.

Jurisdiction: District of Columbia

Wind siting basics: None identified.

History of siting authority: None identified.

Approvals needed: None identified.

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Washington, DC has a renewable energy portfolio standard of 20% by 2020 (Database of State Incentives for Renewables & Efficiency, 2011).

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Data collected by Deborah Luyo, 21 Nov 2011.
Reviewed by Roger Fujihara, 29 Nov 2011.

State: Florida

Wind siting basics: Currently, all applicants proposing to build a wind farm must obtain a variety of permits from various federal and state agencies. There is one-stop permitting for power plants 75 MW and over; however, Florida has yet to extend this process to wind. If the farm is to be on state land, the applicant needs approval from the state Siting Board (the governor and the cabinet).

History of siting authority: Since Florida's Power Plant Siting Act (www.dep.state.fl.us/siting/power_plants.htm) does not apply to wind farms, applicants must obtain all of the necessary permits one by one. The necessary permits are laid out on the Florida Department of Environmental Protection (DEP) website: www.dep.state.fl.us/siting/files/renew_resource_permitting.pdf

Approvals needed: The applicant must obtain approval, either through a permit or authorization, from a variety of federal and state agencies, including: the Federal Aviation Administration, the U.S. Fish and Wildlife Service, the Florida Department of Transportation, the Florida Fish and Wildlife Conservation Commission, the Florida Department of Business and Profession Regulation, the Florida Department of Environmental Protection (sub-agencies: Bureau of Beaches; Stormwater Program; State Lands; District offices), and the Florida Office of Historic Preservation

Evaluation criteria: On the federal level, the applicant must issue a Notice of Proposed Construction concerning height restrictions to the Federal Aviation Administration. A wildlife permit from the U.S. Fish and Wildlife Service is also required.

On the state level, the following authorizations and permits are required:

- Access and roadway (Florida Department of Transportation)
- Migratory Bird Nest Removal and Relocation Permit (Florida Fish and Wildlife)
- Business incorporation (Florida Department of State)
- Business license (Florida Department of Business and Profession Regulation)
- Coastal Construction Control Line (Florida DEP Bureau of Beaches)
- Environmental resources permit (Florida DEP District Office)
- National Historical Preservation Act Compliance (Florida Office of Historic Preservation)
- National Pollutant Discharge Elimination System (NPDES) Stormwater Permit for Construction (Florida DEP Stormwater Program)
- State Lands Determination Waterways (Florida DEP State Lands)

On the county level, the following authorizations and permits are required:

- Building
- Business license
- County wetlands
- Land-use determination
- Local fire marshal
- Noise ordinance
- Zoning

Palm Beach County, which is in the process of approving Florida's first wind farm, has "Alternative Energy Development Guidelines," which the County Council voted to amend in order to accommodate the height of the proposed turbines.

Public input: Some counties include public hearings in the zoning process.

Relationships to other important energy policies or siting and zoning decisions: None identified.

Pending issues: Florida is currently in the process of siting what might be its first wind farm. A few years ago, Florida Power and Light attempted to site a 20 MW wind farm on Hutchinson Island in St. Lucie County, but the initiative failed because of widespread public opposition and because three of the turbines were to be on public land. Right now, Wind Capital Group, St. Louis, Missouri, has applied to build an 80-turbine, 150 MW wind farm in the Everglades agricultural area in Palm Beach County. The project has come into question in light of a recent U.S. Fish and Wildlife analysis that identifies concerns for avian mortality. The Fish and Wildlife Service has recommended a more comprehensive study.

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Data collected by Lauren Teixeira, 26 Jul 2011.
Reviewed by Cindy Mulkey, 8 Nov 2011.

State: Georgia

Wind siting basics: Georgia has no specific siting authority for wind power. Regulation is administered by local government. (Stemler, 2007).

Approvals needed: Most local governments require a land-use permit (Georgia Wind Working Group).

Evaluation criteria: Voluntary siting and land-acquisition guidelines for developers, created by the Georgia Wind Working Group, include:

- Aesthetic impacts
- Avian and bat mortality
- Noise
- Possible construction impacts
- Utility interconnection impacts

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

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Data collected by Deborah Luyo, 4 Nov 2011.
Reviewed by Rita Kilpatrick and members of the Georgia Wind Working Group, 19 Dec 2011.

State: Hawaii

Wind siting basics: Wind production in Hawaii is mainly small scale, and siting procedures are administered by local government (Stemler, 2007). Environmental reviews are conducted at the federal, state, and county levels. No guidelines specific to wind energy have been developed. Regulation is administered through general permitting guidelines (Hawaii Clean Energy Initiative, 2010).

History of siting authority: None identified.

Approvals needed: At the federal level, permits and reviews include: Environmental Impact Statement, Environmental Assessment, administered by the Council on Environmental Quality; Incidental Take Statement, Incidental Take Permit, administered by the National Oceanic and Atmospheric Administration; Incidental Take Statement, Incidental Take Permit, administered by the U.S. Fish & Wildlife Service. At the state level, most environmental permits are administered by the Hawaii Department of Health (DOH); however, depending on the project, other agencies may also issue permits. All counties in Hawaii require a Shoreline Setback Variance for structures and activities in the "Shoreline Area"; counties have their own guidelines for determining the required setback from shore. A Special Management Area Permit is also required. A utility permit, administered by the Public Utilities Commission (PUC), is required for all utility construction, reconstruction, or maintenance activities in Hawaii. (Hawaii Clean Energy Initiative, 2010).

Projects that qualify for the Renewable Energy Facility Siting Process (REFSP) can pursue a streamlined permitting process. To obtain streamlined permitting, the developer will be charged a fee to cover application processing costs.

Evaluation criteria: The most important determination is the impact of the project on the environment and wildlife.

Public input: A public comment period and public hearing are part of the process at both the state and federal levels.

Relationships to other important energy policies or siting and zoning decisions: Hawaii has a renewable portfolio standard of 40% by 2030. In 2008, a Memorandum of Understanding between the state of Hawaii and the U.S. Department of Energy established the Hawaii Clean Energy Initiative (http://apps1.eere.energy.gov/news/pdfs/hawaii_mou.pdf). Goals of this initiative include a significant increase in the use of renewable energy and a transition to the exclusive use of renewable energy on Hawaii's smaller islands. (Database of State Incentives for Renewables & Efficiency, 2011).

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Data collected by Deborah Luyo, 1 Nov 2011.

State: Idaho

Wind siting basics: Local-government siting autonomy, with state enabling legislation.

History of siting authority: Idaho Statute Chapter 65 - Local Land Use Planning (2005) (http://lawjustia.com/codes/idaho/2005/67ftoc/670650002.html, www.legislature.idaho.gov/idstat/Title67/T67CH65SECT67-6504.htm).

Approvals needed: Developers apply for local zoning approval, for a "Conditional Use Permit." Since there is local siting autonomy, only a city council or board of county commissioners can approve wind energy projects (www.legislature.idaho.gov/idstat/Title67/T67CH64SECT67-6504.htm).

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

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Citations and links:

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Idahoans for Responsible Wind Energy [web page]. Retrieved 10 Jul 2011 from www.eastidahowindaction.org/relateddocs.html.

Idaho Office of Energy Resources. (8 Aug 2011). *Resources for Wind Project Development in Idaho*. www.energy.idaho.gov/renewableenergy/wind_productdev.htm, www.energy.idaho.gov/renewableenergy/wind.htm.

Data collected by Marley Ward, 10 Jul 2011.
Reviewed by John Chatburn 22 Nov 2011.

State: Illinois

Wind siting basics: Local government has autonomy. Each county can set standards (55 ILCS 5/5-12020). These standards include the device height and number of electricity-generating wind devices, or wind turbine generators (WTGs) (www.ilga.gov/legislation/ilcs/ilcs4.asp?DocName=005500050HArt.+5&ActID=750&ChapterID=12&SeqStart=55300000&SeqEnd=120400000).

History of siting authority: Illinois General Assembly, in 55 ILCS 5/5-12020 (2007), granted authority for counties to "establish standards for wind farms and electric-generating wind devices." Amendments were made in 2009 and 2010 (www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=005500050K5-12020).

Approvals needed: County approves construction for projects in accordance with local zoning regulations. In some situations, county must consult Illinois Department of Natural Resources for approval (see Great Lakes Commission Staff, 2009, *Siting and Permitting Wind Farms in Illinois*).

Projects have to demonstrate compliance with these federal requirements:

(1) Federal Aviation Administration (FAA): (a) Determination of No Hazard to Air Navigation; (b) Notice of proposed construction (form FAA 7460-1); (c) Lighting plan; (d) Post construction form (form FAA 7460-2).

(2) US Fish and Wildlife Services (USFWS): Threatened and Endangered Species Act, Section 7 Consultation and Migratory Bird Act.

(3) US Army Corps of Engineers (COE): (a) Clean Water Act: Section 404 - Discharge of Fill Materials; (b) Rivers and Harbors Act: Section 10.

(4) Federal Communications Commission (FCC): Microwave Studies.

(5) US Environmental Protection Agency (USEPA): Spill Prevention, Control and Countermeasures Plan (SPCC Plan, 40 CFR112).

(6) U.S. Military: Determination of non-interference with flight operations and radar.

Obtain approval from municipality, National Pollutant Discharge Elimination System (NPDES) permit from Illinois Environmental Protection Agency, and road permit from Department of Transportation (*Siting and Permitting Wind Farms in Illinois*). At least one public hearing will take place not more than 30 days prior to a county board's siting decision (55 ILCS 5/5-12020).

Evaluation criteria: Standards are set at the county level.

According to the Illinois Endangered Species Act, the Illinois DNR must be consulted for approval if proposed project would take place in an area where an endangered species or its habitat might be disrupted.

Illinois Commerce Commission established interconnection standards (August 2008) for distributed generation systems up to 10 MW (Great Lakes Commission, 2009) (www.ilga.gov/commission/jcar/admincode/083/08300200sections.html).

Illinois has no model ordinance in place. However, a maximum setback limit for WTGs is established for self-service power. According to (55 ILCS 5/5-12020), "[A] county may not require a wind tower or other renewable energy system that is used exclusively by an end user to be set back more than 1.1 times the height of the renewable energy system from the end user's property line."

Public input: No specific procedures identified.

Relationships to other important energy and siting and zoning decisions: None identified.

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Data collected by Marley Ward, 1 Jul 2011; Lauren Knapp, 17 Aug 2011.
Reviewed by Jennifer Hinman, Illinois Commerce Commission, 17 Aug 2011; Jolene S. Willis, 23 Aug, 1 Sep 2011.

State: Indiana

Wind siting basics: Indiana has no state-level regulations or guidelines for wind power development. Wind power siting is administered at the local level of government. Siting and permitting requirements vary according to location. (Stemler, 2007).

History of siting authority: Article 4. (24 Apr 2007). Electric Utilities – 170 IAC 4-4.1-1 www.in.gov/legislative/iac/T01700/A00040.PDF.

Approvals needed:

- A certificate of need, granted by the Indiana Utility Regulatory Commission, is required for construction of a new power plant or for delivery of public utility service.
- An National Pollutant Discharge Elimination System (NPDES) Permit is required for discharge of stormwater runoff at construction sites having a size greater than one acre.
- A permit from the Indiana Department of Natural Resources is required for excavation, placement, modification, or repair of a permanent structure over, along, or lakeward of the shoreline or water line of a freshwater lake. (Great Lakes Commission, 2009).
- Any person who desires to erect, make, use, or maintain a structure, an obstruction, or an excavation in or on the floodway first must obtain a Construction in a Floodway permit from the Indiana Department of Natural Resources.

Evaluation criteria: All projects must comply with local and state laws governing electric generation and transmission and environmental laws related to construction (Great Lakes Commission, 2010).

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Indiana's Clean Energy Portfolio Standard establishes a voluntary goal of 10% clean energy by 2025 (Database of State Incentives for Renewables & Efficiency, 2011).

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Citations and links:

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Great Lakes Commission. (Mar 2009). *Siting and Permitting Wind Farms in Indiana*. http://wiki.glin.net/download/attachments/950461/Indiana.doc.

Great Lakes Commission. (Jan 2010). *State and Provincial Land-Based Wind Farm Siting Policy in the Great Lakes Region: Summary and Analysis.* www.glc.org/energy/**wind**/pdf/GLWC-LandBased**Siting**-Jan2010.pdf.

Data collected by Deborah Luyo, 2 Nov 2011.
Reviewed by Matt Buffington, 9 Nov 2011.

State: Iowa

Wind siting basics:

Local government only: facilities with <25 MW capacity
Dual state and local siting: >25 MW capacity
State utilities board has authority at the state level.

History of siting authority: Iowa Code chapter 476A (1977) established generation-siting law. In 2001, the decision criteria for issuance of generation certification were revised. The Iowa Utilities Board can now waive certification requirements for any size facility. (www.legis.state.ia.us/IACODE/2003/476A/)

Approvals needed: A permit from the Iowa Utilities Board is required for larger facilities; otherwise, local zoning and siting regulations apply; Iowa Code 476A and Iowa Administrative Code Chapter 24 (www.legis.state.ia.us/IACODE/2003/476A/).

Cases are presented to the Iowa Utilities Board to apply for a Construction Approval Waiver; Iowa code 476A and Administrative Code Chapter 24 (199-24.15) (www.legis.state.ia.us/IACODE/2003/476A/15.html). The IUB has waived the plant certification process for several projects that would have otherwise required a full certificate proceeding.

Evaluation criteria:

"a. …consistent with the legislative intent… and the economic development policy of the state, and will not be detrimental to the provision of adequate and reliable electric service…include[ing] whether the existing transmission network has the capability to reliably support the proposed additional generation…
b. Whether the construction, maintenance, and operation…will be consistent with reasonable land use and environmental policies…considering available technology and the economics of available alternatives. Such determination shall include:
   (1) Whether all adverse impacts attendant the construction, maintenance and operation of the facility have been reduced to a reasonably acceptable level;
   (2) Whether the proposed site represents a reasonable choice among available alternatives;
   (3) Whether the proposed facility complies with applicable city, county or airport zoning requirements….
c. Whether the applicant is willing to construct, maintain, and operate the facility pursuant to the provisions of the certificate and the Act.
d. Whether the proposed facility meets the permit and licensing requirements of regulatory agencies.
e. The applicant shall use the applicable provisions in the publications listed below as standards of accepted good practice unless otherwise ordered by the board:

   I. Iowa Electrical Safety Code...
   II. National Electrical Code...
   III. Power Piping-ANSI standard B31.1-2004."

(Iowa Code 476A, www.legis.state.ia.us/IACODE/2003/476A/12.html)

Public input: Intervenors are allowed to participate in proceedings. Office of Consumer Advocate generally represents residential customers. An informational meeting and hearing (if the case has contested issues) must be held in the county where the facility is proposed to be built.

Relationships to other important energy and siting/zoning decisions: Generally, a generation certificate is issued contingent upon the applicant receiving appropriate approvals and permits from other state and local zoning authorities.

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John R. Sweet Company. (2001). *Top of Iowa Wind Farm Case Study*. http://johnrsweet.com/personal/wind/PDF/TopofIowaWindFarm.pdf.

Data gathered by Marley Ward, 29 June 2011.
Reviewed by Parveen Baig, 5 Dec 2011.

State: Kansas

Wind siting basics: Local siting autonomy (State Enabling Legislation).

History of siting authority: Kansas Statutes Annotated 12-573
http://kansasstatutes.lesterama.org/Chapter_12/Article_7/12-741.html

Approvals needed: Approval rests with the city's governing body and county commissioners.
http://kansasstatutes.lesterama.org/Chapter_12/Article_7/12-753.html

The now-defunct Kansas Energy Council compiled a wind energy siting handbook with suggested procedures that counties might use for accepting applications for wind projects. See http://kec.kansas.gov/reports/wind_siting_handbook.pdf.

KEC suggests an application process including at least the following:

-site plan
-visual impact assessment
-environmental assessment
-economic assessment
-decommissioning and reclamation plan

Evaluation Criteria: Guidelines established by the Kansas Department of Wildlife, Parks and Tourism (Available from http://kdwpt.state.ks.us/news/Services/Environmental-Reviews/Wind-Power-and-Wildlife-Issues-in-Kansas**,** search for "wind power position".) for consideration by local governments when making siting decisions about wind energy projects include:

(1) That wind power facilities should be sited on previously altered landscapes, such as areas of extensive cultivation or urban and industrial development, and away from extensive areas of intact native prairie, important wildlife migration corridors, and migration staging areas.
(2) To recommend adherence to the Siting Guidelines for Wind Power Projects in Kansas, produced by the Kansas Renewable Energy Working Group (www.kansasenergy.org/documents/KREWGSitingGuidelines.pdf).
(3) To support the study of and establishment of standards for adequate inventory of plant and animal communities before wind development sites are selected, during construction, and after development is completed (Manes et al., in review). The resultant improvement in available knowledge of wind power and wildlife interactions obtained through research and monitoring should be used to periodically update guidelines regarding the siting of wind power facilities.
(4) That mitigation is appropriate only if significant ecological harm from wind power facilities cannot be adequately addressed through proper siting.
(5) To support the establishment of processes to ensure a comprehensive and consistent method in addressing proposed wind power developments.
(6) To advocate the direct coupling of energy conservation and efficiency programs with any new measures aimed at increasing energy supply whether renewable or conventional."

Additionally, voluntary guidelines offered by the Kansas Energy Council's Wind Siting Handbook (http://kec.kansas.gov/reports/wind_siting_handbook.pdf) include:

Pre-construction survey recommendations: Requiring environmental assessment in siting decisions; consideration for the biological setting; use of biological and environmental experts; careful review if legally protected wildlife. Land use regulation is solely under the purview of local governments.

Design/Operation Recommendations: Perches should not be allowed on nacelles; tower design should not provide perches for avian predators; awareness of the potential for adverse effects of turbine warning lights on migrating birds.

Site Development Recommendations: Development in large, intact areas of native vegetation is discouraged; power lines should be buried if possible; turbines should not interfere with important wildlife or livestock movement corridors and staging areas.

Consultation with wildlife agency, USFWS: Contact with appropriate resource management agencies early in the planning process.

Mitigation requirements: Mitigation for habitat loss when significant ecological damage in the siting of a wind power facility cannot be avoided.

Decommissioning recommendations: Plans for future site decommissioning and restoration, including circumstances under which decommissioning and reclamation may occur and the expected end of the project life.

Public input: No specific procedures identified.

Relationships to other important energy and siting/zoning decisions: None identified.

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Citations and links:

Association of Fish and Wildlife Agencies. (n.d.). *Kansas*. www.fishwildlife.org/files/Kansas.pdf.

Environmental Law Institute. (May 2011). *State Enabling Legislation for Commercial-Scale Wind Power and the Local Government Role*. www.elistore.org/reports_detail.asp?ID=11410.

Kansas Energy Council. (Apr 2005). *Wind Energy Siting Handbook: Guideline Options for Kansas Cities and Counties*. http://kec.kansas.gov/reports/wind_siting_handbook.pdf.

Data gathered by Marley Ward, 11 Jul 2011.
Reviewed by Eric Johnson, 10 Nov 2011, Andy Fry, 25 Jan 2012.

State: Kentucky

Wind siting basics: Kentucky's wind energy potential is considered small. No precedent has been established for the siting and zoning of wind developments. The Kentucky State Board on Electric Generation and Transmission Siting (Siting Board) or the Public Service Commission would have authority over major wind developments. (www.fishwildlife.org/files/Kentucky.pdf.).

According to the Kentucky Integrated Resource Plan, most of the state has Class 2 (out of 7) wind speeds, making wind power generation economically impractical using currently available technology. A 2011 study by the Department of Economics at Western Kentucky University, entitled *Wind Energy Feasibility in Kentucky*, found that the wind resource in one major region of Kentucky (featuring Cumberland County) can produce affordable electricity. Statewide siting and zoning regulations could be developed as a result of this study. (www.wku.edu/jaep/html/documents/JAEPVol2708.pdf)

History of siting authority: None identified.

Approvals needed: Siting Board approval is required for merchant plants with a generating capacity of 10 MW or more. For obtaining local government approval, local zoning board rules apply.

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning: None identified.

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Citations and links:

Kentucky Economic Association. (2011). "Wind Energy Feasibility in Kentucky," *Journal of Applied Economics and Policy*, v30, pp. 1-4. http://kentuckyeconomicassociation.org/jaep/issues/JAEPVol30(1)2011.pdf.

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Data gathered by Kai Goldynia, 2 August 2011.
Reviewed by Kate Shanks, 24 Oct 2011.

State: Louisiana

Wind siting basics: Louisiana has no specific siting authority for wind.

History of siting authority: None identified.

Approvals needed: None identified.

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

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Citations and links:

Database of State Incentives for Renewables & Efficiency. *Louisiana Incentives/Policies for Renewables & Efficiency* [web page]. Retrieved 8 Nov 2011 from www.dsireusa.org/incentives/index.cfm?getRE=1?re=undefined&ee=1&spv=0&st=0&srp=1&state=A.

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Data collected by Deborah Luyo, 8 Nov 2011.
Reviewed by Beau Gregory, 9 Dec 2011.

State: Maine

Wind siting basics: In 2008, Maine implemented PL 2007 Ch 661, amending the Maine Wind Energy Act to provide for "expedited" siting and establish specific concerns regarding visual impact and community benefits (www.mainelegislature.org/legis/bills/bills_123rd/billtexts/SP090801.asp).

For projects located within the expedited permitting area for wind energy development:

- All of the organized areas of Maine are designated for expedited permitting. If a project is wholly located within organized areas, then the Maine Department of Environmental Protection (DEP) is the permitting authority at the state level. The municipality may also require a permit.
- If a project is wholly located within the unorganized areas of the state, then the Maine Land Use Regulation Commission (LURC) is the permitting authority at both the state and municipal levels.
- If a project is located within the expedited permitting area for wind energy development and is partially located within the organized areas of the state and partially located within the unorganized areas, then DEP may choose to be the permitting authority or may opt to review only the portion of the project located in the organized areas. In this case, LURC would review the portion in the unorganized areas.[2]

For projects not located in the expedited permitting area of the state, LURC is the permitting authority. In this case, a rezoning would be required first, followed by a development permit.

History of siting authority: Maine Wind Energy Act of 2003 (www.mainelegislature.org/legis/statutes/35-A/title35-Asec3402.html). The Maine Wind Energy Act includes a state goal of 3,000 MW of wind capacity by 2020.

In 2008 Maine implemented SP 980, which amended the Maine Wind Energy Act to provide for "expedited" siting and establish specific concerns about visual impact and benefits to the community (www.mainelegislature.org/legis/bills/bills_123rd/billtexts/SP090801.asp).

Approvals needed: Depending on the site plans and location, approvals may be needed from: Independent [Transmission] System Operator for New England (ISO-NE), Maine Department of Environmental Protection (DEP), Maine Public Utilities Commission (PUC) (for installations interconnecting at >100kV), the Natural Resources Council of Maine (NRCM), and the U.S. Army Corps of Engineers (COE). The Maine Department of Inland Fisheries and Wildlife (IFW) is a reviewer of permit applications for DEP and LURC.

Basic procedures:

1. Pre-application meeting(s) with the applicant and the relevant agencies – DEP and/or LURC, IFW, US Army Corps of Engineers, and others as needed – to discuss processing
2. Submit application
3. Permitting authority conducts review to determine whether application is complete for processing
4. Public meetings or hearing

[2] Unorganized areas are those having no local, incorporated municipal government; government is shared by various state agencies and county government. Organized areas are those having a local government that is incorporated.

5. Deliberation and decision
6. Appeals, if any
7. Begin construction

For more information on the LURC process:
www.maine.gov/tools/whatsnew/index.php?topic=lurcfiles&id=2642&v=tplfiles

The DEP procedure is outlined in Maine's Site Location Law:
www.maine.gov/dep/land/sitelaw/index.html

Evaluation criteria:

The Maine Wind Energy Act, section 9, provides:

- Applicants are required to submit "visual impact assessments" if the project is within three miles of scenic resources. "Scenic resources" are defined in the Act.
- The project must result in "tangible benefits" to the host community.

DEP criteria (www.maine.gov/dep/land/sitelaw/index.html):

"No adverse effect on the natural environment" standard of the Site Location Law (www.maine.gov/dep/land/sitelaw/index.html#rule)
No unreasonable adverse effect on air quality
No unreasonable alterations of climate
No unreasonable alterations of natural drainage ways
No unreasonable effects on runoff/infiltration relationships
No adverse effects on surface water quality
No unreasonable adverse effects on ground water quality or quantity
Sound-level limits
Preservation of historic sites
Preservation of natural areas
No unreasonable effect on scenic character
Protection of wildlife and fisheries

LURC criteria:

Effect on scenic character and related existing uses related to scenic character
Tangible benefits
Public safety-related setbacks

Smaller-scale developments (Other than utility scale)
(www.mainelegislature.org/legis/bills/bills_123rd/billtexts/SP090801.asp):

Projects must meet noise control requirements
Projects must be designed and sited to avoid unreasonable adverse shadow flicker effects
Setbacks must be adequate to protect public safety

Public input: Applicants, petitioners, and other interested persons may request a public hearing. Hearings may be continued and reconvened as circumstances require.

Relationships to other important energy and siting/zoning decisions: None identified.

Pending issues: Many towns in Maine have already drafted or are in the process of drafting wind-specific ordinances.

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www.maine.gov/dep/contact/index.html

Maine Land Use Regulation Commission
22 State House Station
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(207) 287-2631
www.maine.gov/doc/lurc/

Citations and links:

Land Use Regulation Commission. (Apr 2004). *Approval Process for Energy Generation and Transmission Projects.* www.maine.gov/tools/whatsnew/index.php?topic=lurcfiles&id=2642&v=tplfiles.

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Data gathered by Lauren Teixeira. June 23, 2011.
Reviewed by Marcia Famous Spencer, 27 Dec 2011.

State: Maryland

Wind siting basics: For any electric generator 70 MW or greater, including wind-based generation, the Maryland Public Service Law requires the Maryland Public Service Commission (Commission) to issue a Certificate of Public Convenience and Necessity (CPCN) that authorizes the construction and operation of the facility. (PUC §§ 7-207 and 208 (http://law.justia.com/codes/maryland/2005/gpu/7-207.html, http://law.justia.com/codes/maryland/2005/gpu/7-208.html and www.fishwildlife.org/files/Maryland.pdf.)

History of siting authority: The current state siting law was enacted by Chapter 31 of the Laws of 1971. In 2001, by Chapter 655, the General Assembly began to exempt certain types of generation from the CPCN process if the facility does not exceed 70 MW and meets certain specified criteria. The exemption provision is codified in PUC Article § 7-207.1 (2005) (http://law.justia.com/codes/maryland/2005/gpu/7-207.1.html). In 2007, the General Assembly enacted Chapter 163 which allows land-based wind generation facilities to seek an exemption from the CPCN process if the facility will not exceed 70 MW. (PUC §7-207.1 and CPCN *Exemptions: FAQ* at http://webapp.psc.state.md.us/, and http://esm.versar.com/pprp/ceir15/Report_1_1_2.htm).

Approvals needed: For any generation facility over 70 MW, a developer must obtain a CPCN from the Maryland Public Service Commission. See PUC §§7-207 and 208 (http://law.justia.com/codes/maryland/2005/gpu/7-207.html, http://law.justia.com/codes/maryland/2005/gpu/7-208.html).

To initiate the process, a developer must file an application with the Commission that contains descriptive information as to ownership, interconnection, and specified environmental and socioeconomic information. Depending upon the type of generation being proposed as well as the location, the type of information and impact analysis required will vary. The necessary contents of the application and supporting information may be found in Chapter 79 of Title 20 of the Code of Maryland Regulations (COMAR) (www.dsd.state.md.us/comar/subtitle_chapters/20_Chapters.aspx#Subtitle79). For facilities applying for an exemption, the requirements are specified in COMAR 20.79.01.03 (www.dsd.state.md.us/comar/SubtitleSearch.aspx?search=20.79.01.*). Certain basic information, such as ownership, a facility description and location, and interconnection information, is required in either case.

For facilities required to obtain a CPCN, the Power Plant Research Program (PPRP) of the Maryland Department of Natural Resources (DNR) coordinates the state agency review and environmental evaluation. DNR is one of seven state agencies that review and comment on every application for a CPCN. The agencies include the Maryland Departments of Natural Resources, Environment, Agriculture, Business & Economic Development, Transportation, and Planning and Maryland Energy Administration. Once the review is completed, PPRP consolidates the findings of these agencies and represents them along with the state's recommended licensing conditions to the Commission as part of the Commission's hearing process. All facilities must be constructed and operated in compliance with state and federal requirements (www.dnr.state.md.us/bay/pprp/pp_brochure.html).

Regardless of whether a developer applies for a CPCN or for an exemption, the process begins with an application to the Commission. If a facility requires a CPCN, the Commission will usually delegate the application to the Commission's Hearing Office for assignment to a Public Utility Law Judge. The Law Judge sets a prehearing conference to establish a process for completing the application and developing a record to support the Commission's ultimate decision whether to grant the CPCN or not. The CPCN process will involve adjudicatory and public hearings. The time for completing the process depends upon the complexity of the proposed facility, the extent of environmental and socio-economic impacts, and public input – positive or negative. The process can take several months to a year or more. State law requires that the application be filed two years before construction is to commence, but this requirement may be, and usually is, waived upon request. If the facility is requesting an exemption, the Commission

may consider the matter itself without assigning it to the Hearing Division, or it may delegate the matter to a Law Judge. The Law Judge will establish a public hearing process and ensure that the applicant meets the requirements for an exemption. The implementing regulations are set 90 days from the date of application for a decision unless otherwise directed by the Commission. COMAR 20.79.01.03 (www.dsd.state.md.us/comar/SubtitleSearch.aspx?search=20.79.01.*). In exemption proceedings, there are no compliance requirements imposed by the Commission itself beyond a requirement to ensure electrical safety and reliability. The Commission is required to hold at least one public hearing and may issue an exemption if it finds that it is in the public interest to do so. There may be local zoning requirements and state and local environmental compliance requirements outside of the CPCN process itself, such as stormwater management, non-tidal wetlands, and sediment control.

Evaluation criteria: The state of Maryland has drafted guidelines for wind power siting; however, these guidelines have yet to be implemented. Criteria in the draft guidelines include:

(1) Assess species of concern
(2) Minimize seasonal disturbance during construction
(3) Avian and bat breeding seasons
(4) Lighting issues

Public input: Both the PSC CPCN process and the related process for exempting qualifying generators include public input procedures.

Relationships to other important energy policies or siting and zoning decisions: The Maryland Renewable Energy Standard (20% by 2022) includes wind as an eligible technology.

In 2003, two commercial wind projects (one for 100 MW and one for 40 MW) each went through a licensing process and obtained a CPCN to construct and operate wind generation facilities in Garret County, Maryland. A third facility proposing to build another 40-50 MW also received a CPCN to construct a facility in Garrett County but with limitations placed on the siting of its wind turbines. Since then, all proposed commercial wind developments to date have been smaller than 70 MW.

Pending issues: The major issues are implementing the draft siting process guidelines and establishing procedures for siting offshore wind developments.

Research issues: Bird and bat activity studies in western Maryland, bat activity in the Mid-Atlantic Bight (a coastal region spanning from Cape Cod, Massachusetts to Cape Hatteras, North Carolina), bat migration and population size studies, benthic habitat studies in the Maryland Wind Energy Area, assessments of the wind resource offshore of Maryland, techniques for optimizing turbine array layouts.

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Citations and links:

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Maryland Energy Administration. (22 Nov 2010). *Maryland County Wind Ordinances.* http://energy.md.gov/countyOrdinance.html.

Stemler, Jodi. (Oct 2007). *Wind Power Siting, Incentives, and Wildlife Guidelines in the United States*. U.S. Fish & Wildlife Service. www.fishwildlife.org/files/Maryland.pdf.

Data collected by Kai Goldynia, 4 Aug 2011.
Reviewed by Andrew Gohn, 17 Nov 2011.

State: Massachusetts

Wind siting basics: The Energy Facilities Siting Board is the siting authority for facilities with capacities of 100 MW or larger. At this level there is a "one-stop" permitting process. Siting of < 100 MW facilities is subject to municipal or regional permitting. No on-shore wind facilities over 100 MW have been proposed or built in Massachusetts.

History of siting authority: The authority of the Massachusetts Siting Board over energy facilities with > 100 MW of capacity is established by Massachusetts General Law Chapter 164, Section 69H (www.malegislature.gov/Laws/GeneralLaws/PartI/TitleXXII/Chapter164/Section69H)

Approvals needed: On the federal level, the applicant usually needs the approval of the Environmental Protection Agency (EPA), Fish and Wildlife Agency, and the Federal Aviation Administration (FAA). On the state level, permits are generally required under the Massachusetts Environmental Policy Act (MEPA) and the Massachusetts Natural Heritage Program (MNHP). The Department of Environmental Protection (DEP) and the Endangered Species program could also regulate the project.

Since permitting in Massachusetts occurs on a local level, the procedure will vary according to the local bylaw or ordinance. Most procedures involve conducting a pre-construction survey, submitting the application, holding a public hearing, opportunity for appeals, and then a final approval granted (or denial issued) by the permitting authority.

The siting and permitting process for wind projects in Massachusetts can take an exceptionally long time. Under the Massachusetts "citizen suit statute" citizens can appeal any state or local approved permit (Chapter 21E, Section 15 www.malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter21E/Section15). This law allows a group of 10 or more citizens to challenge a permit. Some municipalities have recently adopted "as-of-right zoning" in designated locations, which allows wind projects in the designated zones to proceed without a special permit (Department of Energy Resources, 2011).

Evaluation criteria:

The Massachusetts Department of Energy Resources has developed two model by-laws/ordinances, one for siting projects subject to a special permit and another that allows projects to be sited without a special permit in designated locations. Generally, these bylaws include standards that address:

Design Standards, including height–.
Safety and Environmental Standards, including Setbacks, Shadow/Flicker, and Sound - must comply with DEP noise regulations (www.airandnoise.com/MA310CMR710.html)
Monitoring and Maintenance
Abandonment or Decommissioning

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

Pending issues: The Wind Energy Siting Reform Act (S. 1666 – Finegold, H. 1775 – Smizik, and others[3]), currently before the Joint Committee on Telecommunications, Utilities and Energy, would:

[3] S. 1666 is the language of the conference report that made it to enactment stage in 2009-2010 session. H. 1775 is the House counterpart.

- Mandate that the Siting Board establish clear and predictable state siting standards for wind facilities; the standards must be as protective as existing state laws.

- Ensure municipalities would still establish and apply their own local standards.

- Provide for one-stop permitting at the local level and one stop at the state level for wind projects over 2 MW.

- Maintain home rule. (A municipality is free to reject any wind project, and the Siting Board has no authority to override that decision. Instead, the proponent's only remedy is to go to court – the same remedy as at present.)

- Provide for appeals. (If a municipality approves a wind project, opponents would appeal to the Siting Board. Appeal of a Siting Board ruling would go directly to the State Supreme Judicial Court.)

- Decrease the permitting process from eight years to 18 months, with an additional year if there is a judicial appeal.

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Department of Energy Resources, Massachusetts Executive Office of Environmental Affairs. (Jun 2011). *Model As-of-Right Zoning Ordinance or By-law: Allowing Use of Wind Energy Facilities or By-laws* www.mass.gov/eea/docs/doer/gca/as-of-right-wind-bylaw-june-2011.pdf.

_____. (1 Jan 2007). "Developing wind power projects in Massachusetts: Anticipating and avoiding litigation in the quest to harness wind." *Suffolk Journal of Trial and Appellate Advocacy*. www.thefreelibrary.com/Developing+wind+power+projects+in+Massachusetts%3a+anticipating+and+...-a0172525557.

Environmental Law Institute. (10 May 2011). *State Enabling Legislation for Commercial-Scale Wind Power Siting and the Local Government Role*. www.eli.org/pressdetail.cfm?ID=224.

Massachusetts Department of Energy Resources. *Massachusetts Wind Energy Siting Reform*. www.mass.gov/?pageID=eoeeaterminal&L=4&L0=Home&L1=Energy%2c+Utilities+%26+Clean+Technologies&L2=Renewable+Energy&L3=Wind&sid=Eoeea&b=terminalcontent&f=doer_renewables_wind_siting-reform&csid=Eoeea.

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Data collected by Lauren Teixeira, 13 Jul 2011.
Reviewed by Meg Lusardi, 12 Dec 2011.

State: Michigan

Wind siting basics: Michigan is a home-rule state. Local townships, villages, cities, and counties are responsible for wind siting and zoning. The state government has responsibility for identifying one or more Wind Energy Resource Zones, where transmission construction will be facilitated (see www.michigan.gov/windboard and http://www.michigan.gov/mpsc/0,1607,7-159-16393_52375---,00.html).

History of siting authority: None identified.

Approvals needed: No state permit process exists for construction of wind farms. Local land use and zoning regulations apply.

All construction projects can trigger the need for permits:

(1) Soil Erosion and Sedimentation Control – obtained from the appointed county or municipal enforcing agency
(2) National Pollutant Discharge Elimination System (NPDES) – Construction activities of 1 acre or more with a point-source discharge to waters of the state are required to submit a Notice of Coverage (NOC) to obtain coverage under Permit by Rule from the Michigan Department of Environmental Quality.
(3) Shoreline Construction from the State of Michigan Department of Environmental Quality
(4) Wetland Construction from the State of Michigan Department of Environmental Quality
(5) Sand Dune Construction from the State of Michigan Department of Environmental Quality

These processes are expected to take no more than a few months. A Soil Erosion and Sedimentation Control permit is required for all construction projects. Other permits are required, depending on location.

In addition, developers apply to the local township(s) or municipalities, and sometimes county(ies), for land-use permits (see http://expeng.anr.msu.edu/miwind/zoning_siting).

Like many other states, Michigan faces the challenge of implementing wind technology on the local, community scale. If zoning exists in a city, village, township, or county with its own existing zoning, the provisions adopted must be pursuant to the Michigan Zoning Enabling Act (2006 PA 110; http://legislature.mi.gov/doc.aspx?mcl-Act-110-of-2006). Some Michigan townships rely on county zoning, in which case the township must work with county planning commissions so that wind generator provisions are included in the county's zoning ordinance pursuant to the Michigan Zoning Enabling Act. Where zoning does not already exist, regardless of city, village, or township, it is not possible to adopt regulations without first adopting zoning (Michigan Department of Labor and Economic Growth, 2008).

Evaluation criteria: Some local governments have passed wind energy ordinances. Common evaluation criteria include:

(1) Property Setback
(2) Sound Pressure Level
(3) Safety
(4) Visual Impact
(5) Electromagnetic Interference

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions:

The Wind Energy Resource Zone Board (WERZ Board) was created by the Michigan Public Service Commission (MPSC) in Dec 2008 for the purpose of identifying regions in the state with the greatest potential for harvest of wind energy. In its final report, the WERZ Board determined two geographical zones with the highest estimated generating capacity.

In one of those zones, a transmission construction project has been approved to accommodate future wind generation (http://efile.mpsc.state.mi.us/efile/viewcase.php?casenum=16200&submit.x=21&submit.y=6, www.midwestiso.org/Planning/TransmissionExpansionPlanning/Pages/TransmissionExpansionPlanning.aspx). The Michigan Public Service Commission granted an expedited siting certificate to ITC Transmission for construction of a transmission line and four substations in Michigan's Thumb region, considered the state's highest wind energy resource zone. Appeals to this decision were filed by the Association of Businesses Advocating Tariff Equity (ABATE) and the Michigan Public Power Agency (MPPA) and Michigan Municipal Electrical Association (MMEA).

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Data collected by Kai Goldynia, 28 June 2011; Deborah Luyo, 19 Oct 2011.
Reviewed by Julie Baldwin, 20 Oct 2011, John Sarver, 20 Oct 2

State: Minnesota

Wind siting basics: In 2005, the Minnesota Legislature transferred to Minnesota Public Utilities Commission (PUC or Commission) from the Minnesota Environmental Quality Board (MEQB) the permitting authority for wind facilities greater than or equal to 5 MW in capacity (Minnesota statute, Chapter 216F [Wind Energy Conversion Systems] (www.revisor.mn.gov/statutes/?id=216F). Siting authority for facilities < 5 MW is reserved for local jurisdictions.

Section 216F.08 allows counties to assume authority for permitting of facilities with capacities of up to 25 MW if they, as a minimum, adopt the Commissions' General Permit Standards (www.revisor.mn.gov/statutes/?id=216F.08).

History of siting authority: In 1995, the Minnesota legislature enacted legislation that excluded wind energy facilities from the requirements of the Power Plant Siting Act, established a review process specific to wind energy facilities and authorized the MEQB to adopt rules specific to large wind energy conversion systems. (www.revisor.mn.gov/laws/?doctype=Chapter&year=1995&type=0&id=203). Minnesota statute 216F.02 gives local governments authority over wind farms less than 5 MW: www.revisor.mn.gov/statutes/?id=216f.02.

Approvals needed: The Commission, in making its determination on whether to issue a final site permit, relies on standards, criteria, and factors in Minnesota Rules parts 7850.4000 and 7850.4100 (https://www.revisor.mn.gov/rules/?id=7850) and the record developed in the review process governed by Minnesota Rules, Chapter 7854 (https://www.revisor.mn.gov/rules/?id=7854). Commission site permit requirements address site designation, setbacks and site layout restriction, compliance procedures, surveys and reporting, construction and operation practices, final as built documents, decommissioning, restoration and abandonment, and special conditions as warranted. The Commission's website at www.puc.state.mn.us/PUC/energyfacilities/siting-routing/index.html provides access to each project docket, which contains the primary documents associated with a project, and eDockets, which contains all of the documents associated with an individual project.

Other permits required for LWECS construction may also include:

Minnesota Public Utilities Commission

Certificate of Need (for facilities generating 50 MW or more).
www.puc.state.mn.us/portal/groups/public/documents/pdf_files/001075.pdf

Minnesota Department of Transportation

Utility Permit (Long Form) - www.dot.state.mn.us/utility/files/pdf/permits/long-form-complete.pdf

Utility Permit (Short Form) www.dot.state.mn.us/utility/files/pdf/permits/short-form-complete.pdf

Access Driveway Permit - www.dot.state.mn.us/utility/files/pdf/permits/access-form-complete.pdf

Oversize/Overweight Permits Page - www.dot.state.mn.us/cvo/oversize/forms_and_applications.html

County and Township Road permits

In Minnesota, it is common practice for wind developers and counties to enter into development agreements that provide for designation of haul roads, assessment of road and infrastructure conditions prior to construction, damages, restoration, and ditch requirements. The following link

(www.lrrb.org/trafcalc.aspx) provides a downloadable interactive document that provides web links, sample ordinances, reports, traffic calculators to quantify the traffic impact on roads, public policy options to recapture roadway maintenance costs, experience from current projects, and research information. This site will provide updates when available.

Tall Structure Permits

Wind energy conversion systems near airports may require a permit from the Minnesota Department of Transportation. Additional information is available on the Department's Aeronautics and Aviation website.
Minnesota Pollution Control Agency
NPDES Permit www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/construction-stormwater.html?menuid=&redirect=1). This may also include and/or satisfy the Soil Erosion and Sediment Control Plan.

Noise Standards. The project must comply with Minnesota Rules Chapter 7030 (www.revisor.leg.state.mn.us/rules/?id=7030) for setbacks from defined facilities.

Minnesota Department of Natural Resources

Permits to cross public lands and waters
(www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/applications.html)

Native Prairie: turbines and associated facilities shall not be place in native prairie unless approved in a native prairie protection plan (www.dnr.state.mn.us/prairierestoration).

Minnesota Board of Water and Soil Resources

Wetland Conservation Act (WCA) (www.bwsr.state.mn.us/wetlands/forms/form03_B.PDF)

Other PUC Site Permit and or Study Requirements

Archaeological Resource Survey and Consultation (through State Historic Preservation Office (www.mnhs.org/shpo/).

Avian and Bat Protection Plan: Avian and Bat Assessments, Survey and Monitoring Requirements

Shadow Flicker Modeling, Analysis and Mapping

Noise Modeling, Analysis and Mapping and Post Construction Noise Surveys

Demonstrate Control of Wind Rights

Wind Access Buffer: Turbine towers must be placed a minimum of 5 rotor diameters (RD) from all boundaries of site on the prevailing wind directions and 3 RD on the non-prevailing directions, unless otherwise approved by the Commission.

Internal Turbine Spacing Requirements: Turbine towers must be placed a minimum of 5 rotor diameters apart on the prevailing winds directions and a minimum of 3 RD on the non-prevailing winds within the permitted site boundaries, unless otherwise approved by the Commission

Off-Air TV Analysis

AM and FM Radio Reports

Licensed Microwave Report

Land Mobile Report

Freestanding permanent MET Towers

For projects under the authority of the local jurisdiction, the applicant must obtain the appropriate land use and zoning permits, depending on the ordinance.

Model ordinance: www.cleanenergyresourceteams.org/files/2005_model_wind_ordinance.pdf.

Public input: Commission rules include provisions for application distribution requirements, public notice, public meetings, public hearings, and other procedural requirements (https://www.revisor.mn.gov/rules/?id=7854).

The Commission makes a final decision within 180 days of the acceptance of the application. If the project is approved, a permit is issued with any conditions the Commission considers necessary to protect the environment, enhance sustainable development, and promote the efficient use of resources. Minn. Rules 7854 | LWECS Permitting Flowchart.

Relationships to other important energy policies or siting and zoning decisions:
Minnesota law provides for the creation of wind and solar easements for solar and wind-energy systems. The Commission's site permit wind access buffer requirements protect the wind rights of both project participants and non-participants (See Minn. Stat. 500.30).

Pending issues: Health effects and Avian and bat issues.

Research issues: Avian and bat issues.

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http://mn.gov/commerce/energy/utilities/Energy-Facility-Permits.jsp
www.energyfacilities.puc.state.mn.us/contact.html

Citations and links:

Great Lakes Wind Commission. (Mar 2009). *Siting and Permitting Wind Farms in Minnesota*. http://wiki.glin.net/download/attachments/950461/Minnesota.doc.

Minnesota Public Utilities Commission. *Energy Facilities* [web page]. www.puc.state.mn.us/PUC/energyfacilities/index.html.

Minnesota Statutes. (2011). *Chapter 216F. Wind Energy Conversion Systems*. https://www.revisor.mn.gov/statutes/?id=216F.

Data collected by Marley Ward, 1 July 2011, Deborah Luyo 27 Oct 2011.
Reviewed by Tricia DeBleeckere, 22 Dec 2011, Larry Hartman 9 Jan 2012.

State: Mississippi

Wind siting basics: Mississippi has no specific siting authority for wind.

History of siting authority: None identified.

Approvals needed: None identified.

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

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Citations and links:

Database of State Incentives for Renewables & Efficiency. *Mississippi Incentives/Policies for Renewables & Efficiency* [web page]. Retrieved 6 Nov 2011 from www.dsireusa.org/incentives/index.cfm?getRE=1?re=undefined&ee=1&spv=0&st=0&srp=1&state=MS.

Stemler, Jodi. (Apr 2007). *Wind Power Siting Regulations and Wildlife Guidelines in the United States*. U.S. Fish & Wildlife Service. www.fws.gov/midwest/wind/guidance/AFWASitingSummaries.pdf.

Data collected by Deborah Luyo, 6 Nov 2011.

State: Missouri

Wind siting basics: Local siting autonomy (Environmental Law Institute, 2011).

History of siting authority: None identified.

Approvals needed: There is no specific approval process; however, the Public Service Commission and Department of Natural Resources can have input and provide oversight, depending on the location and facilities planned. Otherwise, wind energy facilities are subject only to existing local government zoning regulations (Association of Fish and Wildlife Agencies).

Local government grants permit for construction if project is in compliance with zoning laws. (Association of Fish and Wildlife Agencies).

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

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Citations and links:

Association of Fish and Wildlife Agencies. *Missouri*. www.fishwildlife.org/files/Missouri.pdf.

Environmental Law Institute. (10 May 2011). *State Enabling Legislation for Commercial-Scale Wind Power Siting and the Local Government Role*. www.eli.org/pressdetail.cfm?ID=224.

Missouri Department of Natural Resources, *Wind Energy Resources* [web page]. Retrieved 20 Oct 2011 from www.dnr.mo.gov/energy/renewables/wind-energy.htm.

Data collected by Marley Ward, 1 Jul 2011.

State Name: Montana

Wind siting basics: Wind power development on private land is generally not government regulated, but under a statewide permit, persons disturbing more than one acre of land are required to file a Storm Water Pollution Prevention Plan with the Montana Department of Environmental Quality. The Montana Department of Environmental Quality can regulate projects impinging on wetlands, water quality, and the like (www.fishwildlife.org/files/Montana.pdf). Each county controls zoning for commercial and industrial development. *The Montana Department of Natural Resources and Conservation must approve projects on state owned land.*

History of siting authority: None identified.

Approvals needed: No specific wind energy siting or zoning approvals are needed from state or local agencies. If the project encroaches on wildlife, or impacts the human environment, environmental reviews may be necessary.

Only projects requiring a state permit or approval are subject to review under the Montana Environmental Policy Act (MEPA). If a wind project is determined to require MEPA review, an Environmental Assessment (EA) and/or Environmental Impact Statement (EIS) is required. One of the functions of an EA is to document whether there is potential for a significant impact. If there is a potential significant impact, an EIS must be prepared by the permitting agency. An EIS details the purpose of the project, describes the areas and resources affected, and reviews alternatives including the no action alternative and possible measures to reduce adverse impacts. Public participation is discretionary during EA review, but mandatory for EIS review.

Evaluation criteria: No specific criteria identified. Permits may be required from the Department of Environmental Quality depending on circumstances involving:

(1) Electric Transmission
(2) Open-cut Mining
(3) Wastewater
(4) Water Quality

Public Input: Public participation is a vital tool during the Environmental Impact Statement review and may be required during a state agency during preparation of an Environmental Assessment. The agency must provide at least a 30-day period for comments on the draft EIS and must not make a decision for a 15-day period following publication of a final EIS. The 30-day comment period may be extended for up to an additional 30 days unless the state agency is doing a joint review with a federal agency. In addition, the state agency must inform the public of its decision and its justification for that decision.

Relationships to other important energy policies or siting and zoning decisions: Montana's RPS requires that all public utilities obtain 15% of their electricity supply from qualified renewable energy resources by 2015.

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Citations and Links:

Association of Fish and Wildlife Agencies. *Montana*. www.fishwildlife.org/files/Montana.pdf.

Gaelectric. (13 Apr 2011). "Study confirms unique features of Montana wind in providing solutions for Pacific NW power market." www.gaelectric.ie/news-detail.asp?nid=79&id=5.

Montana Wind Group [web page]. Retrieved 13 Jul 2011 from http://montanawindgroup.org/index.html.

Montana Dept. of Environmental Quality. *Wind Energy Permit Requirements* [web page]. Retrieved 13 Jul 2011 from www.deq.mt.gov/energy/renewable/windweb/WindPermits.mcpx.

National Wind, *Montana Wind Facts* [web page]. Retrieved 13 Jul 2011 from www.nationalwind.com/montana_wind_facts.

Data collected by Kai Goldynia, 12 Jul 2011.
Reviewed by Tom Kaiserski, 12 Jan 2012, Tom Ring, 18 Jan 2012.

State: Nebraska

Wind siting basics: Nebraska is the only state where all electric power is publicly owned. As such, all power is regulated by the legislature, a local utility, or the Nebraska Power Review Board (NPRB).

Under 80 MW: Applicants connecting to the electric grid must obtain a power purchase agreement with a local utility and comply with local ordinances. Applicants must receive approval prior to construction either from the Federal Energy Regulatory Commission using the PURPA certification process, or from the NPRB. Customer generators (net metering) with a generator under 25 kilowatts rated capacity are exempt from the NPRB approval requirement.

Over 80 MW: Applicants must obtain NPRB approval prior to construction. The approval criteria the NPRB must use is set out in Neb. Rev. Stat. § 70-1014 (1996) (www.nprb.state.ne.us/prbmanual/4.html). A special generation application process is available under Neb. Rev. Stat. § 70-1014.01(2) if filed by a Nebraska utility for a renewable energy project and the total production from all such facilities does not exceed 10 percent of the utility's total energy sales. Approval of special generation applications is allowed if the applicant conducts a public hearing on the proposed project.

Wind-for-export project: Private developers wishing to construct renewable generation facilities can file an application using special NPRB approval criteria if at least 90 percent of the power will be exported outside Nebraska. The developer must offer certain public power utilities 10 percent of the renewable-generated electricity. The utilities can negotiate – the utilities do not have to purchase 10 percent. This process is set out in Neb. Rev. Stat. § 70-1014.02.

The Nebraska Power Review Board's approval criteria in Neb. Rev. Stat. § 70-1014 for generation and transmission facilities are based on public convenience and necessity, cost-effectiveness, and feasibility, as well as whether the proposed facility will duplicate existing facilities. The Board also determines issues relating to territorial disputes between utilities and is the repository for all Nebraska electric power suppliers' certified service areas.

History of siting authority: The authority of the Nebraska Power Review Board is statutory law: www.powerreview.nebraska.gov/powerlaws.htm

Terms for wind-for-export projects are defined in Section 70-1014.02, which was added in 2010. http://uniweb.legislature.ne.gov/laws/laws-index/chap70-full.html

Community-Based (C-BED) legislation was added in 2007, Sections 70-1901 to 70-1907: http://nebraskalegislature.gov/laws/laws-index/chap70-full.html

Approvals needed: Approval is also needed from: the Federal Aviation Administration, the Department of Defense, and the Nebraska Game and Parks Commission. The developer must notify either the Nebraska Game and Parks Commission or the U.S. Wildlife Agency. The project will receive a thumbs up/thumbs down from federal and state wildlife agencies as a unit. The NPRB is required to consult with the Nebraska Game and Parks Commission on all applications to ensure that approval will not cause harm to threatened or endangered species or their critical habitat. The Game and Parks Commission will notify the NPRB of its determination. The NPRB will also coordinate with the Nebraska Department of Aeronautics, the State Historical Society and the Nebraska Commission on Indian Affairs.

Omaha Public Power District, the Municipal Energy Agency of Nebraska, and NPPD have all solicited wind resources through requests for proposals (RFPs). NPPD expects to need 533MW of wind generation in order to meet its goal of 10% renewables by 2020. The NPPD RFP process is as follows:

(1) The NPPD submits an RFP, specifying a capacity and general location for the facility. Developers can propose projects on NPPD land or privately owned land.
(2) Developers submit their proposals during the RFP time period. (The second most recent RFP, which closed 15 Apr 2009, yielded 22 proposals.)
(3) The NPPD evaluates the proposals and develops a short list.
(4) From this shortlist the NPPD Board of Directors must approve a power purchase agreement.

Evaluation criteria: Energy cost to NPPD, cost of transmission, developers' experience, and environmental impact.

Counties drafting ordinances usually consult the NPPD. Setback distances are recommended by the U.S. Bureau of Land Management.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: C-BED legislation gives landowners first right to wind energy development and provides a sales and use tax exemption on the gross receipts from the sale, lease, or rental of personal property for use in a C-BED project (http://uniweb.legislature.ne.gov/laws/statutes.php?statute=s7727004057).

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Citations and links:

Environmental Law Institute. (10 May 2011). *State Enabling Legislation for Commercial-Scale Wind Power Siting and the Local Government Role*. www.eli.org/pressdetail.cfm?ID=224.

Stemler, Jodi. (11 Apr 2007). *Wind Power Siting Regulations and Wildlife Guidelines in the United States*. U.S. Fish and Wildlife Service. www.fws.gov/midwest/wind/guidance/AFWASitingSummaries.pdf.

WOWT. "NPPD Receives 18 Wind Energy Proposals," *WOWT.com*. www.wowt.com/news/headlines/43127912.html?storySection=story.

Data collected by Lauren Teixeira, 11 Jul 2011.
Reviewed by Jerry Loos, 5 Jan 2012; David Ried, 5 Jan 2012; Tim Texel, 9 Jan 2012.

State: Nevada

Wind siting basics: Wind siting is done at the local level. The Public Utilities Commission of Nevada issues a permit for construction of renewable electric generating plants, including wind, with a nameplate capacity of 70 MW or more.

History of siting authority: Utility Environmental Protection Act; Nevada Revised Statutes § 704.820 through 704.900 (1971) (www.leg.state.nv.us/nrs/nrs-704.html). Nevada is a Dillon's Rule state.

Approvals needed: Approval at the county level is needed. Applicants are required to file with the Nevada PUC, including a summary of environmental impact and need. The applicant must also submit a copy to the Division of Environmental Protection, Nevada Department of Conservation and Natural Resources, and Nevada State Clearinghouse. Within 150 days, the PUC will grant or deny the application.

Approximately 85% of Nevada land is federal property, where environmental studies are required by the federal Bureau of Land Management. Such studies are thorough and usually take up to two years (for an environmental assessment; EA) or three years (for an environmental impact statement; EIS).

Evaluation criteria: A community does not have authority to deny approval of a wind energy system if the owner has written consent from all owners of properties within 300 feet of the system and meets all of the local jurisdiction's ordinances for wind energy systems if in effect (Database of State Incentives for Renewables & Efficiency, *Nevada Solar and Wind Easements & Rights Laws*).

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Nevada's most recent renewable portfolio standard (RPS) mandates that 25% of energy must come from renewable sources by 2025. Portfolio energy credits (PECs) are used to facilitate the buying and selling of renewable energy to meet portfolio standards. One PEC is equal to one kilowatt-hour (kWh) produced from a non-solar renewable source.

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Citations and links:

Database of State Incentives for Renewables & Efficiency. (2 Jun 2011). *Nevada Incentives/Policies for Renewables & Efficiency* [web page]. Retrieved 6 Jul 2011 from www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NV01R&re=1&ee=1.

Database of State Incentives for Renewables & Efficiency. (16 Jun 2011). *Nevada Solar and Wind Easements & Rights Laws* [web page]. Retrieved 21 Oct 2011 from www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NV03R&re=1&ee=1.

Robison, Jennifer. (22 Jun 2011). "In Wind Farms, Nevada Decidedly Calm," *The Las Vegas Review-Journal*. www.lvrj.com/business/in-wind-farms-nevada-decidedly-calm-124337909.html.

United States Court of Appeals for the Ninth Circuit. *Western Watersheds Project and Center for Biological Diversity v. Bureau of Land Management*, Docket 11-15799. www.sustainabilityclimatechangereporter.com/uploads/file/11-15799%5b2%5d.pdf.

Data collected by Francis Motycka, 6, 11 Jul 2011, 4 Aug 2011.
Reviewed by Mark Harris, 31 Oct 2011.

State: New Hampshire

Wind siting basics:

Small Wind: Wind siting is done at the local level of government. However, developers of facilities larger than 5 MW and smaller than 30 MW can petition the New Hampshire Site Evaluation Committee (SEC) for a Certificate for Site and Facility, which would preempt local jurisdiction (www.nhsec.nh.gov/rules/index.htm).

Large Wind: The NH SEC has overall siting authority for energy facilities 30 MW or over, as demonstrated by its decision-making authority in RSA 162-H:16, II (www.gencourt.state.nh.us/rsa/html/XII/162-H/162-H-16.htm). The committee works closely with the host community(ies) to ensure orderly development of the region and incorporates local interests as much as possible in a decision as long as the preamble to RSA 162-H is not compromised. Local ordinances, etc. are not binding on the NH SEC. The NH SEC possesses the authority to supersede the local host community(ies) if its requirements conflict with the preamble of the law (RSA 162-H:1, www.gencourt.state.nh.us/rsa/html/XII/162-H/162-H-1.htm) in favor of the greater good.

History of siting authority: New Hampshire Revised Statute: RSA 162-H:2, XI (1991, 1998, 2009) (www.gencourt.state.nh.us/rsa/html/XII/162-H/162-H-mrg.htm). New Hampshire is a Home Rule state.

Approvals needed: For Large Wind, the New Hampshire Energy Facility Siting Evaluation Committee (SEC) provides a Certificate of Site and Facility.

Within 60 days of submitting an application to the SEC, a decision will be made to either accept or deny the application. If an application is deemed incomplete, the applicant has 10 days to make corrections or choose to begin anew. Within five months, all state agencies involved are to submit to the SEC reports of progress and list any additional information required for permits. Within eight months, the state agencies are to report their final decisions regarding their respective jurisdictions. Within nine months of the application's acceptance date, the SEC makes a decision to either issue or deny the certificate.

Evaluation criteria: The SEC must determine that the project:

- Applicant has adequate financial, technical, and managerial capability to assure construction and operation of the facility in continuing compliance with the terms and conditions of the certificate.
- Will not unduly interfere with the orderly development of the region, with due consideration having been given to the views of municipal and regional planning commissions and municipal governing bodies.
- Will not have an unreasonable adverse effect on aesthetics, historic sites, air and water quality, the natural environment, and public health and safety.

(1) Environmental impact: The New Hampshire Fish & Game Department reviews potential impacts to wildlife. The New Hampshire Natural Heritage Bureau focuses on the potential impact to endangered species and plants.
(2) Historic sites: The New Hampshire State Historic Preservation Office is responsible for historic and cultural resource issues.
(3) Stormwater and wetlands: New Hampshire Department of Environmental Services is responsible for storm water runoff, wetlands, and alteration of terrain.

Public input: The SEC subcommittee must hold at least one public hearing after acceptance of the application, and another after submission of final decisions from participating state agencies (www.nhsec.nh.gov/rules/index.htm).

Relationships to other important energy policies or siting and zoning decisions: New Hampshire's Renewable Energy Portfolio mandates that 23.8% of electric generation must come from renewable sources by 2025. Wind energy, among others, is listed as a Class I energy source. Class I energy sources must increase by 1% every year from 2011 through 2025, reaching 16% by 2025.

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Citations and links:

Database of State Incentives for Renewables & Efficiency. (7 Feb 2011). *New Hampshire Incentives/Policies for Renewables & Efficiency* [web page]. www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NH09R&re=1&ee=1, retrieved 3 Jul 2011.

Government of New Hampshire. *New Hampshire Siting Evaluation Committee* [web page]. Retrieved 3 Jul 2011 from www.nhsec.nh.gov/.

New Hampshire Revised Statutes. (8 Aug 2009). *Title XII Public Safety and Welfare Chapter 162-H-2, XL Energy Facility Evaluation, siting, Construction and Operation.* www.gencourt.state.nh.us/rsa/html/XII/162-H/162-H-mrg.htm.

Tracy, Paula. (2 Nov 2010). "State Wants More Analyses of Wind Project's Effects," *New Hampshire Union Leader*. www.wind-watch.org/news/2010/11/02/state-wants-more-analysis-of-wind-projects-effects/.

Data collected by Francis Motycka, 3, 6 Jul 2011, 4 Aug 2011.
Reviewed by Tim Drew, 4 Nov 2011, Kate Epsen, 26 Jan 2012.

State Name: New Jersey

Wind Siting Basics: New Jersey has no specific wind siting authority.

History of Siting Authority: New Jersey Statute § 40:55D-66.11, 31 Mar 2009. *Wind and solar facilities permitted in industrial zones* ftp://www.njleg.state.nj.us/20082009/AL09/35_.PDF.

New Jersey Statute § 40:55D-66.12, 16 Jan 2010. *Municipal ordinances relative to small wind energy systems* www.njleg.state.nj.us/2008/Bills/AL09/244_.PDF.

New Jersey Statutes §13:19-10.1, Jan 2010. *Wind as a Permitted Use on Piers*. www.njleg.state.nj.us/2010/Bills/S0500/212_R3.PDF.

New Jersey Statutes § 48:3-51, 29 Mar 2010. *The Offshore Wind Economic Development Act* http://law.onecle.com/new-jersey/48-public-utilities/3-51.html.

Approvals needed: Approval is needed from the Department of Environment Protection and from local governments through the planning and zoning commission. Offshore wind power, considered the greatest source of wind power potential in New Jersey, is subject to state coastal zone management rules.

There are two general types of wind energy generation projects in New Jersey; net metered systems interconnected behind an electric customer's meter and merchant wholesale power generators. Developers of net metered generation facilities must file an interconnection application with the Electric Distribution Company serving the potential "customer-generator". The state's Board of Public Utilities (NJBPU) promulgates regulations governing how the state's franchise Electric Distribution Companies interconnect and net meter NJ Class I renewable resources, including wind energy.

Developers of new wholesale merchant power generation facilities must file an application with the PJM Interconnection. The PJM will conduct a review, which includes preliminary feasibility, impact and cost allocation studies.

Evaluation criteria: Pre-construction requirements for projects located in the coastal zone (Four distinct regions are included in New Jersey's coastal zone. Standards for determination of boundaries differ among regions.) include:

- Visual and Audio Bird Surveys
- Migratory Bat surveys
- Radar Surveys

Post construction monitoring is also required (NJ Department of Environmental Protection, 2010).

Public Input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: New Jersey's renewable portfolio standard requires that each electricity supplier or provider serving retail electric customers in the state's competitive generation marketplace procure 22.5% of electricity sold from renewable sources by 2021 (Database of State Incentives for Renewables & Efficiency, 2010).

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Citations and Links:

Database of State Incentives for Renewables & Efficiency. (10 May 2010), *New Jersey Incentives/Policies for Renewables & Efficiency* [web page]. Retrieved 1 Nov 2011 from www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NJ05R.

Database of State Incentives for Renewables & Efficiency. (11 Feb 2011). *New Jersey Solar and Wind Permitting Laws* [web page]. Retrieved 1 Nov 2011 from www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NJ17R&re=1&ee=1.

Edison Electric Institute. (2004). *State Generation & Transmission Siting Directory: Agencies, Contacts, and Regulations*. www.eei.org/ourissues/ElectricityTransmission/Documents/State_Generation_Transmission_Siting_Directory.pdf.

New Jersey Department of Environmental Protection. (7 Sep 2010). *Technical Manual for Evaluating Wildlife Impacts of Wind Turbines Requiring Coastal Permits*. www.state.nj.us/dep/landuse/forms/wind_monitoring_protocol.pdf.

New Jersey Department of Environmental Protection. Division of Land Use Regulation. *Regulation of Wind Turbines in New Jersey's Coastal Zone* [web page]. Retrieved 1 Nov 2011 from www.nj.gov/dep/landuse/windturbine.html.

Stemler, Jodi. (Oct 2007). *Wind Power Siting, Incentives and Wildlife Guidelines in the United States*. U.S. Fish & Wildlife Service. www.fws.gov/habitatconservation/windpower/AFWA%20Wind%20Power%20Final%20Report.pdf.

Data collected by Deborah Luyo, 1 Nov 2011.
Reviewed by B. Scott Hunter, 20 Jan 2012.

State: New Mexico

Wind siting basics: Local siting with local autonomy for projects up to 300 MW (Environmental Law Institute, 2011). The New Mexico Public Regulation Commission has authority for projects greater than 300 MW. State agencies have the authority to override local decisions, if they are not within the guidelines of Section 62-9-3 of the 2009 New Mexico Code (http://law.justia.com/codes/new-mexico/2009/chapter-62/article-9/section-62-9-3/).

History of siting authority: 2009 New Mexico Code (http://law.justia.com/codes/new-mexico/2009/chapter-3/article-21/section-3-21-1).

Approvals needed: Approval of projects by county government is based on zoning laws.

New Mexico's Public Regulation Commission has no process for review of potential wind projects.

Evaluation criteria: Guidelines from the New Mexico Department of Game & Fish include:

- Turbines should not be place in documented locations of any species of wildlife, fish or plant protected under the Federal Endangered Species Act.
- Turbines should not be located in known local bird migration pathways or in areas where birds are highly concentrated, unless mortality risk is low.
- Turbines should not be placed near known bat hibernation, breeding, and maternity/nursery colonies, in migration corridors, or in flight paths between colonies and feeding areas.
- Configure turbine locations to avoid areas or features of the landscape known to attract raptors (hawks, falcons, eagles, owls).
- Configure turbine arrays to avoid potential avian mortality where feasible.
- Avoid fragmenting large, contiguous tracts of wildlife habitat.
- Avoid placing turbines in habitat known to be occupied by Lesser Prairie Chickens or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation.
- Minimize roads, fences, and other infrastructure.
- Develop a habitat restoration plan for proposed sites that avoids or minimizes negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species.
- Post-development mortality studies should be a part of any site development plan.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

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Data collected by Marley Ward, 13 Jul 2011.
Reviewed by Rachel Jankowitz, 8 Nov 2011.

State: New York

Wind siting basics: Projects with a nameplate capacity of 25 MW or more require a Certificate of Public Convenience and Necessity from the Public Service Commission. Wind energy projects may require specific approvals from state or federal agencies, for example wetland or stream disturbance permits from the Department of Environmental Conservation (DEC) or U.S. Army Corps of Engineers (USACE). Before local and State agencies can issue these approvals, an environmental review must be conducted according to the State Environmental Quality Review Act (SEQRA).

History of siting authority: Public Service Law (PSL) § 617, 1996**.** Co-generation, Small Hydro and Alternate Energy Production Facilities**;** New York Code: Energy Law Article 21 - § 21-106, 2010. State Environmental Quality Review Act (SEQRA), 2011**.** New York is a Home Rule State.

Approvals needed: The pre-application process involves submission of an application to the siting board, which includes five state agency officials and two ad hoc members from the community. Depending on location and environmental impact, required permits could include:

(1) Construction stormwater permit
(2) Coastal erosion control permit
(3) Freshwater wetland permit
(4) Protection of waters permit
(5) Tidal wetlands permit
(6) Endangered and threatened species take permit

The first step in the approval process is initiating the SEQRA review, where a local agency is typically the Lead Agency. If at least one potential adverse environmental impact is identified, depending on the type and amount of impact, an Environmental Impact Statement (EIS) could be required. After completion of the SEQRA process, which sometimes includes a public comment period, all involved agencies make decisions, based on each agency's jurisdiction, to approve or deny the project. SEQRA publishes its procedures (www.riverkeeper.org/wp-content/uploads/2009/06/A_Citizens_Guid-1.pdf).

The Department of Environmental Conservation has issued guidelines for pre- and post-construction bird and bat monitoring (www.dec.ny.gov/energy/40966.html). Prior to construction, at least one year of monitoring is encouraged, longer if findings indicate that more study is needed. Post-construction monitoring is typically done for a minimum of two years at each project, longer if findings indicate that more study is needed or if site-specific situations warrant further observation.

Evaluation criteria: The following criteria are from the *Model Ordinance* developed by the New York State Research and Development Authority (NYSERDA; http://nyserda.ny.gov/):

- Controls and brakes: "All wind turbines shall have an automatic braking, governing or feathering system."
- Climb prevention and locks: "…a fence six feet high with a locking portal shall be placed around the facility's tower base or the tower climbing apparatus shall be limited to no lower than 12 feet from the ground, or the facility's tower may be mounted on a roof top."
- Decommissioning: "Any wind energy system found to be unsafe… shall be repaired…or removed within six months. If any wind energy system is not operated for a continuous period of 12 months, the Town will notify the landowner."
- Environmental: "Wind turbines shall be set back at least 2,500 feet from Important Bird Areas… and at least 1,500 feet from State-identified wetlands."

- Interference with communications devices: "The applicant shall minimize or mitigate any interference with electromagnetic communications."
- Liability insurance: "Prior to issuance of a building permit, the applicant shall provide the town proof of… insurance."
- Lighting: "Towers shall be equipped with air traffic warning lights and shall have prominent markings on the rotor blade tips of an international orange color where the total height of the tower exceeds 175 feet."
- Minimum property setbacks: "The minimum setback distance… shall be equal to no less than 1.5 times the sum of proposed structure height plus the rotor radius."
- Power lines: "All wiring between wind turbines and the wind energy facility substation shall be underground."
- Protection of public roads: "…if new roads are needed, minimize the amount of land used for new roads and locate them so as to minimize adverse environmental impacts."
- Sound levels: "Individual wind turbine towers shall be located so that the level of noise produced by wind turbine operation shall not exceed 55 dBA."
- Substation: "…if new substations are needed, minimize the number of new substations."
- Visual appearance of wind turbines and related infrastructure: "Brand names or advertising… shall not be visible from any public access" and "colors and surface treatment… shall minimize visual disruption. … Where wind characteristics permit, wind towers shall be set back from the tops of visually prominent ridgelines."

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: The state of New York has a renewable portfolio standard (RPS) of 24% percent by 2013. "Main tier" sources, including wind power, must provide at least 93% of this standard.

Pending issues: On 22 Jun 2011, the New York State Assembly passed the State Power Act of 2011, which will create a centralized and streamlined process for wind facility siting for projects over 25 MW. The new siting board will be composed of executives at various state agencies. http://public.leginfo.state.ny.us/LAWSSEAF.cgi?QUERYTYPE=LAWS+&QUERYDATA=$$PBS18-A$$@TXPBS018-A+&LIST=LAW+&BROWSER=EXPLORER+&TOKEN=21386711+&TARGET=VIEW.

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Data collected by Francis Motycka, 5, 11, Jul 2011, 4 Aug 2011.
Reviewed by Brianna Gary, 10 Nov 2011.

State: North Carolina

Wind siting basics: Wind siting is done at the local level of government.

History of siting authority: North Carolina General Statutes, Chapter 62 (1963) (www.ncga.state.nc.us/enactedlegislation/statutes/html/bychapter/chapter_62.html)

Rule R8-61regarding certificates of public convenience and necessity for construction of electric generation and related transmission facilities in North Carolina (Feb 2008) (http://ncrules.state.nc.us/ncac/title%2004%20-%20commerce/chapter%2011%20-%20utilities%20commission/04%20ncac%2011%20r08-61.pdf)

North Carolina Environmental Policy Act (SEPA) (1971, 1991) (www.ncleg.net/EnactedLegislation/Statutes/HTML/ByChapter/Chapter_113A.html)

North Carolina is a Home Rule state.

Approvals needed: The following agencies should be contacted:

(1) North Carolina Department of Environment
(2) North Carolina Department of Natural Resources
(3) U.S. Army Corps of Engineers for projects in or around streams, wetlands, or other waters
(4) County government

The developer must obtain a Certificate of Public Convenience and Necessity from the NCUC. If the project is 300 MW or more, the applicant must submit a summary at least 120 days before filing an application.

Evaluation criteria: Criteria from the Watuaga County ordinance (2006) include:

(1) Decommissioning
(2) Demographics of surrounding area
(3) Location, topography and wetland assessments
(4) Maintenance
(5) Noise
(6) Public health and safety
(7) Tourism and community benefits
(8) Visual impacts, with a special emphasis on the Blue Ridge Parkway viewshed.

Public input: Within ten days of filing an application, the applicant must provide at least three public notifications through the local newspaper to all residents in the county and municipality that will be affected by the facility. A project summary must also be forwarded to the North Carolina State Environmental Review Clearinghouse (www.doa.state.nc.us/clearing/).

Relationships to other important energy policies or siting and zoning decisions: North Carolina's renewable portfolio standard (RPS) requires 12.5% of 2020 electricity sales to come from renewable sources. Each utility shall file compliance reports in 2012, 2013, 2014, 2015, 2018, and 2021, detailing the previous year's electricity sales. (Database of State Incentives for Renewables & Efficiency, 2011).

Pending issues: The Desert Wind Energy Project, North Carolina's first utility-scale wind facility, a 300 MW wind facility in the counties of Pasquotank and Perquimans, has received approval from the North Carolina Utilities Commission. Electricity generation is anticipated to begin by the end of 2012.

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Data collected by Francis Motycka 6, 11, 12 Jul , 3 Aug 2011.

State: North Dakota

Wind siting basics: The North Dakota Public Service Commission (PSC) regulates the siting of wind facilities greater than 0.5 MW (www.legis.nd.gov/cencode/t49c22.pdf). Smaller facilities are regulated at the local level (by either county or township board).

History of siting authority: The Energy Conversion and Transmission Facility Siting General Provisions were amended in 1979, and again in 1982, 2008, and most recently in 2011.[4] Passage of Senate Bill 2196 (Sixty Second Legislative Assembly of North Dakota, 2011) closed what one state senator referred to as a "loophole" that allowed wind developers to avoid the state siting provisions by breaking up larger wind projects into smaller ones simply to keep under the minimum capacity threshold ("ND PSC may get broader wind farm siting authority," 2011). Prior to this amendment, North Dakota PSC had authority to review energy conversion facilities for projects over 60 MW. The 2011 amendments lower the limit for wind generators to 0.5 MW and all other generators to 50 MW.

Approvals needed: For any wind project greater than 0.5 MW, applicants must obtain a Certificate of Site Compatibility from the North Dakota Public Service Commission. The Commission works in concert with as many as 21 state agencies in determining whether to issue a Certificate.[5]

The North Dakota PSC outlines a comprehensive list of procedures and required certificates and permits. These include:

(1) General Provisions
- Advisory Committees
- Public Hearings

(2) Utility Reporting Requirements
(3) Letter of Intent
(4) Certificate of Site or Corridor Compatibility
(5) Transmission Facility Permit
(6) Waiver of Procedures and Time Schedules
(7) Criteria
(8) Continuing Suitability of Certificate or Permit

The timetable for application review is undetermined, dependent upon completion of all requirements.

Evaluation criteria: Criteria for evaluating energy conversion facility siting decisions include:

(1) Exclusion zones
- national parks, forests, etc.
- state parks, forests, etc.
- irrigated lands

[4] North Dakota Administrative Code, Title 69-06, www.legis.nd.gov/information/acdata/html/69-06.html.
[5] The list of 21 state agencies required to receive notice of applications for Energy Conversion Facilities and Transmission Facilities is included in § 69-06-01-05. These include the North Dakota Departments of Agriculture, Health, Human Services, Labor, Career and Technical Education, and the Aeronautics Commission, Attorney General, Economic Development Commission Energy Development Impact Office, Game and Fish Department, Geological Survey, Governor, Highway Department, State Historical Society of North Dakota, Indian Affairs Commission, Job Service of North Dakota, Land Development, Parks and Recreation Department, Division of Community Services-Department of Commerce, Soil Conservation Committee, and State Water Commission.

- areas important to the life-cycle of endangered species

(2) Avoidance areas
- geologically unstable areas
- historically significant areas
- woodlands and wetlands

(3) Selection criterion – evaluation of impacts on:
- Agriculture
- Law enforcement
- School systems and educational programs
- Governmental services and education programs
- General and mental health care facilities
- Recreational programs and facilities
- Transportation facilities and networks
- Retail service facilities
- Utility services
- Local institutions
- Noise-sensitive land uses
- Rural residences and businesses
- Aquifers
- Human health and safety
- Animal health and safety
- Plant life
- Temporary and permanent housing
- Temporary and permanent skilled and unskilled labor

Public input: General hearings are held prior to adopting or modifying the criteria, or suspending a certificate or permit. Application hearings are held for a certificate or permit.

Relationships to other important energy policies or siting and zoning decisions: North Dakota has a Renewable Portfolio Standard of 10% by 2015. North Dakota already has over 1,400 MW of installed wind capacity (Wind Powering America, 2011).

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Data gathered by Kai Goldynia, 23 Jul 2011.
Reviewed by Christopher Marohl, 31 Oct 2011.

State: Ohio

Wind siting basics: The Ohio Power Siting Board (OPSB) has regulatory jurisdiction for the siting of all wind projects in Ohio with a generating capacity of at least 5 megawatts (MWs). For wind projects less than 5 MW, the local zoning requirements would apply.

History of siting authority: Previously, the OPSB had jurisdiction for wind farms with a capacity of at least 50 megawatts; however, as of 2008, the legislature extended the Board's jurisdiction to also include economically significant wind farms, defined as having generating capacities between 5 and 50 MWs (http://codes.ohio.gov/orc/4906.20).

Approvals needed: Developers who wish to site wind facilities designed for or capable of generating five or more megawatts must first apply for and obtain a certificate of environmental compatibility and public need from the OPSB.

Permits required for construction could include at least:

- National Pollutant Discharge Elimination System (NPDES) Permit – Construction that disturbs 1 acre or more requires a stormwater-discharge permit from the Ohio Environmental Protection Agency (EPA).
- Water Quality Certificate – Construction that disturbs lakes, rivers, streams, and wetlands requires a water-quality certificate from the Ohio EPA.
- Shoreline – Shore structure construction requires a permit from the Ohio Department of Natural Resources. (Great Lakes Commission, 2009).

Evaluation criteria: For the complete *Basis for Decision Granting or Denying Certificate* (Ohio Revised Code 4906.10), see http://codes.ohio.gov/orc/4906.10. The OPSB criteria include:

- The need for the facility if the facility is an electric transmission line…;
- The probable environmental impact of the proposed facility;
- Whether the facility represents the minimum adverse environmental impact…;
- In the case of electric transmission lines, that the facility is consistent with regional plans for expansion of the electric power grid of the electric systems serving Ohio…
- That the facility will comply with all air and water pollution control and solid waste disposal laws and regulations;
- That the facility will serve the public interest, convenience, and necessity;
- The facility's impact on the viability as agricultural land of any land in an existing agricultural district; and
- That the facility incorporates maximum feasible water conservation practices as determined by the Board…. (Ohio Power Siting Board, 2010).

Public input: The Ohio power siting process includes several opportunities for public input, including mandatory public information meetings prior to the filing of an application and public hearings. Members of the public can seek to intervene in the siting proceeding, testify at public hearings without intervening, and submit letters that are considered by the Board in making its decisions. (www.puco.ohio.gov/emplibrary/files/OPSB/Presentations_Manuals/OPSBbrochure2010.pdf).

Relationships to other important energy policies or siting and zoning decisions: Ohio has an alternative energy resource standard of 25 percent by 2025; at least half must come from renewable sources, including a specific in-state requirement (Database of State Incentives for Renewables & Efficiency).

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Data collected by Kai Goldynia, 23 June 2011.
Reviewed by Stuart Siegfried, 8 Nov 2011.

State: Oklahoma

Wind siting basics: Responsibility for wind siting is entirely at the local level of government. Wind power projects can go through a voluntary review by the Oklahoma Corporation Commission.

History of siting authority: *The Oklahoma Wind Energy Development Act* (Jun 2010) – Oklahoma Statutes Title 17, §160.11 – § 160.19 (www.occeweb.com/GC/OKLaw.html). Oklahoma is a Dillon Rule state (National League of Cities).

Approvals needed: Applicants must adhere to the requirements mandated by the local jurisdiction.

The Oklahoma Wind Energy Development Act regulates decommissioning, requires wind farm operators to provide prompt statements regarding royalty payments to land-owners, and requires commercial liability insurance with the landowner insured (Oklahoma Statutes Title 17, §160.14 et seq.) .

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Oklahoma has a renewable energy portfolio standard (RPS) mandating that 15% of energy capacity will come from renewable sources, including wind, by 2015. Each utility files an annual report to the Oklahoma Corporation Commission, including total kilowatt-hours (kWh) and the sources for generation. Oklahoma has no specific provisions for using or trading renewable energy credits (RECs) (Database of State Incentives for Renewables & Efficiency).

Pending issues: The Oklahoma Exploration Rights of 2011 (§52-801 – §52-805 www.oklegislature.gov/osstatuestitle.html) mandates that the exploratory rights of oil and natural gas companies "not be diminished, abrogated or interfered with in any respect by a wind or solar energy agreement except with the prior written consent of the owner of exploration rights, which consent may be granted or withheld for any reason or for no reason."

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Data collected by Francis Motycka, 8, 10, 11 Jul 2011.
Reviewed by George Kiser, 16 Dec 2011.

State: Oregon

Wind siting basics: Wind projects smaller than 105 MW are regulated by cities and counties. The Oregon Energy Facility Siting Council (EFSC) regulates larger projects.

History of siting authority: The Energy Facility Siting Council and the Oregon Department of Energy were created in 1975 (Oregon Statutes – Chapter 469, www.leg.state.or.us/ors/469.html).

Approvals needed: For small wind applications, applicants must obtain local land-use permits and electrical (building) permits. For large wind, developers must apply to the EFSC for a site certificate.

Evaluation criteria:

Small Wind

- Turbines must be mounted on towers between 60-100 feet tall, at least 30 feet above obstructions
- Residential wind turbines must range from 500 watts to 10 kilowatts

Large Wind

General Standards

- Noise
- Wetlands
- Water Pollution Control Facility
- Water Rights

Specific Standards

- Organizational Expertise: helps ensure that the applicant has the abilities and resources to successfully build and operate the facility.
- Structural Standard: protects public health and safety, including the safety of
- facility workers, from seismic hazards.
- Soil Protection
- Protected Areas
- Fish and Wildlife Habitat
- Threatened and Endangered Species
- Scenic Resources
- Historical, Cultural, and Archaeological Resources
- Recreation
- Public Services
- Waste Minimization
- Carbon Dioxide Emissions
- A "one-stop" process in which the Council determines compliance with specific standards of the Council and other state and local permitting agencies.
- Appeals requiring judicial review go directly to the Oregon Supreme Court.

Public input: For large wind, public comment periods take place during the early phase of the process and are followed by formal contested case proceedings.

Relationship to other important energy policies or siting and zoning decisions: Oregon's Renewable Portfolio Standard directs utilities to reach 25% of retail electricity needs with qualified renewable resources by 2025.

Pending issues: A major issue for Oregon large wind generation arises due to competition with hydroelectric power for limited transmission capacity. The Bonneville Power Authority (BPA) has sometimes issued curtailment orders for wind farms along the Columbia River (Laskow, 2011). On 7 Dec 2011, the Federal Energy Regulatory Commission (FERC) ruled that curtailment of wind power is discriminatory (Ranken, 2011).

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Data collected by Kai Goldynia, 10 Jul 2011.

State: Pennsylvania

Wind siting basics: Siting responsibility lies at the municipal level of government. A model ordinance was created in 2006; however, many local municipalities have developed their own guidelines and ordinances (Pennsylvania Department of Environmental Protection, 2006).

History of siting authority: Pennsylvania Municipalites Planning Code (MPC) Act of 1968, P.L.805, No.247. http://mpc.landuselawinpa.com/mpc_full.html

Approvals needed: Within 30 days of a permit application, the municipality will determine whether or not the application is complete. Once the application is determined to be complete, the municipality will schedule a public hearing, and, within 120 days or 45 days after any hearing is completed, whichever is later, the municipality will decide to issue or deny the permit application (Pennsylvania Department of Environmental Protection, 2006).

A cooperative agreement with the Pennsylvania Game Commission addressing bat, bird, and wildlife issues is voluntary. Specific wildlife surveys can be required, depending on projected impacts. According to the *Wind Energy Voluntary Cooperation Agreement* with the Pennsylvania Game Commission, the developer must notify the PGC 14 months prior to construction. Within 45 days of the notification, the PGC will communicate its findings on the potential impact of the wind development site on wildlife and habitat.

For erosion and sediment control, the Pennsylvania Department of Environmental Protection (DEP) requires a general or individual NPDES *Permit for Storm Water Discharges Associated with Construction Activities*. For water obstruction and encroachment and wetlands, developers must obtain a separate DEP permit (Commonwealth of Pennsylvania). In addition, before submitting to the DEP, the applicant must complete an online Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review (Commonwealth of Pennsylvania Office of Energy and Technology Development, Department of Environmental Protection).

Evaluation criteria: No firm criteria identified. The *Model Ordinance* includes:

- Controls and brakes: “All Wind Energy Facilities shall be equipped with a redundant braking system.”
- Climb prevention and locks: “Wind Turbines shall not be climbable up to fifteen (15) feet above ground surface,” and “All access doors to Wind Turbines and electrical equipment shall be locked or fenced, as appropriate.”
- Decommissioning: “The Facility Owner and Operator shall… complete decommissioning of the Wind Energy Facility, or individual Wind Turbines, within (12) twelve months after the end of the useful life of the Facility or individual Wind Turbines”
- Dispute resolution: “The Facility Owner and Operator shall maintain a phone number and identify a responsible person for the public to contact with inquiries and complaints.”
- Interference with communications devices: “The Applicant shall make reasonable efforts to avoid any disruption or loss of radio, telephone, television or similar signals, and shall mitigate any harm caused by the Wind Energy Facility.”
- Liability insurance: “There shall be maintained a current general liability policy. ”

- Minimum property setbacks: "Wind Turbines shall be set back from the nearest Occupied Building a distance…1.1 times the Turbine Height. For non-participating landowners, "Wind Turbines shall be set back from the nearest Occupied Building located on a Non-participating Landowner's property a distance of not less than five (5) times the Hub Height."

- Power lines: "On-site transmission and power lines between Wind Turbines shall… be placed underground."

- Protection of public roads: "Any road damage caused by the applicant or its contractors shall be promptly repaired at the Applicant's expense."

- Shadow flicker: There are no specific standards in the *Model Ordinance*.

- Sound levels: "Audible sound from a Wind Energy Facility shall not exceed fifty (55) dBA."

- Visual appearance of wind turbines and related infrastructure: "Wind Turbines shall be a non-obtrusive color…" and "Wind Turbines shall not display advertising."

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Pennsylvania's Advanced Energy Portfolio Standard (AEPS) mandates that 18% of electricity sold by each electric distribution company (EDC) and electric generation supplier (EGS) within Pennsylvania must be generated from alternative energy sources by the year 2020. The standard includes a mandate for 8% of the energy sources to come from "Tier 1" sources, which includes wind, among other sources.

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Data collected by Francis Motycka, 5, 8 Jul 2011.
Reviewed by Scott Gebhardt and Kerry Campbell, 11 Nov 2011.

State: Rhode Island

Wind siting basics: For projects 40 MW and over, the Rhode Island Energy Facilities Siting Board is in charge. For projects under 40 MW, local governments have siting authority.

History of siting authority: The Energy Facility Siting Act, most recently updated in 2001 (www.rilin.state.ri.us/Statutes/TITLE42/42-98/INDEX.HTM).

The Comprehensive Energy Conservation Efficiency and Affordability Act of 2006 gives the Rhode Island Division of Planning the authority to establish standards and guidelines for locating renewable energy facilities (www.rilin.state.ri.us/BillText/BillText06/SenateText06/S2903Baa.pdf).

Approvals needed: For facilities over 40 MW, the Siting Board collaborates with various state and local agencies to ensure that the applicant is complying with state and local regulations and then issues a one-stop permit. The only on-shore wind facilities in Rhode Island, as well as any that have been proposed to date, are far under 40 MWs (Gonsalves, Paul, Rhode Island Division of Planning, personal communication, 8 Aug 2011). Therefore, applicants are permitted by the local government. In this case, the applicant would at least need approval from the local Planning Commission and a special use permit from the zoning board.

Evaluation Criteria:

A report by the Rhode Island Department of Environmental Management (DEM) proposed the following guidelines for siting wind turbines on *state* lands:

-Distance from nearest property line: 1.5 times hub height + rotor radius
-Distance from nearest structure: 1.5 times hub height + rotor radius
-Distance from roads: 1.5 times hub height + rotor radius
-Distance to protect from icing: 820 feet
-Public safety distance: 1.5 times hub height + rotor radius
-Noise: Project must not exceed 35 DBA in the evening, 45 DBA in the daytime in residential areas. Cannot increase background tonal sound by more than 3 DB.

The Rhode Island Division of Planning is currently in the process of developing wind siting guidelines for the municipalities, and possibly a model ordinance. The guidelines should be released next month.

Rhode Island Energy Plan (includes discussion of wind guidelines):
www.planning.ri.gov/landuse/Energy%20plan311.pdf

Public input: None identified. Municipalities can hold public hearings.

Relationships to other important energy policies or siting and zoning decisions: Rhode Island has an RPS of 16% by 2019. A separate and distinct standard enacted in June 2009 (Long-Term Contracting Standard for Renewable Energy) requires electric distribution companies to solicit proposals and enter into long-term contracts for capacity, energy and attributes from new renewable energy facilities. (DSIRE, 10 Aug 2011).

Pending issues: Over 95% of wind energy potential in Rhode Island is located offshore. As such, the Rhode Island Coastal Resources Management Council has developed the Ocean Special Area Management Plan (Ocean SAMP), in an effort to encourage renewable energy development offshore. Link to the Ocean SAMP:
http://seagrant.gso.uri.edu/oceansamp/pdf/samp_approved/800_renewable_OCRMchanges_5.4_Clean.pdf

Several towns currently in the process of permitting a wind turbine have placed a moratorium on permitting until the RI Division of Planning releases its new wind siting guidelines.

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Data collected by Lauren Teixeira, 28 Jul 2011.

State Name: South Carolina

Wind siting basics: The Utility Facility Siting and Environmental Protection Act (S.C. Code Ann. § 58-33-10, www.scstatehouse.gov/code/t58c033.php) governs siting of major utility facilities. Currently, wind power projects less than 75 MW are not regulated at either the state or local level of government. Electric suppliers regulated by the Public Service Commission (PSC) seeking to build an electric generating plant of 75 MW or greater must obtain a Certificate of Public Convenience and Necessity (CPCN), issued by the PSC. The application includes a description of the facility, its location, a statement explaining the need for the facility, and environmental impact studies.

The South Carolina Office of Regulatory Staff (ORS) has sole responsibility for the inspection, auditing, and examination of public utilities, and represents the public interest in regulation of the major utility industries (Act 175 of 2004, www.scstatehouse.gov/code/t58c003.php).

History of siting authority: None identified.

Approvals needed: No state level approval is needed, unless the facility is covered under the Utility Facility Siting and Environmental Protection Act or involves lands otherwise subject to regulation, such as wetlands.

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: South Carolina currently has no Renewable Portfolio Standard. The potential for use of offshore wind as a key renewable technology is currently a subject of discussion in South Carolina.

Pending issues: South Carolina Act 318 of 2008 (www.scstatehouse.gov/code/t48c052.php) established the Wind Production Farms Feasibility Study Committee to evaluate wind power feasibility. The study results were issued in a 1 Jan 2010 report to the Governor and South Carolina General Assembly (http://energy.sc.gov/index.aspx?m=6&t=123).

The Regulatory Task Force for Coastal Clean Energy was established as an objective of a 2008 grant from the U.S. Department of Energy, which has the goal of identifying and overcoming existing barriers for coastal clean energy development for wind, wave and tidal energy projects in South Carolina (http://energy.sc.gov/index.aspx?m=6&t=85&h=904).

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Data gathered by Kai Goldynia, 4 August 2011, Deborah Luyo 27 Oct 2011.
Reviewed by Allyn Powell, 20 Jan 2012.

State: South Dakota

Wind siting basics: A permit from the South Dakota Public Utilities Commission (PUC) is required for electric generating facilities with a capacity over 100 MW. http://legis.state.sd.us/statutes/DisplayStatute.aspx?Type=Statute&Statute=49-41B-35

History of siting authority: Siting authority created by SD Legislature in SDCL 49-41B (1977) (http://legis.state.sd.us/statutes/DisplayStatute.aspx?Type=Statute&Statute=49-41B-1).

SDCL 43-13-21 through 24 (2009) established setbacks for wind turbines (http://legis.statse.sd.us/statutes/DisplayStatute.aspx?Type=Statute&Statute=43-13).

Draft Model Ordinance for Siting of Wind Energy Systems (2008) (http://puc.sd.gov/commission/twg/WindEnergyOrdinance.pdf).

Approvals needed: In addition to the permit from the PUC, approvals are required from the following agencies:

South Dakota Game, Fish & Parks, concerning grasslands, wetlands and wildlife, http://gfp.sd.gov/.

South Dakota State Historic Preservation Office, concerning historically important sites, http://history.sd.gov/Preservation/.

South Dakota Department of Environment and Natural Resources, concerning air and water protection, http://denr.sd.gov/.

South Dakota Department of Transportation, www.sddot.com/ – Need is dependent on whether the site will utilize state right-of-way.

Local Government (County/City Commission) – Building permits typically required regardless of project size.

The time frame for obtaining a permit from the PUC is (Binder, 2009):

- Notice of intent filed six months prior to Application for Permit. (Notice of intent process only applies to non-wind energy conversion facilities over 100 MW.)
- Application for Permit filed.
- Public Hearing within 60 Days.
- Decision within six months of receipt of Application (one year for non-wind energy conversion facilities).

Evaluation criteria: Evaluation criteria are laid out in SDCL 49-41B (http://legis.state.sd.us/statutes/DisplayStatute.aspx?Type=Statute&Statute=49-41B) and ARSD 20:10:22 (http://legis.state.sd.us/rules/DisplayRule.aspx?Rule=20:10:22).

"The Public Utilities Commission shall also hear and receive evidence presented by any state department, agency, or units of local government relative to the environmental, social, and economic conditions and projected changes therein" (http://legis.state.sd.us/statutes/DisplayStatute.aspx?Type=Statute&Statute=49-41B-19).

Public input: Per SDCL 49-41B-16, a public hearing shall be held as close as practicable to the proposed facility's location. Timing requirements usually schedule this about 60 days after the application is filed (http://legis.state.sd.us/statutes/DisplayStatute.aspx?Type=Statute&Statute=49-41B-16).

Relationships to other important energy policies or siting and zoning decisions: None identified.

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Data collected by Marley Ward, 1 Jul 2011, Deborah Luyo, 24 Oct 2011.
Reviewed by Brian Rounds, 1 Dec 2011.

State: Tennessee

Wind siting basics: Wind siting is done at the local level of government. The applicant could apply to the Tennessee Department of Economic and Community Development (TECD) for energy facilities that will produce over 50 MW.

History of siting authority: None identified.

Approvals needed: TECD will find information regarding economic need and transmission. If the application meets TECD approval, it is then forwarded to the Tennessee Department of Environment & Conservation for environmental permitting. Tennessee is a Home Rule state.

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: None identified.

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Tennessee Valley Authority. *Wind Turbine Energy* [web page]. Retrieved 6 Jul 2011 from www.tva.gov/greenpowerswitch/wind_faq.htm.

Data collected by Francis Motycka, 6, 11 Jul 2011.

State: Texas

Wind siting basics: All siting authority is delegated to the local governments. If asked, the Texas Parks and Wildlife Department will review projects for compliance with wildlife protection guidelines. The Texas PUC has some indirect authority (see discussion of transmission below).

History of siting authority: 2007 Statute regarding Competitive Renewable Energy Zones: www.statutes.legis.state.tx.us/Docs/UT/htm/UT.39.htm#39.904.

Title 7. Regulation Of Land Use, Structures, Business, and Related Activities (1987) (www.statutes.legis.state.tx.us/Docs/LG/htm/LG.231.htm)

Approvals needed: No approval is needed from anyone, except leases with landowners; however, wind developments are subject to federal and state laws protecting endangered species. Applicants can request a review from the Texas Parks and Wildlife Department. The Department's findings are not binding (Boydston, 2011). Applicants can ask the county comptroller for a property tax abatement, based on the jobs and general economic benefits expected. The county board can deny the property tax abatement if there is public opposition.

Most projects take about 18 months to begin commercial operation, and few projects take longer than two years (Boydston, Kathy, Texas Parks and Wildlife Department, personal communication, 24 Jun 2011).

Evaluation criteria: Although there are no officially required criteria, developers often conduct pre-construction wildlife surveys.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Competitive Renewable Energy Zone (CREZ) legislation passed in 2007. The Texas PUC designates CREZs, which allow construction of transmission lines to serve the zone, prior to the commercial operation of new renewable energy generators. In this way, the Texas PUC has indirect siting authority.

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Data collected by Lauren Teixeira, 24 Jun 2011, Deborah Luyo, 29 Oct 2011.
Reviewed by Brian Almon, 8 Nov 2011.

State: Utah

Wind siting basics: Wind siting is done at the local level of government. Utah does not have a state agency with sole authority over electric plant siting. The developer must contact the various agencies that could have responsibility. Those agencies will determine what approvals are required (Stemler, 2007). Utah is a Home Rule state.

History of siting authority: UTAH CODE – TITLE 541-1 – PUBLIC SERVICE COMMISSION – Establishment of Commission – Functions (1983), http://le.utah.gov/~code/TITLE54/htm/54_01_000100.htm.

UTAH CODE – TITLE 54-4a-1 – DIVISION OF PUBLIC UTILITIES – Establishment of Division – Functions (1989), http://le.utah.gov/~code/TITLE54/htm/54_04a000100.htm.

UTAH CODE – TITLE 79-2-201 – DEPARTMENT OF NATURAL RESOURCES – Department of Natural Resources Created, http://le.utah.gov/~code/TITLE79/htm/79_02_020100.htm.

UTAH CODE – TITLE 23-14-1 – DIVISION OF WILDLIFE RESOURCES AND WILDLIFE BOARD – Division of Wildlife Resources – Creation – General Powers and Duties – Limits on Authority of Political Subdivisions (1995), http://le.utah.gov/~code/TITLE23/htm/23_14_000100.htm.

Approvals needed: A Certificate of Public Convenience and Necessity from the Utah Public Service Commission is required for new generation facilities. Developers should also contact the Utah Division of Public Utilities, the Utah Department of Natural Resources, and the Utah Division of Wildlife.

If the project includes facilities on or near lands that are under the jurisdiction of the federal Bureau of Land Management (BLM), an application must be submitted to the BLM. (United States Department of the Interior, Bureau of Land Management, 2008).

Evaluation criteria: Utah's *Model Wind Ordinance* (2009) lists:

- Climb prevention and locks
- Decommissioning
- Height and blade height (clearance above the ground)
- Lighting
- Maintenance
- Minimum property setbacks (110% of the height of the system from all inhabited structures, overhead utility lines, and public roads or public right-of-ways; § 4.1.2)
- Sound levels (compliance with the existing noise or sound ordinance; § 4.1.9)
- Visual appearance of wind turbines and related infrastructure

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: *The Energy Resource and Carbon Emissions Reduction Initiative* was passed into law in 2008, with a goal of 20% electricity generated from renewable sources by 2025. The first compliance year will be 2025.

Pending issues: On 23 Mar 2011 the Utah Association of Counties and the Uintah County Commission filed a lawsuit (United States Department of the Interior) against Ken Salazar, Secretary of the Interior, et al., in response to Secretarial Order 3310, declaring 385,000 acres of Uintah County land wild lands territory (The Secretary of the Interior, 2010). The declaration will expand the power of the Bureau of Land Management in control of public land and would place additional restrictions on the potential for wind development.

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Data collected by Francis Motycka, 6, 11 Jul 2011; Deborah Luyo, 21 Oct 2011.

State Name: Vermont

Wind siting basics: The Vermont Public Service Board (PSB) issues a Certificate of Public Good (CPG) for all wind facilities, with the exception of those operated solely for the customer's on-site consumption. Net metering systems do require a CPG. The Vermont Department of Public Service (DPS), which represents ratepayers in PSB proceedings, and the Vermont Agency of Natural Resources (ANR) are automatic parties to any proceeding.

History of siting authority:
30 V.S.A. § 248 www.leg.state.vt.us/statutes/fullsection.cfm?Title=30&Chapter=005&Section=00248
PSB Rule 5.400
http://psb.vermont.gov/sites/psb/files/rules/OfficialAdoptedRules/5400_248_Requirements.pdf

Approvals needed: The PSB regulates all grid-connected wind developments and must find that the facility will promote the general good of the state before it can issue a CPG. In addition, the Vermont Agency of Natural Resources (ANR) has independent jurisdiction over certain permits that may be required by the facility; these may include permits involving the facility's impact on wetlands and water quality.

Local permits are not required; however, the PSB is required to give "due consideration" to the recommendations of municipal and regional planning organizations as well as the recommendations of municipal legislative bodies.

Evaluation criteria: Pursuant to statute, the PSB must find that the facility meets certain criteria. These include whether the project will:

1. adversely affect system stability and reliability;
2. provide an economic benefit to the state; and
3. have an undue adverse impact on natural resources and aesthetics.

In analyzing the project's impacts on natural resources, developers often provide information regarding:

(1) Radar and acoustical surveys to develop an understanding of bird and bat activity and migration characteristics
(2) Evaluation of the presence of rare, threatened, and endangered species and associated habitat(s)
(3) Analysis of suitable habitat for endangered bat species
(4) Resident avian and breeding survey
(5) Necessary wildlife habitat surveys
(6) Delineation of habitats that may be especially vulnerable

ANR requests that developers follow specific voluntary procedures in accordance with ANR guidelines, including:

(1) Completion of pre-construction survey
(2) Site development recommendations
(3) Consultation with wildlife agency, USFWS
(4) Mitigation requirements
(5) Post-construction/operational surveys
(6) Decommissioning procedures

Public Input: With the exception of net metered projects, and projects of limited size and scope, all PSB siting proceedings involve a public hearing in the county in which the facility is located. In addition, the deadline for intervention requests is typically after the public hearing in order to allow members of the public that meet the PSB's standards for intervention to participate in the proceeding.

Relationships to other important energy policies or siting and zoning decisions: Vermont has a state-wide voluntary renewable goal of 20% by 2017. *30 V.S.A. § 8005(d)(2).* http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=30&Chapter=089&Section=08005

Pending issues*: On 3 Oct 2011 the PSB recommended an RPS of 75% by 2034 (*http://psb.vermont.gov/sites/psb/files/publications/Reports%20to%20legislature/RPSreport2011/Study%20on%20Renewable%20Electricity%20Requirements%20-%20Final.pdf*).*

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Data collected by Kai Goldynia, 6 Aug 2011.
Reviewed by Ed McNamara, 24 Jan 2012.

State: Virginia

Wind siting basics: Siting for renewable energy projects is conducted under the authority of local government. The permitting program for construction and operation of renewable energy projects is administered at the state level by the Virginia Department of Environment Quality (DEQ), which explicitly considers the impacts of the project on natural resources (in particular, on wildlife and historical resources).

The Virginia Department of Environmental Quality permits "small renewable energy projects" up to 100 MW (https://leg1.state.va.us/cgi-bin/legp504.exe?091+ful+CHAP0808). The State Corporation Commission (SCC) has siting authority for energy facilities over 100 MW, constructed by rate-regulated utilities (1999, as amended) (https://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+56-580).

History of siting authority: Code of Virginia: Chapter 11.1 of Title 10.1, Article 5, sections 10.1-1197.5 through 10.1-1197.11 (https://leg1.state.va.us/cgi-bin/legp504.exe?091+ful+CHAP0808). Previously, authority over wildlife and historic resources resided with the SCC. This authority was transferred to the DEQ in 2009 for "small renewable energy projects."

Approvals needed: A special use permit or zoning approval comes from the local government. Virginia is a Dillon's Rule state.

Among the Virginia counties that have enacted wind ordinances are Pulaski County and Rockingham County, which are inland, and Northampton, located on the coast.

> Article 26, the Pulaski County Draft Wind Ordinance,
> www.pulaskicounty.org/planning/minutes%20and%20agendas/2010/08-10-10%20minutes.pdf
>
> Ordinance Repealing and Re-enacting Certain Designated Definitions Section 17-6 and 17-6.2 of the Code of Ordinances of Rockingham County Virginia,
> www.preserverockingham.org/images/Wind_Energy_Conversion_System_Draft_Oct_8_2010_Changes_Accepted.pdf
>
> Draft revised to incorporate Planning Commission Recommendations of August 2, 2011
> & Board of Supervisors' Intended Recommendations of August 18, 2011,
> www.co.northampton.va.us/departments/pdf/Wind%20Tower%20draft%20%20incl%20PC%20recs%208-2-11%20and%20BOS%208-18-11%20edits%20_2_.pdf.

Code of Virginia: Title 10.1, Chapter 11.1, Article 5 (2009), vests authority in the Virginia Department of Environmental Quality for permitting a "small renewable energy project," defined as having "a rated capacity not exceeding 100 megawatts… ."

Mitigation authority, under the DEQ process, is limited to wildlife and historic resources. Specific wildlife considerations include the effects of wind development on threatened and endangered species, bats, coastal avian protection zones, and sea turtle nesting beaches.

Evaluation criteria: As prerequisites to the renewable energy permit-by-rule application to the DEQ, 14 statutory requirements (from https://leg1.state.va.us/cgi-bin/legp504.exe?091+ful+CHAP0808) must be met:

1. A notice of intent…to submit the necessary documentation for a permit by rule for a small renewable energy project;
2. A certification by the [local] governing body[ies] … that the project complies with all applicable land-use ordinances;

3. Copies of all [electric grid] interconnection studies…;
4. A copy of the final interconnection agreement …;
5. A certification… that the maximum generation capacity… does not exceed 100 megawatts;
6. An analysis of potential environmental impacts… on attainment of national ambient air quality standards;
7. Where relevant, an analysis of the beneficial and adverse impacts… on natural resources;
8. If the Department determines that… significant adverse impacts to wildlife or historic resources are likely, the submission of a mitigation plan…including plans to measure the efficacy of mitigation actions;
9. A certification [that the design is] in accordance with all of the standards that are established in the regulations applicable…;
10. An operating plan describing how any standards… will be achieved;
11. A detailed site plan with project location maps…;
12. …all necessary environmental permits;
13. A requirement that the applicant hold a public meeting; and
14. A 30-day public review and comment period….

The process by which DEQ's wind permit-by-rule regulations were developed involved 22 Regulatory Advisory Panel meetings, 2 public comment periods, 1 public hearing, and 1 public meeting. (http://vwec.cisat.jmu.edu/workshop/Presentations/Wampler%20-%20Navigating%20Wind%20PBR.pdf)

Criteria common to the three county ordinances cited above include:

- Wind turbines must be of a non-obtrusive color
- Wind energy systems cannot display advertising
- Wind energy systems cannot be artificially lit unless required by the FAA
- Audible sound cannot exceed 55-60 decibels
- Setback requirements
- Height restrictions

P**ublic input:** No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: Virginia has a voluntary Renewable Portfolio goal for 15% of electricity to come from renewable energy sources by 2025. Yearly percentage goals are formulated with 2007 as the base year upon which future years are calculated. To help facilitate these goals, the SCC provides an increased rate of return for participating utilities that meet the requirements. Onshore wind production credits are doubled for compliance purposes (www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=VA10R&re=1&ee=1).

Pending issues: A model wind ordinance is under consideration by an informal Local Government Outreach Stakeholder Group, which includes professionals from state and local government, academia, environmental groups, and industry. A suggested model ordinance is expected by year end 2011. (Contact Carol Wampler, Department of Environmental Quality.)

Research issues: The DEQ would like to know more about the impact of wind turbines on bats, avian species, other wildlife, and historic resources. Research is ongoing.

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Data collected by Francis Motycka, 6 Jun, 3, 12 Jul 2011; Deborah Luyo, 14 Oct 2011.
Reviewed by Carol Wampler, 18 Nov 2011.

State: Washington

Wind siting basics: Review by the Energy Facility Site Evaluation Council (EFSEC) is available for proposed wind power projects, but applicants must "opt in" to EFSEC's process. Most existing wind projects have been permitted through counties.

History of siting authority: Revised Code of Washington (RCW) 80.50. 040 (1970, 2001) (http://apps.leg.wa.gov/rcw/default.aspx?cite=80.50.040)

Approvals needed: From the EFSEC website:

"The EFSEC certification process was designed to give applicants an opportunity to present their proposals, allow interested parties to express their concerns to the Council, and have the Council to [sic] address issues related to the application.

There are six major steps in the certification process:

I. Application Submittal
II. Application Review
III. Initial public hearings
IV. Environmental impact statement
V. Adjudicative proceedings and permits review
VI. Recommendation to the Governor

Each step has specific requirements the applicant and the Council must follow to ensure a comprehensive and balanced review of the project. Many of the steps take place at the same time." (www.efsec.wa.gov/cert.shtml#Certification2).

Applicants who qualify, as determined by the Council, can undergo an expedited process. The Council has four months to evaluate the application to determine whether to grant expedited processing. The Council has an additional two months to forward a recommendation of approval to the governor. This schedule may be modified as mutually agreed to by the applicant and the Council.

Evaluation criteria: Criteria used by the Department of Fish and Wildlife include:

(1) Baseline and Monitoring Studies: Calls for pre-project assessments of wind power sites with the goal of avoiding and minimizing bird and bat impacts related to wind turbines; information review; habitat mapping; bird and bat surveys, and threatened and endangered species surveys.
(2) Minimization of Wildlife Impacts: Outlines the path for avoiding and minimizing potential impacts related to construction methods and sensitive habitat areas.
(3) Operational Monitoring: Details the post-construction monitoring recommendations and the role of the Technical Advisory Committee (TAC), which is recommended for the purpose of providing advice to the project owner and the permitting authority. Members of the TAC can include wind project owners and developers, landowners, and representatives from environmental groups, counties, tribes, and state and federal resources agencies.
(4) Research-oriented Studies: Offers recommendations and examples for research needs related to wind power development as it relates to wildlife habitats and species.
(5) Habitat Types and Mitigation: Provides statewide ecoregional definitions of habitat types throughout Washington State; encourages development into previously disturbed and developed areas and away from undeveloped fish and wildlife habitat; provides ratios for replacement habitat as mitigation for temporary and permanent wind project impacts; adheres to the principle of no loss of habitat functions and values. (http://wdfw.wa.gov/conservation/habitat/planning/energy/wind.html)

Public input: State regulations provide opportunities for public input at several points during the licensing process.

Relationships to other important energy and siting/zoning decisions: EFSEC is statutorily authorized to preempt local land-use/zoning ordinances for the siting of energy projects.

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Citations and links:

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Data collected by Marley Ward, 10 Jul 2011.
Reviewed by Meg O'Leary, 14 Dec 2011.

State: West Virginia

Wind siting basics: The Public Service Commission (PSC) has sole authority of all public utility siting.

History of siting authority: West Virginia Code §24-2-1 (1991) (www.legis.state.wv.us/WVCODE/Code.cfm?chap=24&art=2#02).

Approvals needed: Developers of wind generation that will produce electricity for sale in wholesale markets need a certificate of public convenience and necessity from the PSC (West Virginia Code §24-2-11, www.legis.state.wv.us/WVCODE/ChapterEntire.cfm?chap=24&art=2&section=11#02). West Virginia is a Dillon's Rule state.

An applicant must give the PSC a 30-day notice before filing an application for the certificate of public convenience and necessity. After an application is filed, the PSC will either issue or deny the certificate within 270 days. If the projected cost is over $50 million, the PSC will issue or deny the certificate within 400 days.

Evaluation criteria: None identified.

Public input: No specific procedures identified.

Relationships to other important energy policies or siting and zoning decisions: West Virginia's Renewable Portfolio Standard (RPS) mandates that utility companies with more than 30,000 residential consumers must have at least 25% of their energy from alternative and renewable sources by 2025, with no minimum requirement from renewable sources. Alternative energy credits (AEPs) are used for compliance. Each megawatt-hour of renewable energy (wind) is equal to two AEP credits. Utility companies must have submitted their compliance strategies to the West Virginia PSC by 1 Jan 2011, followed by annual compliance reports. The PSC will impose penalties for utilities not in compliance on 1 Jan 2015 (www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=WV05R&re=1&ee=1).

Pending issues: The Cow Knob Wind Farm is a proposed project in Pendleton County. Solaya Energy LLC has requested that Pendleton County create an ordinance to help facilitate wind facility construction (Adams, 2011).

Research issues: The Beech Ridge Wind Farm in Greenbrier County is currently shutting down its turbines at night, from 1 Apr to 15 Nov, because of concerns over potential harm to the Indiana bat, an endangered species. The developer faces a lawsuit on claims that it did not obtain a permit from the U.S. Fish and Wildlife Service when siting this facility (Hammack, 2011).

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West Virginia Public Service Commission (PSC) [web page]. Retrieved 12 Jul 2011 from www.psc.state.wv.us/.

Data collected by Francis Motycka, 6, 11, 12 Jul 2011.
Reviewed by Earl Melton, 10 Oct 2011.

State: Wisconsin

Wind siting basics: Power plants with a capacity of 100 MW or more must have a Certificate of Public Convenience and Necessity (CPCN) from the Public Service Commission of Wisconsin (PSCW) prior to construction. Projects having less than 100 MW capacity may require a Certificate of Authority (CA) from the PSCW.

History of siting authority: In 2009, Wisconsin Act 40 (Wisc. Stat. § 196.378(4g)(b)) directed the PSCW to establish statewide wind energy siting rules (http://psc.wi.gov/renewables/windSitingRules.htm). The new law required the PSCW to appoint a Wind Siting Council, to advise the PSCW in developing its standards (http://psc.wi.gov/renewables/windSitingCouncil.htm). The Act also provided that local government wind siting ordinances could not be more restrictive than the PSCW rules. The Act dictated that the rules were to include:

> setback requirements that provide reasonable protection from any health effects, including health effects from noise and shadow flicker … decommissioning and may include visual appearance, lighting, electrical connections to the power grid, setback distances, maximum audible sound levels, shadow flicker, proper means of measuring noise, interference with radio, telephone, or television signals, or other matters.

(See https://docs.legis.wisconsin.gov/statutes/statutes/196/378/4g/b and https://docs.legis.wisconsin.gov/statutes/statutes/66/IV/0401).

In March 2011, before the Council's proposed rules could take effect, the state legislature's Joint Committee for the Review of Administrative Rules suspended the rules indefinitely. (See http://psc.wi.gov/apps35/ERF_view/viewdoc.aspx?docid=145834).

Approvals needed: The PSCW and the Wisconsin Environmental Policy Act require that applicants provide information on at least two sites. The PSCW then prepares an environmental impact statement, in conjunction with the Wisconsin Department of Natural Resources (WDNR), or an environmental assessment.

Developers must submit an engineering plan to the Wisconsin Department of Natural Resources (DNR) at least 60 days prior to filing an application for a CPCN.

Evaluation criteria: None identified.

Pending issues: How and when the legislature will act on the WPSC proposed rules.

Relationships to other important energy and siting and zoning policies: Wisconsin has a wind (and solar) access law, which protects a right to wind access, via local land-use easement, if the land owner installs a wind generator.

To assist counties, towns, and municipalities in interpreting Wisconsin's wind access laws, chiefly Wis. Stat. § 66.0401, the state developed a Model Small Wind Ordinance which suggests appropriate zoning language for wind energy systems of 100 kilowatts (kW) or less. (http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=WI16R&re=1&ee=1).

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Data gathered by Kai Goldynia, 24 Jun 2011; Tom Stanton, 20 Oct 2011.

State: Wyoming

Wind siting basics: Under Wyoming law, all wind energy facilities with a capacity greater than 0.5 MW (500 kW) must obtain county permits. Facilities with 30 or more turbines must, in addition, obtain a permit from the Wyoming Industrial Siting Council (part of the state Department of Environmental Quality). Any application for a project that does not meet the statutory definition of a facility can be referred to the Industrial Siting Council, consistent with the requirements of the Industrial Development Information and Siting Act. No county may adopt wind siting laws less stringent than those of the state. If any part of the proposed project is to occupy federal lands, the applicant must also obtain a permit from the federal Bureau of Land Management (BLM).

History of siting authority: Wyoming Statutes 18-5-501 to 18-5-509 are the most relevant (Wyoming Legislature).

Approvals needed: A permit from the Industrial Siting Council may be required for proposed facilities with less than 30 turbines if the county authority finds that a proposed facility poses certain significant environmental or societal risks that the county does not feel qualified to assess.

Procedures for application include:

(1) Developer must submit application to the County Board of Commissioners
Notifications
- Applicant must have made "reasonable efforts" to provide notice to all owners of land within one mile of the facility and to all cities and towns located within 20 miles of the facility.
- Applicant must publish a notice of application in a widely circulated newspaper at least 20 days prior to a public hearing.

(2) The board will conduct a review to determine whether the application is complete.
(3) Within 45 days after completion of the hearing period, the Board shall "make complete findings" and issue its decision granting or denying the application.
(4) Any party can file an appeal in district court. The decision issued in the appeal is considered final.
(5) If the facility does not automatically fall under the Industrial Siting Council, the County Board may refer the applicant to the Industrial Siting Council for further permitting.

Evaluation Criteria: Environmental approval is part of a collaborative review process in which the Industrial Siting Council asks for input on environmental standards from the Wyoming Fish and Game Department. The Council has the authority to require wildlife mitigation measures.

Various other standards must be met and certified in the application:

Setbacks
- A turbine must be sited at least 110% of its height from any property line "contiguous or adjacent" to the proposed facility, unless the property owner waives the setback distance in writing.
- A turbine must be sited at least 110% of its height from public roads.
- A turbine must be 550% of its height and no fewer than 1000 feet away from "platted subdivisions."
- A turbine must be 550% of its height and no fewer than 1000 feet away from a residential dwelling.
- A turbine must be at least a half mile from city limits.

Other criteria:

- Must have an emergency management plan.
- Must have a waste management plan (including decommissioning).
- Must conduct a traffic study of any public roadways leading to and away from the proposed facility. (Applicant can be required to enter into "reasonable road use" agreements.)
- There can be no advertising on the facility, with the exception of the applicant's logo on the nacelle.
- Must have a reclamation and decommissioning plan that indicates the planned life of the wind energy facility.
- Must certify that the landowners have been consulted.
- The decommissioning/reclamation plan must be updated every five years.

Public input: Once the application is determined to be complete, the Board must provide notice of the date and time of completion of the hearing period. The public hearing period is no fewer than 45 days and no more than 60 days after the application has been determined to be complete.

Relationships to other important energy policies or siting and zoning decisions: Wyoming statutory law requires that applicants proposing to build a wind energy facility include in their application a "project plan" indicating proposed roadways, tower locations and substation locations, transmission, collector and gathering and lines, and other "ancillary facility components" (http://legisweb.state.wy.us/statutes/statutes.aspx?file=titles/Title18/T18CH5AR5.htm)

Research issues: Wyoming is home to over half of all sage grouse, an endangered species, in the United States. Conservationists have expressed concern that wind development and the building of ancillary transmission lines will harm the sage grouse. Horizon Wind, a developer, has called for peer-reviewed study to establish the impact of turbines on the sage grouse. The United States Bureau of Land Management (BLM) has announced its intention to include sage grouse conservation measures in land management plans in Wyoming and nine other western states, including Colorado, North Dakota, South Dakota, Utah, Montana, California, Idaho, Nevada, and Oregon (www.blm.gov/wo/st/en/info/newsroom/2011/december/NR_12_08_2011.html).

In an effort to protect the sage grouse, there has been a movement by conservationists, supported by the governor, to draw up "core areas" in Wyoming where no energy development, agriculture, or recreation will be allowed. According to state government estimates, the proposed areas include only 14% of Wyoming's windy land. (Stoddard, 2009).

In an effort by the Federal Bureau of Land Management to facilitate development of renewable energy sources on public lands, the Wyoming Wind and Transmission Study is being conducted to analyze Wyoming's wind resources in order to identify potential sites for wind power development. The study is expected to be completed within approximately three years.

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Data collected by Lauren Teixeira, 5 Jul 2011.