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INCONVENIENT TRUTHS ABOUT WIND ENERGY: REPRESENTING NEIGHBORS AND COMMUNITIES IMPACTED BY COMMERCIAL WIND PROJECTS

Gary A. Abraham[1]

Editor's note: Several recent articles in this newsletter have focused on wind energy law in New York. This article offers a different perspective, articulating environmental concerns and questioning popular advocacy in support of the siting of commercial scale wind projects.

Americans' support for utility-scale wind energy development is nearly unanimous.[2] And yet, everywhere wind farms[3] are sited in rural residential communities in the U.S.[4] and in Europe,[5] there are complaints, most often about the noise made by such projects.[6] It is therefore worth considering whether the substantial public financial outlay required to make wind energy commercially viable[7] is justified in light of the balance of benefits and burdens of industrial wind farms.

The inconvenient truths for those promoting aggressive wind farm development are that grid-connected utility-scale wind energy performs poorly, is unable to displace a meaningful amount of carbon emissions from other generators of electricity, has substantial adverse environmental impacts, and is among the most costly sources of energy. In addition, state and federal energy and environmental agencies have completed little meaningful long-term planning for wind energy development. This article is designed for land use and environmental law practitioners who find themselves representing clients who have the seemingly unpopular view that wind turbines are not welcome next door.

I. What Does Utility-Scale Wind Energy Development Cost the Public?

Most of the revenue of a wind farm comes from tax credits and grants from federal and state governments. A recent study finds that when all federal tax credits are combined, utility-scale wind projects enjoy a -164% tax rate; that is, wind farms are credited more than one and one-half times the income required to cover costs, pay taxes and provide a reasonable return on investment.[8]

The availability of lucrative public money for wind drives the way wind farms are financed, through "complex carbon credit structured products" including derivatives and "sub-index arbitrage strategies."[9] In simple

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terms, wind farms are financed in large part by selling the right to use tax credits to investment partners who, unlike wind farms, have enough income to generate sufficient tax liability to take advantage of the credits.[10]

One of the most important tax credit streams[11] is the Production Tax Credit (PTC), about two cents per kilowatt-hour (KWH) for electricity generated from a wind farm, paid annually by the federal government for ten years.[12] Thus a wind farm that generates 20 megawatts on average[13] over the course of a year also generates 175 million KWHs,[14] worth $3.5 million in tax credits per year for ten years. Since all federal subsidies and support provided for utility-scale wind energy amount to $23.37 per megawatt-hour (MWH),[15] the same wind farm receives over $4 million in federal assistance, or more than half the revenue received from sales of electricity.[16]

The federal tax code also provides wind farms with a generous double declining balance depreciation over five years, not accounted for in the previously-referenced $23.37 per MWH of federal subsidies. The depreciation credit continues even if all equity in the project is recovered during the five-year term,[17] amounting to an interest-free loan.[18] A parallel depreciation tax credit is provided to offset New York corporate tax liability.[19]

When enterprise incomes declined precipitously in 2008, wind industry lobbyists complained to Congress that they could not finance wind projects, so the PTC should be converted into an outright grant. Congress agreed, and in the Stimulus Bill enacted into law in 2009, a provision was added allowing wind farms to take a lump sum grant from the U.S. Treasury for 30% of the project cost in lieu of the PTC, so long as the project is approved by the end of 2010 and placed in service by the end of 2011.[20] On September 1, 2009, under the first disbursement of the new grant benefit, the Canandaigua Power Partners wind farm in Cohocton (Steuben County) got a check for over $74 million from Treasury.[21] Nationally, $503 million was disbursed to wind farms in September to create 2,000 jobs; thus, each job created cost taxpayers a quarter-million dollars.[22] On September 22, 2009, another $550 million in new awards was disbursed, again mostly to wind farms.[23] Over half the federal renewable energy stimulus money disbursed in September went to Spanish wind farm developer Iberdrola S.A., and 84% of the total went to foreign wind companies.[24] It is estimated that this program will cost taxpayers $10 billion over the next three years.[25]

Additional revenue is obtained from renewable energy credits (RECs), also called environmental attributes, which Renewable Portfolio Standards (RPS) programs in states like New York award to wind farms out of revenue provided by power generators who are required to purchase credits to offset their carbon emissions.[26] Each REC is supposed to represent one MWH of low-carbon electricity. In New York, most RECs are awarded to wind farms.[27] However, despite the difficulty of determining whether wind energy displaces carbon emissions from other sources (discussed below in Section III), and wind energy's high capital costs (about double the cost of constructing a gas-fired plant), environmental attributes sold under RPS programs boost wind power revenue to "about $12 to $15 more per MW than power generated by fossil fuels, before local, state and federal tax credits and exemptions."[28]

Little of the revenue obtained by a wind farm is attributable to earned income.

Wind farms are exempt from local property taxes in New York under either the Real Property Law[29] or, when sponsored by an Industrial Development Agency (IDA), the General Municipal Law.[30] Instead, wind developers offer to pay about 20% of the amount they would be taxed at their assessed value.[31]

Thus, little of the revenue obtained by a wind farm is attributable to earned income. Most revenue (and profit) is instead derived from tax credits and other government transfer payments, a business strategy energy analyst Robert Bradley calls political capitalism, which he finds originated in the

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energy business with Ken Lay at Enron and survives in wind farm financing.[32]

II. What Are the Environmental Impacts of Wind Farms?

When sited in rural residential areas, wind farms are very intrusive. The typical 100-MW wind farm requires about 25 square miles.[33] Noise from the wind farm at nuisance levels will affect people about a mile away.[34] According to the wind industry, adverse visual impacts (including rotating blades and blinking night lights) affect the viewscape up to five kilometers away, depending on topography.[35] "Shadow flicker" from wind turbine blades spinning in front of a sunrise or sunset is linked to dilation of blood vessels in the eyes and associated headaches (neural oscillation) in healthy people.[36] Habitat fragmentation caused by access roads to wind turbine sites and clear-cutting for transmission lines can be substantial, adversely affecting breeding birds in particular.[37] It has been estimated that U.S. wind turbines kill between 75,000 and 275,000 birds per year,[38] and outside of migratory flyways slow-flying raptors appear to be most at risk.[39] Bats are killed by wind turbines in large numbers as a result of collisions with the turbine blades[40] and because their lungs explode, unable to tolerate the pressure change that occurs when passing through the blades and blade-tip turbulence (a phenomenon known as barotrauma).[41]

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Wind farms interfere with wireless,[42] radar and other radio frequencies, resulting in potentially significant impacts on access to accurate weather forecasting in the host community,[43] and prompting the Federal Aviation Administration (FAA) to require application of a screening tool developed by the U.S. Department of Defense to determine whether an area proposed for wind farm development will require an aeronautical study to protect Air Defense and Homeland Security radars.[44] In Britain, the Ministry of Defense successfully defeated nearly half of the wind farms proposed by 2004 "because of their proximity to air-defense stations."[45] In the U.S., the FAA requires obstruction lighting, which causes pulsing red or white lights at night throughout the project area.[46] Emergency medical service helicopters may refuse to land near a wind farm because of dangerous air turbulence and because, although FAA warning lights are installed on the nacelle, blades can extend up 200 feet higher than the lights, making nighttime landing unsafe.[47]

Wind turbine noise is characterized by impulsive (rhythmic, modulating, beating or pulsating) sounds and low-frequency sounds, both of which make noise that is particularly annoying compared to other noises at the same or lower decibel levels.

However, most complaints about existing wind farms and concerns about proposed wind farms address noise impacts. Wind turbine noise is characterized by impulsive (rhythmic, modulating, beating or pulsating) sounds and low-frequency sounds, both of which make noise that is particularly annoying compared to other noises at the same or lower sound pressure (decibel) levels.[48] To compensate for the added annoyance of impulsive sound, the convention is to add a penalty of 5 decibels to modeled sound, or to subtract an equivalent amount from the allowable numerical sound level.[49] Wind developers preparing an impact study for their project rarely do so. Instead, assuming wind-related noise will mask wind turbine sounds, developers commonly calculate background sound levels so high that project-related sound appears in their models to be insignificant. However, a landmark study found that modern turbines are subject to wind shear—the occurrence of calm air at ground level and high winds at turbine height.[50] Specifically, when ground-level wind speed calms after sunset, wind speed at typical hub height for large wind turbines (80 meters, or 262 feet) commonly increases. As a result, turbines can be expected to operate, thereby generating noise, while at the same time there is no masking effect from wind-related noise down below, where people live.[51] This occurs more than half the time at night, when the expectation of quiet is greatest.[52]

III. What Are the Environmental Benefits of Utility-Scale Wind Energy?

Two principal environmental benefits are attributed to wind farms: the electricity they generate will (1) meaningfully reduce dependence on foreign oil; and (2) displace greenhouse gas emissions from conventional power plants.[53] However, there is little evidence that wind energy achieves these two goals.

A. Wind Energy Does Not Meaningfully Affect Our Dependence on Foreign Oil.

Almost all emissions from the combustion of oil products come from the transportation sector.[54] Only about 1% of electric power comes from oil combustion nationally, and about 3% in New York.[55]

B. Utility-Scale Wind Power Plants Operate at Very Low Effective Capacity.

Electric power plants are responsible for 40% of CO_2 emissions in the U.S., more than any other sector, including the transportation and industrial sectors.[56] Coal power plants are responsible for over 80% of these emissions.[57] Meaningful reduction of these emissions is a primary goal of renewable energy policy and planning.[58]

Because large-scale electricity storage is not practical, electricity is consumed the instant it is generated. Intermittent sources like wind and solar displace carbon emissions only when they are generating, so their "rated," "nameplate" or "installed" capacity does not indicate their ability to displace carbon emissions from other sources.[59] In addition, with increased reliance on wind energy, more non-intermittent power plants must be added to assure grid system reliability. This added reserve power generates emissions that offset emissions reductions from wind power.[60]

The effective electric generation capacity of a wind farm is difficult to estimate. The "capacity value" of a power plant is an estimate, generally made for long-term grid planning purposes, of the percentage of the plant's maximum design capacity that can be relied on by the grid operator during times of peak grid demand.[61] Although somewhat arbitrary, the New York Independent System Operator (NYISO) assigns a capacity value to wind energy of 10% of nameplate for summer, 30% for winter.[62]

The "capacity factor" of a power plant is the ratio of performance over time for the specific technology employed, such as industrial wind turbines, to the continuous full power (nameplate) performance over the same period.[63] The capacity factor for a coal-fired power plant is 73.6%, that for a nuclear plant is 91.8%, that for a natural gas-fired combined cycle plant is 42%, and that for a hydroelectric plant is 36.3%.[64]

GE Energy reported to the New York State Energy Research and Development Authority (NYSERDA) in 2005 that, while the *capacity factor* of utility-scale wind turbines is about 30%, the "effective capacity" of these turbines *in New York* is 10%, "due to both the seasonal and daily patterns of the wind generation being largely out of phase with the NYISO load patterns."[65] That is, most electricity from wind power is generated during cold winter nights, but electricity load (demand) is greatest during warm summer days. As a result, the use of up to two-thirds of wind-generated electricity is transmitted to the grid at times when it is not needed. Even the 195-turbine Maple Ridge Wind Farm located on the Tug Hill Plateau, a high wind resource area,[66] generates no more than about 20% of its nameplate design capacity.[67]

C. Wind Resources in New York Are Poor.

The best wind resources in New York are offshore.[68] Class 3 or 4 winds (in a classification from 1 to 7, with 7 the best) are the minimum required to make utility-scale wind projects commercially viable.[69] Class 3 winds are present where mean wind speeds at a height of 50 meters (164 ft.) are between 6.4 and 7 meters per second (14.3 to 15.7 mph).[70] Midwestern states have abundant winds in those classes, but New York does not.[71]

D. Wind Farms Require a Substantial Amount of What They Generate to Be Operated in Reserve by Other Electric Utilities.

Wind energy proponents claim that greater reliance on wind energy does not require greater reliance on back-up or reserve sources of electricity, most of which will burn fossil fuels.[72] This view is not shared by many energy analysts. European grid operator (and wind farm developer) E.On Netz reports that "wind farms can only replace traditional power station capacities to a limited degree," specifically about 4%, because reliable generation capacity must be operated in reserve.[73]

The most comprehensive effort to estimate the potential for wind farms to displace greenhouse gas emissions in the foreseeable future, provided by the National Academy of Sciences, finds that a substantial amount of wind power needs to be backed up by other generators, depending on the distinctive features of the transmission system into which wind power is integrated:

[T]he cost of [wind energy's] intermittency (in terms of backup or reserve requirements) will be less if the generation mix is dominated by power

plants with fast ramp rates (gas, hydropower) than if it is dominated by coal or nuclear plants, which have high capital costs and slow ramp rates. ... Denmark, for example, has access to substantial hydroelectric capacity, which it relies on to balance the intermittent output from wind-energy installations.[74]

Accordingly, the Academy estimates that by 2020, wind-generated energy could displace no more than 2.25% of U.S. anthropogenic CO_2 emissions, and increases rather than decreases the need for reserve power, further reducing wind power's net displacement of CO_2.[75]

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Emissions *avoided* by wind energy should be distinguished from the ability of wind energy to *displace* other energy capacity and their emissions. In states like New York, an RPS program creates a closed market for renewables, with the result that wind energy does not avoid emissions from other energy sources because it competes only with other, zero-emissions sources in the closed market. Thus, "no avoided air emission benefit exists if wind generation displaces another renewable project generation to meet a state (or future national) renewable portfolio standard."[76]

E. The Highest-Emitting Sources of Greenhouse Gas Are Not Powered Down When Wind Farms Operate.

Emissions reductions for the amount of electricity generated by grid-connected wind power should come first from baseload coal-fired power plants, because combustion of coal accounts for most CO_2 emissions in the electric power sector.[77] But unless a region relies almost entirely on coal for power,[78] grid operators do not turn first to coal-fired power plants to accommodate intermittent power sources.[79] Instead, natural gas-fired or hydroelectric plants are directed by the grid operator to ramp up or down first because their ability to do so is much greater than that of coal-fired plants.[80] In states like New York, where substantial hydroelectric power is integrated into the grid, wind power may displace proven low-emissions sources.[81] Little or no emissions reductions from coal combustion can therefore be realized as a result of greater integration of utility-scale wind energy.[82]

F. Manufacture and Development of Wind Farms Generates Substantial Amounts of Greenhouse Gas.

In addition, "life-cycle effects [on greenhouse gas emissions], those effects caused by the development, manufacture, resource extraction, and other activities affiliated with all energy sources," will need to be accounted for in any assessment of wind energy's potential for emissions displacement.[83] For example, wherever they are sited, wind farms require large amounts of concrete, production of which is one of the greatest industrial sources of CO_2 emissions. Taking into account the CO_2 generated by concrete production alone, industrial wind energy emits comparable volumes of greenhouse emissions as biomass, and not significantly less than natural gas by some estimates.[84]

G. Integrating Substantial Amounts of Wind Energy into the Grid Is Costly and Will Likely Disrupt Service.

Increased development of utility-scale wind power is likely to result in electricity system disruption. For example, after investing heavily in wind power in a high wind resource region, the Canadian province of Alberta is reverting back to conventional fossil fuel power plants because, as a wind developer explained, "the greater percentage of the system depends on wind, the more vulnerable to disruption the system becomes when the wind stops blowing."[85] Denmark's wind farms generate the equivalent of about 20% of its electricity demand, but to avoid disruption of its electric grid it exports most of that.[86]

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To maintain transmission system reliability with substantial reliance on wind energy is costly. In Britain, the European nation with the greatest wind resources and a well-developed transmission infrastructure, the cost of generating only 1.3% of

its electricity from wind energy was over $1 billion in fiscal year 2007-2008, causing electricity prices to rise almost 30% in one year.[87] Denmark's electric rates are much higher than Britain's.[88]

Greater integration of wind energy into regional grids raises questions about the cost of needed transmission improvements. In New York, the largest wind farm, Maple Ridge in Lewis County, "has been forced to shut down even with a brisk wind blowing" at times because existing transmission infrastructure is inadequate to handle a surge in load, and there are no plans to add more transmission capacity.[89] However, upstate wind farms serve upstate urban areas, and there appears to be no need to enhance the electric grid downstate, which is "grossly oversized, built to handle extreme power demands that occur for only a few hours on the hottest days of the year."[90] Recently, New York's Public Service Commission adopted rules requiring new wind farm applicants to provide "energy deliverability" studies to determine whether there is sufficient transmission line capacity under various load levels to actually deliver the power such projects will create.[91]

Much of the interest in new transmission capacity is focused on the idea of bringing wind-generated electricity from the Midwest to the East Coast. U.S. Energy Secretary Steven Chu has estimated the cost of a national transmission system capable of realizing this idea will be as much as $1 trillion.[92] Planning for such expenditures in the U.S. has not yet begun.[93]

H. New York's Land Base Is Insufficient for Substantial Reliance on Wind.

To generate 1,000 MW (the equivalent of one major traditional power plant), if we apply GE Energy's 10% effective capacity rule to each 25-square mile 100 MW wind farm, we see that about 2,500 square miles of land is needed. Approximately 35 wind farms are operating or proposed in New York.[94] Assuming an average of 25 square miles is required for each project, full build-out in New York as currently planned by the private sector will involve 875 square miles of project area. However, one study concludes that because viable wind farm sites in New York are limited to lands close to existing transmission lines with adequate wind resources, and half the land with (marginally) adequate wind resources is located in the Catskills and Adirondacks, which are generally off-limits to wind farm development, only 0.3% of New York's land area, or 164 square miles is available.[95] These conclusions suggest that the relatively easy access to a developed transmission infrastructure in New York, coupled to large and complex sources of public money, rather than environmental benefits, is what drives the development of utility-scale wind energy.

IV. What Planning for Wind Energy Is Occurring in New York?

Unfortunately, New York's Renewable Portfolio Standard, state grants and tax incentives, and efforts by the NYISO and the Department of Public Service to manage the state's electric grid burdened by increasingly greater integration of utility-scale wind energy has been accompanied by little planning.[96] Wind farm siting requirements at either the state or federal level do not exist. Instead, determining what if any siting restrictions should be imposed on wind farm development falls on the shoulders of local agencies, generally either a five-member rural town board or planning board, or a county industrial development authority, each of which are ill-equipped to understand the burdens and benefits of wind farms.[97]

Wind energy developers in New York commonly purchase land use rights a year or more in advance of the process of developing local regulations, thereby securing a small but vocal band of pro-wind supporters who have been given an initial payment and a promise of annual payments for every turbine that can be sited on their land.[98] Often, the developer funds a local "environmental" group dominated by project "participants" (those who have contracted for use of their land), to boost the project with slick brochures, newspaper ads, tee-shirts and public meetings. Commonly, local officials are asked to become participating landowners, raising ethics questions.[99] The typical land use agreement includes provisions requiring the landowner to support the project, prohibiting any conduct criticizing the project, and prohibiting any release of information about the terms of the agreement. In most cases a project area map can be constructed based on recorded land use agreements, well in advance of either the consideration of local regulations or the submission of a project application pursuant to local law.[100] By then the developer and its participants have lobbied the local government for setbacks and noise limits that will accommodate the project area. If those who have not been brought within the net of project "participants" raise concerns during the

review of potential impacts of local regulations[101] or the subsequent project application, the local board is reluctant to adopt standards that would adversely affect project plans.

In advance of any local regulation, the developer also often signs up with the New York Independent System Operator for approval of a grid interconnection request, and this puts them on a tight time frame: NYISO puts the request on a queue for processing, it takes about 36 months to come to the head of the queue for consideration,[102] but NYISO wants to see that most state and local approvals are in hand before they will consider a request that has gotten that far. (If the project has a capacity of 80 MW or more, PSC approval is needed, but neither NYISO nor PSC applies any siting standards.[103]) If the local approvals have not been obtained, the developer's request is moved to the back of the queue and must wait to come to the head of the queue all over. If the developer's request is delayed in this way, its financial backers often pull out.

Feeling pressure from a vocal fraction of the community early on in the process of considering siting standards, the town board typically feels hard pressed to meaningfully consider standards that will adequately protect the nonparticipants, who generally easily outnumber the participants. Feeling that lax siting requirements are quickly becoming a "done deal," the nonparticipants get very vocal too, organizing as their means allow, but they've been beaten to the table by an organized participant group. As the issues get increasingly polarized and emotional (with the participants' financial stake on the line, and nonparticipants' property use rights on the line), the town board often loses sight of what the research on wind farm impacts says. For example, town boards are generally reluctant to hire an acoustic engineer familiar with wind farm noise, and perhaps also to hire a generalist environmental consulting firm, until the project application phase—which comes after and pursuant to siting standards to be adopted in a local law, since there is no state or federal siting law.

V. Conclusion

Given the poor performance of utility-scale wind energy, its minimal direct contribution to emissions reduction goals (e.g., no reduction would be expected where wind displaces hydroelectric generation), the need to operate reserve power sources to manage the intermittent character of wind energy, and the emissions inefficiencies that result, whether wind energy can make a meaningful contribution to carbon emissions reduction goals is unproven.[104]

To date the industry has consumed billions in state and federal subsidies and tax credits, and forgiven local taxes but without demonstrating any environmental benefits. Costly transmission and other infrastructure improvements will be required before such benefits can be realized.[105] Whether promotion of grid-connected industrial wind energy is a modest but ineffective solution (but at a very large cost) to climate change remains an open question.

Until these questions are addressed, skeptics will continue to ask whether the level of intrusion by wind farms into rural residential communities in New York will ever be justified by their benefits.

NOTES

1. Gary A. Abraham is an attorney in Allegany, NY whose private public interest law firm specializes in environmental and land use regulation and enforcement. This article is based on a presentation and materials prepared for a joint meeting of the New York State Bar Association's Environmental and Municipal Law Sections in the fall of 2009. Gary can be reached at: http://www.garyabraham.com/.
2. Yale Center for Environmental Law & Policy, SURVEY ON AMERICAN ATTITUDES ON THE ENVIRONMENT, "Key Findings" (2007) at 6, available at http://envirocenter.research.yale.edu/uploads/epoll/YaleEnvironmentalPoll2007Keyfindings.pdf.
3. The euphemism "wind farm" is used throughout in this Article, despite its problematic benign connotation, because it has become an accepted descriptor for large arrays of industrial wind turbines, in contrast to smaller wind energy devices used for distributed generation of electricity.
4. *See* Bob Vila, *Green Backlash: The Wind Farm Controversy*, http://www.bobvila.com/HowTo_Library/Green_Backlash_The_Wind_Turbine_Controversy-Subject_Green__Building-A3923.html. Bob Vila is the television show host for *This Old House*, *Bob Vila's Home Again* and *Bob Vila*.
5. Nicolas Boccard, *The Social Cost of Wind Power*, Institut d'Economie Industrielle (IDEI, University Toulouse), conference on The Economics of Energy Markets, Toulouse (June 2008), 8, http://idei.fr/doc/conf/eem/papers_2008/boccard.pdf.
6. *See infra* text at notes 48-52.
7. U.S. Department of Energy, Energy Information Administration (EIA), FEDERAL FINANCIAL INTERVENTIONS AND SUBSIDIES IN ENERGY MARKETS 2007, April 9, 2008, p. 43 http://www.eia.doe.gov/oiaf/servicerpt/subsidy2/ ("renewable programs . . . such as wind, are not yet considered commercially viable because of cost and performance issues").

8. Gilbert E. Metcalf, *Taxing Energy in the United States: Which Fuels Does the Tax Code Favor?* MANHATTAN INST. (January 2009), p. 5, Table 2, available at http://www.manhattan-institute.org/html/eper_04.htm. Metcalfe is Professor of Economics at Tufts University. The effective tax rate for natural gas is 34.4%, for nuclear, -99.5%. *Taxing Energy, supra.*
9. *Cf.* John Vidal, *The carbon cash-in*, THE GUARDIAN, October 22, 2008, http://www.guardian.co.uk/environment/ 2008/oct/22/1 (reporting that "the world's leading investment banks meet in London today to discuss how they can 'cash in' on carbon").
10. *Cf.* Baker Botts LLP, "Revenue Procedure Establishes a Safe Harbor for 'Partnership Flip' Structures in Wind Projects," http://www.bakerbotts.com/file_upload/SafeHarborforPartnership FlipStructuresinWindDeals.htm; Stoel Rives LLP, THE LAW OF WIND: A GUIDE TO BUSINESS AND LEGAL ISSUES, 5th ed. (2009), http://www.stoel.com/showarticle.aspx?show=1185, ch. 8 (describing in depth lending and financing strategies for wind projects).
11. Angela Neville, *Prevailing Winds: Trends in U.S. Wind Energy*, POWER MAGAZINE, December 1, 2008, http://www.powermag.com/issues/features/Prevailing-winds-Trends-in-U-S-wind-energy_1573.html (the number of wind turbines installed dropped quickly each time the U.S. production tax credit expired, in 1999, 2001 and 2003).
12. I.R.C. § 45(a).
13. The capacity factor assigned to wind farms in New York is 10% in summer, 30% in winter; therefore the average annual actual capacity of a 100 megawatt (MW) wind farm is assumed to be 20MW. *See* NYISO, 2007 GOLD BOOK, pp. 45, 58, http://www.nyiso.com/public/webdocs/services/planning/planning_data_reference_documents/2007_GoldBook_PUBLIC.pdf.
14. 20 MW = 20,000 KW x 8,760 hrs./yr. = 175,200,000 KWH annually.
15. EIA, FEDERAL FINANCIAL INTERVENTIONS AND SUBSIDIES IN ENERGY MARKETS 2007 (April 2008), *Executive Summary*, p. xvi, http://www.eia.doe.gov/oiaf/servicerpt/subsidy2/index.html.
16. This is based on the 100.5 MW Noble Bliss Windpark, which reported to FERC that it generated 22% of its rated capacity over the four quarters from July 2008 to June 2009, for which it was paid $8.1 million. *Cf. infra* note 67.
17. EIA, FEDERAL FINANCIAL INTERVENTIONS AND SUBSIDIES IN ENERGY MARKETS 2007, *supra* note 15, p. 4. *See generally* I.R.C. § 168. *See also* Glenn R. Schleede, Comments submitted to New York State Energy Planning Board, July 30, 2008, pp. 2-3 http://www.nysenergyplan.com/presentations/PDF/Glenn R. Schleede.pdf.
18. EIA, Federal Financial Interventions, *supra* note 17, p. 3.
19. EIA, FEDERAL FINANCIAL INTERVENTIONS, *supra* note 17, p. 4. Summaries and histories for most state subsidies for renewable energy projects are available at Database for State Incentives for Renewables & Efficiency, www.dsireusa.org.
20. The American Recovery and Reinvestment Act of 2009 (Stimulus Bill), Public Law 111-5, 123 Stat. 364, Sec. 1603 (February 17, 2009). *See generally* Jeffry S. Hinman, *The Green Economic Recovery: Wind Energy Tax Policy After Financial Crisis and the American Recovery and Reinvestment Act of 2009*, 25 J. ENVTL. LAW & LITIG. 35, at 55-68 (2009); and Stoel Rives LLP, THE LAW OF WIND, *supra* note 10, ch. 9.
21. U.S. Department of Energy (DOE), *Treasury, Energy Announce $500 Million in Awards for Clean Energy Projects,* September 1, 2009 (press release), http://www.energy.gov/news2009/print2009/7851.htm.
22. DOE press release, *supra* note 21. A typical 100 MW wind farm generates as little as five permanent local positions or as many as 16. *Cf.* Larry Flowers, NREL, Wind Energy Update, August 2009, http://www.windpoweringamerica.gov/ pdfs/wpa/wpa_update.pdf (comparing permanent operations and maintenance jobs generated at wind projects in Iowa, South Dakota, Colorado, Oklahoma and Wyoming).
23. DOE, Treasury, *Energy Surpass $1 Billion Milestone in Recovery Act Awards for Clean Energy Projects*, September 22, 2009 (press release), http://www.energy.gov/news2009/8038.htm.
24. Russ Choma (Investigative Reporting Workshop, American University School of Communication), *Overseas firms collecting most green energy money*, October 29, 2009, http://investigativereportingworkshop.org/ investigations/wind-energy-funds-going-overseas/.
25. Russell Gold, *Wind Farms Set Wall Street Aflutter*, WALL STREET JOURNAL, August 31, 2009.
26. North Carolina Solar Center and the Interstate Renewable Energy Council, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY (DSIRE), *New York . . . Renewables Portfolio Standard*, http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NY03R&re=1&ee=1 (summarizing the New York Renewables Portfolio Standard program).
27. NYSERDA MAIN TIER RPS ECONOMIC BENEFITS REPORT, November 14, 2008, p. 6-2 http://www.nyserda.org/rps/KEMA EXH D Main Tier Econ Benefits Report 111408.pdf.
28. Stoel Rives LLP, THE LAW OF WIND, *supra* note 10, p. 8-5.
29. RPTL § 487 (making renewable energy property exempt from local property taxes unless the local tax jurisdiction opts out by resolution or local law).
30. GML § 858 (making renewable energy property exempt from local sales, mortgage recording and property taxes whenever an IDA provides financial assis-

tance to the energy project, and regardless of whether affected tax jurisdictions opt out under RPTL § 487).

31. *Cf.* Nancy Madsen, *JCIDA [Jefferson County IDA] crafts tax-exemption formula*, WATERTOWN DAILY TIMES, September 6, 2009, http://www.watertowndailytimes.com/article/ 20090906/NEWS03/309069966 (payments to IDA by wind farm developer of $8,500 per MW of installed capacity are about 20% of "full taxation"). Generally in New York, payments in lieu of taxes to an IDA are split among the school district, the County and the host town roughly 50%-40%-10%, respectively, or about $2,500 per MW to the school, $2,000 to the County and $500 to the town in this example. *See* GML § 858[17].
32. Robert Bradley, *Who Was Ken Lay? (The Senate should know the industry father of U.S.-side cap-and-trade)*, July 7, 2009, MasterResource: A free-market energy blog, http://masterresource.org/ ?p=3644.
33. This is based on the effective project area for the proposed Noble Environmental Power 100.5 MW Allegany Wind Park in the western New York towns of Centerville and Rushford. Although the stated project area is 7,633 acres (about 12 square miles), the project area map shows this is broken up into numerous parcels within an area 8 mi. x 3.2 mi., or 25.6 sq. mi. *Cf.* Noble Environmental Power, ALLEGANY FEIS, REVISED FIGURE 2.23-2, PROJECT FACILITIES MAP, available at http://www.noblepower.com/our-windparks/allegany/AlleganyFEIS.html. *See also* E.On UK Renewables, TURBINES ON YOUR LAND, http://www.eon-uk.com/Turbinesonyourland.pdf (recommending that wind turbine sites "should be greater than 350 acres," turbines should be separated by 400 meters, and turbine sites should be set back from "the nearest dwellings" at least 750 meters).
34. *Cf.* Comment, *Addressing the Impacts of Large Wind Turbine Projects to Encourage Utilization of Wind Energy Resources*, 27 TEMP. J. SCI. TECH. & ENVTL. L. 123, 131-133 (2008) (discussing nuisance actions brought by wind farm neighbors where noise was the primary complaint). Noise impacts are discussed at greater length below.
35. *See* University of Newcastle, *Visual Assessment of Windfarms Best Practice*, SCOTTISH NATURAL HERITAGE COMMISSIONED REPORT F01AA303A (2002), p. 10, http://www.snh.org.uk/pdfs/publications/commissioned_reports/f01aa303a.pdf. To screen for adverse visual impacts, Scottish authorities recommend wind farms be set back two kilometers from "the edge of cities, towns and villages." SCOTTISH PLANNING POLICY SPP 6, RENEWABLE ENERGY, March 2007, p. 18, http://www.scotland.gov.uk/Publications/2007/03/22084213/22.
36. A. Kevin Gleason, Assistant Director, Bureau of Toxic Substance Assessment, NYSDOH, to James P. Sherron, Executive Director, Steuben County IDA (comments on Ecogen LLC, Prattsburgh/Italy Wind Farm proposal), June 7, 2005, p. 4 (on file with the author).
37. U.S. Fish and Wildlife Service (FWS), INTERIM GUIDELINES TO AVOID AND MINIMIZE WILDLIFE IMPACTS FROM WIND TURBINES, p. 4 (May 13, 2003), available from http://www.fws.gov/ habitatconservation/wind.html. FWS must be consulted whenever a wind farm requires a Clean Water Act § 404 permit from the U.S. Army Corps of Engineers. In New York, the Breeding Bird Atlas may be consulted for a list of breeding birds known to breed in specific areas of the state. *Cf.* http://www.dec.ny.gov/animals/7312.html (scroll to bottom).
38. Robert Bryce, *Windmills Are Killing Our Birds*, WALL STREET JOURNAL, September 8, 2009. *See also* Donald Michael Fry, Director, Pesticides and Birds Program, American Bird Conservancy, *Testimony before the House Subcommittee on Fisheries, Wildlife and Oceans Oversight Hearing on: "Gone with the Wind: Impacts of Wind Turbines on Birds and Bats,"* May 1, 2007, http://www.abcbirds.org/newsandreports/releases/ 070430_testimony.html.
39. *Cf.* Michael Fry, *Wind power might blow a hole in bird populations*, THE LOS ANGELES TIMES, November 2, 2009, http://www.latimes.com/news/opinion/la-oe-fry2-2009nov02,0,1954510.story. *See generally* U.S. House of Representatives, Committee on Natural Resources, Subcommittee on Fisheries, Wildlife and Oceans, Oversight Hearing, *Gone With the Wind: Impacts of Wind Turbines on Birds and Bats*, May 1, 2007, http://www.gpoaccess.gov/congress/index.html.
40. Jason W. Horn et al., *Behavioral Responses of Bats to Operating Wind Turbines*, 72:1 THE JOURNAL OF WILDLIFE MANAGEMENT 123 (2008), http://www.bu.edu/cecb/wind/video/Horn_et_al_2008.pdf.
41. E.F. Baerwald et al., *Barotrauma is a significant cause of bat fatalities at wind turbines*, 18 CURR BIOL R695 (2008); Gerry Smith, *Wind farms' biggest victims: bats; Researchers say a pressure drop created by turbines can cause bats' lungs to burst*, CHICAGO TRIBUNE, March 1, 2009, www.chicagotribune.com/features/lifestyle/green/chi-exploding-bats-bd01-mar01,0,6899974.story; David Figura, *Wind turbine placement should take migrating birds into consideration, ornithologist says*, Outdoors Blog, THE POST-STANDARD (Syracuse, NY), November 8, 2009, http://blog.syracuse.com/outdoors/2009/11/wind_turbine_placement_should.html (bat mortality results from both collisions with the rotor blades and "barotrauma"). N.Y. State Dept. Envtl. Conserv. (DEC) recently issued GUIDELINES FOR CONDUCTING BIRD AND BAT STUDIES AT COMMERCIAL WIND ENERGY PROJECTS (August 2009), available at http://www.dec.ny.gov/energy/40966.html.
42. B.S. Randhawa, R. Rudd, *RF Measurement Assessment of Potential Wind Farm Interference to Fixed Links and Scanning Telemetry Devices* (March 2009), available at http://www.ofcom.org.uk/radiocomms/ifi/licensing/classes/fixed/Windfarms/rf_measurement/windfarm_report.pdf.
43. Richard. J. Vogt et al., *Weather Radars and Wind Farms: Working Together for Mutual Benefit*, pre-

sented at the American Wind Energy Association WINDPOWER 2008 Conference, Houston, TX (June 1-4, 2008), http://www.roc.noaa.gov/windfarm/WindPower2007_final_wheader.pdf. *See also* Nancy Madsen, *Wind farms interfering with Doppler radar*, DAILY TIMES (Watertown, NY), June 24, 2009 ("Maple Ridge Wind Farm is one of several farms in the state causing problems for the National Weather Service Forecast Office in Buffalo"); *Don Paul Weather Blog*, entry by Don Paul, February 27, 2009, available at http://blogs.wivb.com/2009/02/20/another-snowmaker-enroute-pattern-change-in-the-distance/.

44. FAA, https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp. The FAA screening tool allows users to input the longitude and latitude of an area and obtain information on potential inference with long range radar, NEXRAD communications, and military operations.
45. Laura Nelson, *Air force clips the wings of UK wind power*, 428 NATURE 111 (March 11, 2004), http://users.erols.com/iri/EnewsApril5,2004.htm#3. *See also Windfarms now a threat to air safety*, NEWS & STAR (West Cumbria, UK), December 11, 2001, http://www.newsandstar.co.uk/ (reporting on air traffic control service letter to local planning council warning that "wind turbines may prevent radar from seeing aircraft or send false returns that could be interpreted as aircraft . . . pos[ing] a risk to aircraft safety").
46. National Academy of Sciences, ENVIRONMENTAL IMPACTS OF WIND-ENERGY PROJECTS (2007), p. 143, available at http://www.nap.edu/openbook.php?isbn=0309108349 (hereafter cited as "NAS") (citing J. Hecklau, *Visual Characteristics of Wind Turbines*, Proceedings, Technical Considerations in Siting Wind Developments (2005), http://www.nationalwind.org/events/siting/presentations/hecklau-visual_characteristics.pdf.
47. *Cf.* Better Plan, Wisconsin, "Flight for Life Won't Land in Wisconsin Windfarm," http://betterplan.squarespace.com/flight-for-life-wont-land-in-w/ (links to flyer, "Important Information from *FLIGHT FOR LIFE* about Windmill Farms," and "H is for HELP!," an interview with a Flight for Life helicopter pilot).
48. Eja Pedersen, *Human response to wind turbine noise: Perception, annoyance and moderating factors*, Diss., Göteborg University 2007), p. 24, http://dspace.hh.se/space/handle/2082/1925 (reviewing literature); Minnesota Department of Health, PUBLIC HEALTH IMPACTS OF WIND TURBINES (2009), pp. 19-20, http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf. *See also* DEC, ASSESSING AND MITIGATING NOISE IMPACTS, 2001, http://www.dec.ny.gov/docs/permits_ej_operations_pdf/noise2000.pdf, p. 3 ("The amplitude (loudness), frequency (pitch), impulse patterns and duration of sound all affect the potential for a sound to be a noise.").
49. Godefridus Petrus van den Berg, *The sounds of high winds: the effect of atmospheric stability on wind turbine sound and microphone noise*, Diss., Univ.Groningen 2006, p. 106, http://dissertations.ub.rug.nl/FILES/faculties/science/2006/g.p.van.den.berg/00_titlecon.pdf; Minnesota Department of Health, PUBLIC HEALTH IMPACTS OF WIND TURBINES, p. 21.
50. van den Berg, *supra* note 49, pp. 36, 81, 85, 142; M. Moorhouse et al., *Research into Aerodynamic Modulation of Wind Turbine Noise: Final Report July 2007,* University of Salford (report for Defra), http://members.kos.net/kenth/.
51. van den Berg, *supra* note 49, p. 96.
52. van den Berg, *supra* note 49, p. 96.
53. *Cf.* Comment, *Addressing the Impacts of Large Wind Turbine Projects to Encourage Utilization of Wind Energy Resources*, 27 TEMP. J. SCI. TECH. & ENVTL. L. 123, 133 (2008) (development of industrial wind energy facilities is justified by "concerns regarding anthropogenic climate change and United States dependence on foreign fossil fuel supplies") (citing Pew Center on Global Climate Change, http://www.pewclimate.org/global-warming-basics/basic_science; Governors' Wind Energy Coalition, *Letter to The Honorable Barack Obama*, February 18, 2009, http://www.governorswindenergycoalition.org/assets/files/GWC_Obama_letter_021909_1(1).pdf ("Working toward this goal [i.e., DOE's 20% by 2030] would spur new investments that can help stabilize our states' and nation's economies, reduce consumer energy costs, reduce dependence on foreign oil, lessen carbon emissions, and create thousands of good jobs."); Wayne Perry, *Eastern wind could replace coal for power*, ASSOCIATED PRESS, April 6, 2009 (reporting on U.S. Interior Secretary Ken Salazar's claim that offshore wind farms along the east coast could replace most coal-fired power plants in the U.S.).
54. EIA, *U.S. Primary Energy Consumption by Source and Sector, 2008*, http://www.eia.doe.gov/emeu/aer/pecss_diagram.html (95% of U.S. oil consumption occurs in the transportation sector).
55. EIA, *Electric Power Monthly*, January 2009, Table 1.2, http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html (in 2006, only about 1% of the electricity generated in the United States was produced using oil); EIA, *State Energy Profiles: New York*, available at http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=NY (2.5% of New York's oil consumption is used for electricity generation).
56. Natural Resources Defense Council, BENCHMARKING AIR EMISSIONS OF THE 100 LARGEST ELECTRIC POWER PRODUCERS IN THE UNITED STATES (May 2008) 3, 10, 18 Fig. 6 http://www.nrdc.org/air/pollution/benchmarking/2006/benchmark2006.pdf.
57. Benchmarking Air Emissions, *supra* note 56 at 41.
58. *Cf. supra* note 53.
59. This is obscured by wind project sponsors who emphasize that the installed capacity of their projects

can provide enough electricity to serve so many thousands of homes. The average home consumes about one MWH per month, but could not rely on wind power to do so because of its intermittency.

60. *See below*, text following note 72.
61. *Cf.* Matthias Fripp and Ryan H. Wiser, *Effects of Temporal Wind Patterns on the Value of Wind-Generated Electricity in California and the Northwest*, 23:2 IEEE TRANSACTIONS ON POWER SYSTEMS, 477-485, 480 (May 2008), http://repositories.cdlib.org/cgi/viewcontent.cgi? article=6513&context=lbnl.
62. *Cf.* NYISO, 2007 GOLDBOOK, *supra* note 13.
63. *Cf.* EIA, "Glossary," http://www.eia.does.gov/glossary. For a down-to-earth explanation of "capacity factor," *see* the British internet energy blog LIGHTBUCKET, *The capacity factor of wind power*, http://lightbucket. wordpress.com/2008/03/13/the-capacity-factor-of-wind-power/.
64. EIA, ELECTRIC POWER INDUSTRY 2007: YEAR IN REVIEW, Table A6. Average Capacity Factors by Energy Source, 1996 through 2007, http://www.eia.doe.gov/cneaf/electricity/epa/epaxlfilea6.pdf.
65. GE Energy, THE EFFECTS OF INTEGRATING WIND POWER ON TRANSMISSION SYSTEM PLANNING, RELIABILITY, AND OPERATIONS (REPORT ON PHASE 2), prepared for NYSERDA. March 4, 2005), p. 7.16, available at http://www.nyserda.org/publications/wind_integration_report.pdf. Early "wind resource performance data has tended to validate the use of the [2005] GE study." New York State Reliability Council, L.L.C., INSTALLED CAPACITY SUBCOMMITTEE MEETING #76, May 4, 2007, 5, http://www.nysrc.org/pdf/ICSMeeting-Minutes/20070504 ICS Minutes_Final.pdf. The GE study findings are generally consistent with the capacity factors assigned to upstate land-based wind farms by NYISO. *Cf. supra*, note 13.
66. *Cf. infra*, note 68.
67. *Cf.* Federal Energy Regulatory Commission (FERC), *Electric Quarterly Reports (EQRs)*, Download Spreadsheets utility (by quarter and name of company), http://www.ferc.gov/docs-filing/eqr/data.asp. This utility provides the actual quarterly generation rate for each wind project, which must then be compared to the project's nameplate capacity. Note that actual generation rates may not be equivalent to effective capacity. *See supra* note 65.
68. Wind resource maps for all of New York State are available at http://windexplorer.awstruewind.com/NewYork/NewYork.htm.
69. National Renewable Energy Laboratory, WIND RESOURCE ASSESSMENT HANDBOOK, April 1997, p. 3-2 http://www.nrel.gov/wind/pdfs/22223.pdf (wind farms are viable in a Class 3 wind resource area); U.S. Army Corps of Engineers, Cape Wind Energy Project DEIS, Appendix 3A, p. 1, available at http://www.nae.usace.army.mil/projects/ma/ccwf/deis.htm ("areas designated as Class 4 or greater onshore are generally considered to be the minimum suitable for larger scale wind project development by the industry").
70. WIND RESOURCE ASSESSMENT HANDBOOK, *supra* note 69. The capacity factor assigned to wind farms in a Class 3 wind resource area is between 26.2% and 31.6%. Matthias Fripp and Ryan Wiser, Lawrence Berkeley National Laboratory, ANALYZING THE EFFECTS OF TEMPORAL WIND PATTERNS ON THE VALUE OF WIND-GENERATED ELECTRICITY AT DIFFERENT SITES IN CALIFORNIA AND THE NORTHWEST, June 2006, p. 31 (California data), .
71. *Cf.* NAS, *supra* note 46, pp. 65-66 ("Wind energy will contribute proportionately less to electricity generation in the mid-Atlantic region than in the United States as a whole, because a smaller portion of the region has high-quality wind resources than the portion of high-quality wind resources in the United States as a whole.").
72. *E.g.*, American Wind Energy Assn. (AWEA), INTEGRATING UTILITY-SCALE WIND ENERGY ONTO THE GRID: AN INFORMATIONAL RESOURCE, November 17, 2006, http://www.awea.org/pubs/factsheets/ 061117 Integrating Utility scale Wind.pdf ("Since wind is primarily an energy—not a capacity—source, no additional generation needs to be added to provide back-up capability provided that wind capacity is properly discounted in the determination of generation capacity adequacy.").
73. E.ON Netz GmbH, WIND REPORT 2005, p. 10, available at http://www.eon-netz.com/pages/ ene_en/EEG KWK-G/Renewable Energy Sources Act / EEG plants/Facts and figures relating to wind power/index.htm.
74. Environmental Impacts of Wind-Energy Projects, *supra* note 46 at 35.
75. ENVIRONMENTAL IMPACTS OF WIND-ENERGY PROJECTS, *supra* note 46 at 35, 52, 63-64. *See also* Richard S. Courtney (Center for Science and Public Policy, Washington, D.C.), *Wind Farms Provide Negligible Useful Electricity*, March 2006, p. 13, http://ff.org/centers/csspp/pdf/ 20060331 wind.pdf; Michael J. Trebilcock (Professor of Law and Economics, University of Toronto), *Wind power is a complete disaster*, NATIONAL POST (Canada), April 8, 2009; Tyndall Centre for Climate Change Research, *Security assessment of future UK electricity scenarios*, July 2005, pp. 5, 24, 46. http://www.tyndall.ac.uk/research/ theme2/final reports/t2_24.pdf. *See also infra* text at note 83.
76. Thomas Hewson, Jr. and David Pressman, *Calculating Wind Power's Environmental Benefits*, POWER ENGINEERING, July, 2009, http://pepei.pennnet.com/.
77. EIA, FUEL AND ENERGY SOURCE CODES AND EMISSION COEFFICIENTS, http://www.eia.doe.gov/oiaf/1605/ coefficients.html.
78. Because of its reliance on coal power, China has had to increase coal-fired power plants as a result of aggressive development of wind farms. *China's Wind*

Farms Come With a Catch: Coal Plants, WALL STREET JOURNAL, September 28, 2009, A17.

79. See ENVIRONMENTAL IMPACTS OF WIND-ENERGY PROJECTS, *supra* note 46 at 33; D. Blakeway and C.B. White, *Tapping the Power of Wind: FERC Initiatives to Facilitate Transmission of Wind Power*, 26 ENERGY L. J. 393, 412 (2005) (compared to other conventional electric generators, nuclear and coal-fired power plants have "long ramp-up and ramp-down times"); World Nuclear Association, *Nuclear Power in France*, http://www.world-nuclear.org/info/inf40.html ("nuclear and coal-fired plants cannot readily alter power output, compared with gas or hydro plants").
80. Environmental Impacts of Wind-Energy Projects, *supra* note 46 at 33.
81. On October 15, 2009, New York's Public Service Commission (PSC) adopted rules "requir[ing wind farm] developers to study whether or not their project is merely replacing an existing source of renewable energy such as a hydro plant." Larry Rulison, *New rule called obstacle to wind power: Advocates say regulation will impede shift to key clean power technology in the Empire State*, ALBANY TIMES UNION, October 26, 2009, http://www.timesunion.com/AspStories/story.asp?storyID=857320. *Cf.* PSC, Case 09-E-0497—*In the Matter of Generator-Specific Energy Deliverability Study Methodology, Order Prescribing Study Methodology*, October 20, 2009, available at www.dps.state.ny.us.
82. David Chandler, *Renewable energy regulations may miss the mark, says MIT graduate student*, MIT NEWS, October 1, 2008, http://web.mit.edu/newsoffice/2008/renewable-energy-tt1001.html (research finds "wind farms . . . almost never displace baseload coal-fired plants"). *See also* FactCheck.org, *Hot Air on Wind Energy*, April 10, 2009, http://www.factcheck.org/2009/04/hot-air-on-wind-energy/ (finding U.S. Interior Secretary Ken Salazar's claim that "[t]he idea that wind energy has the potential to replace most of our coal-burning power today is a very real possibility" to be "far-fetched").
83. ENVIRONMENTAL IMPACTS OF WIND-ENERGY PROJECTS, *supra* note 46 at 4 (noting the NAS assessment was unable to take life cycle effects into account). "There are over 8,000 components in a turbine." Alliance for Clean Energy New York, *New York and Wind Power: Linking Economic Development, Environmental Protection, and Energy Security*, Buffalo Niagara Wind Component Manufacturing Symposium, Buffalo, NY, July 15, 2009, 22 (listing components).
84. Richard Wilson, *Sustainable nuclear energy: Some reasons for optimism*, 28 INT. J. GLOBAL ENERGY ISSUES 138-160, 148, Fig. 4 (2007) (citing J. Spadaro, REPORT TO INTERNATIONAL ATOMIC ENERGY AGENCY (Vienna, Austria), March 29, 2001.
85. Claudia Cattaneo, *Alberta turns to natural gas after wind lessens reliability*, FINANCIAL POST (Toronto, CN), April 20, 2007, http://www.financialpost.com/story.html?id=f7ef4e6d-29f0-4a5e-95c3-084ff5eac8c0&k=3367.
86. Center for Politiske Studier (CEPOS), WIND ENERGY—THE CASE OF DENMARK, September 2009, 2 www.cepos.dk/fileadmin/user_upload/Arkiv/PDF/Wind_energy_-_the_case_of_Denmark.pdf; Hugh Sharman, Incoteco ApS (Denmark), *Planning for Intermittency: The Importance of Evidence from Germany and Denmark*, UK ERC Workshop, Imperial College, July 2005, slides 19-20, 24, http://www.ukerc.ac.uk/Downloads/PDF/05/050705TPASharmanpres.pdf.
87. Peter Glover and Michael J. Economides, *Wind Power Exposed: the Renewable Energy Source is Expensive, Unreliable and Won't Save Natural Gas*, ENERGY TRIBUNE (November 25, 2008), available at http://www.energytribune.com/articles.cfm?aid=1029#.
88. *Cf. supra* note 86.
89. Matthew L. Wald, *Wind Energy Bumps Into Power Grid's Limits*, THE NEW YORK TIMES, August 27, 2008.
90. Kevin Bullis, *Intelligent Electricity*, 112:5 TECHNOLOGY REVIEW 92 (Sept./Oct. 2009) ("In New York City peak demand is about 35,000 MW of electricity. Most of the time, the city's demand is about 9,000 MW less.").
91. *Supra* note 81.
92. *Steven Chu Reacts to the Citizen's Briefing Book*, YOUTUBE (January 15, 2009), a 14-minute video available at http://www.youtube.com/watch?v=i5_spDNuA4Q, at 4:40ff., especially at 8:10.
93. At the December 2008 meeting of the Governor's Energy Planning Board, which I attended, the Board acknowledged it was not considering transmission development needs.
94. DEC, *Existing and Proposed New York State Wind Energy Projects—July 2009*, http://www.dec.ny.gov/energy/48089.html (listing 33 such projects). Additional projects have been proposed since this list was prepared.
95. AWS Truewind, LLC, NEW YORK STATE WIND RESOURCE REPORT, TOWN OF ITALY AREA WIND RESOURCE REPORT, September 25, 2007, Appendix D to *Final Generic Environmental Impact Statement, Comprehensive Plan Amendment and Wind Energy Facilities Law, Town Of Italy* (December 2, 2008), pp. 3-4 (on file with the Author). The total land area of New York is 54,555 square miles.
96. *Cf. e.g.*, NYISO, Connection, Spring 2008, 13, http://www.nyiso.com/public/webdocs/documents/newsletters/connection/nyiso_connection_spring2008final1.pdf ("Since wind is an 'intermittent' resource, the NYISO is conducting detailed analyses to determine how best to accommodate such large increases in wind energy while maintaining the reliability of the bulk electric system.").
97. The remainder of this subsection is based on the Author's involvement in more than a dozen wind farm siting disputes in New York.
98. *Cf.* findings in Ecogen, LLC v. Town of Italy, 438 F. Supp. 2d 149, 152, 156 n.3 (W.D. N.Y. 2006).

99. *See* Patricia E. Salkin, *2009 Ethical Considerations in Land Use*, 41 URBAN LAWYER 529, 535-536 (Summer 2009), and citations therein; Ken Belson, *Amid Talk of Hidden Deals, Wind Firms Agree to Code of Conduct*, NEW YORK TIMES, October 31, 2008; New York State Office of the Attorney General, *Attorney General Cuomo Announces New Ethics Code Adopted by Wind Industry Companies Across NY*, July 29, 2009, http://www.oag.state.ny.us/media_center/2009/july/july29a_09.html.
100. *Cf. Attorney General Cuomo Announces New Ethics Code, supra* note 99 (noting that recording of land use agreements by wind developers is now a requirement under New York State Office of the Attorney General's Code of Conduct for Wind Farm Development).
101. Local laws regulating wind projects are Type I action under New York's State Environmental Quality Review Act (*see* 6 N.Y.C.R.R. Part 617), and therefore require completion of a Full Environmental Assessment Form. Centerville's Concerned Citizens v. Town Bd. of Town of Centerville, 56 A.D.3d 1129, 867 N.Y.S.2d 626 (4th Dep't 2008).
102. New York State Energy Planning Board, DRAFT NEW YORK STATE ENERGY PLAN 2009, "Siting New Energy Infrastructure" (August 2009) at 4, available at http://www.nysenergyplan.com/Issue_Briefs/Siting_New_Energy_Infrastructure-IB.pdf ("NYISO has indicated that its entire interconnection process may take anywhere from 27 to 52 months, with most projects taking between 36 and 38 months.").
103. PSC review of power projects is exempt from SEQRA. 6 N.Y.C.R.R. § 617.5(c)(35). However, PSC may not grant a required Certificate unless it finds "that the location of the facility as proposed conforms to applicable state and local laws and regulations issued thereunder." Pub. Serv. L. § 126(1)(f). Accordingly, PSC review is completed only after any required state and local approvals are issued. *Cf.* PSC, *Order Granting a Certificate of Public Convenience and Necessity and an Order Providing for Lightened Regulation*, No. 06-E-0135 (Noble Bliss Windpark), 2006 N.Y. PUC LEXIS 365 (November 9, 2006).
104. In 2008 wind energy accounted for less than 0.5% of U.S. renewable energy consumption: all renewables accounted for 7% of consumption, and wind energy accounted for 7% of that amount. EIA, Renewable Energy Consumption and Electricity Preliminary Statistics 2008, http://www.eia.doe.gov/cneaf/alternate/page/ renew_energy_consump/rea_prereport.html.
105. *Cf. supra* text at note 92.

FROM THE FEDERAL COURTS

Northern District of New York Dismisses Equal Protection Claim Made by Leather Manufacturing Facility

There are several processes involved in manufacturing leather, including one called "beaming," which is the removal of hair from animal hide. Since 1981, Androme had been engaged in leather manufacturing, but had not engaged in beaming. Another facility in the area, JFB, had been beaming since 1968. In 1988 the district in which both Androme and JFB was located was re-zoned as "M-1." This meant that facilities in the area were not permitted to process leather, including beaming. Facilities already involved in the process, however, were permitted to continue. In October of 2000, Androme requested a permit from the City to be allowed to add the beaming process to its facility. The permit was denied, and this decision was upheld by the zoning board of appeals. Androme sued in federal court, alleging that the City's denial of its application to beam, while allowing the JFB plant to continue beaming, violated its equal protection rights because the City was treating Androme differently from other similarly situated individuals.

The crux of Androme's argument, noted the court, was that at approximately the time of Androme's request to engage in beaming, the City's building inspector—in a letter to a prospective buyer of JFB inquiring as to whether JFB would be permitted to "resume" beaming—indicated that JFB had a "grandfathered" right to continue beaming as long as it did not cease beaming for more than one year after it was deemed exempt from the zoning restriction. Androme argued that the building inspector knew when he wrote that letter that JFB had previously gone more than a year without beaming, and therefore had lost its grandfathered right to beam. Androme argued that, by informing a potential purchaser that JFB had the right to continue beaming, and by not requiring JFB to undergo the same application process as Androme, the City treated the similarly situated leather-manufacturing facilities differently.

The court first addressed whether Androme and JFB had a high degree of similarity. The court concluded that they did not. Unlike JFB, Androme had never engaged in beaming prior to the re-zoning. As a result, while Androme was required to obtain permission from the City before it could begin beaming, JFB was required only to beam once a year in order to retain its right to continue beaming. Unless the City had reason to believe that JFB was not beaming, it was afforded a degree of discretion to assume that JFB maintained its beaming operation. By