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WISCONSIN STATE LEGISLATURE ...
PUBLIC HEARING - COMMITTEE RECORDS

2009-10

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Senate

(Assembly, Senate or Joint)

Committee on ... Commerce, Utilities, Energy, & Rail (SC-CUER)

COMMITTEE NOTICES ...

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INFORMATION COLLECTED BY COMMITTEE FOR AND AGAINST PROPOSAL

- Appointments ... **Appt** (w/Record of Comm. Proceedings)
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- Hearing Records ... bills and resolutions (w/Record of Comm. Proceedings)
  (**ab** = Assembly Bill) (**ar** = Assembly Resolution) (**ajr** = Assembly Joint Resolution)
  (**sb** = Senate Bill) (**sr** = Senate Resolution) (**sjr** = Senate Joint Resolution)
- Miscellaneous ... **Misc**

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And 67% believed property value depreciation starts at the planning stages and lessen with time.[105]

In Kewaunee, Wisconsin, a 2007 study paid for by Invenergy, LLC – a wind farm developer – found no measurable difference in home values in the target areas close to the wind farms and the control areas outside of the wind farm vicinity. It found the same for a case study in Mendota, Illinois.[106]

However, even the possibility of a wind farm may have a more significant impact than the actual presence of one. In Michigan, a real estate agent lost a large vineyard sale because a proposed wind farm was seen as a detriment to potential buyers.[107] Wind farms in the UK are purposely avoiding populated areas in order to mitigate property value-based opposition.[108]

In 2006, concerned about the impact wind turbines may have on local property values, two members of the Centerville Township in Michigan conducted their own literature review of four available studies on the subject. The township committee concluded that the presence of wind turbine generators near residential houses causes property values to decline.[109] They concluded that the amount of negative impact is as high as $25,000 per property. In their words, "This is common sense, and there are no serious scholarly studies that support an opposite conclusion."

They found that large wind turbines can affect neighboring property values due to noise, health effects and visual impacts on residents. Some homes have been reported as "not salable" because of their proximity to wind turbines. Further impact on property values depends on location. These adverse impacts on property values may not exist in agricultural areas that have huge farms. If land is being sold as fertile farmland, then the presence (or absence) of a nearby wind turbine is probably irrelevant. If there is a chance that a future wind turbine might be placed on the property, a potential buyer might think the land was slightly more valuable.[110]

Though having a wind turbine on a property may create an income stream and thus increase a property's production value, it does not necessarily result in increased market value.[111] The wind turbine lessee incurs a higher property tax and receives annual rent for signing the lease/easement. The other landholders find their property values decreased, and they receive nothing.[112] Real Estate brokers in rural areas confirm that property values in wind farm areas are 10-30% less than similar properties outside of wind farm areas.[113]

View adds value to rural property. Take away the view, and you take away the value.[114] Homes with a turbine within 300 feet can suffer reduced property values of up to 10%. Noise, blinking lights, glare from the blades and vibrations all play a role in devaluation.[115] The value of a farmhouse may be affected by as much as 30% if it is in close proximity to a wind turbine.[116] In 2001 a British judge found that the noise, visual intrusion and flickering of a turbine a little over 1,800 feet away from a property negatively impacted local properties by 20%. According to the judge, "It is an incursion into the countryside. It ruins the peace."[117] Agents in Britain, Australia and the U.S.A. agree. They have found it nearly impossible to sell properties next to wind farms unless they discount it 20-30%.[118] "To me, it is absolute common sense that if you put up huge industrial structures in an exceptionally beautiful area, property prices are going to suffer," said British real estate agent, Kyle Blue.[119]

A 2004 realtor study around Nantucket Sound found that 49% of realtors expect property values to fall in proximity to a wind farm.[120] Two studies conducted in Nantucket, Massachusetts found that a 130-turbine offshore wind farm would drive enough visitors away to see a loss of up to 2,500 tourism-related jobs. They also found that inland property values would decline 4.6% while the waterfront properties suffer nearly 11% diminution for a total loss of $8 million in yearly tax revenue.[121]

In 2005, a successful Maryland realtor named Russell Bounds testified before the Maryland Public Service Commission as to the effect wind farms have on property values. In his experience he found that combining an area of natural beauty with industrial development like a wind farm will negatively impact its desirability. "It is not only devalued," Bounds said, "but the property may also be rendered unsaleable."[122]

Bounds further testified that property values up to a mile from the turbines will be negatively impacted. Beyond a mile the visual impact may still diminish property value. Closer to the turbines, the visual and the noise impact will substantially diminish special attributes of a property including scenic view, natural setting and peace and quiet. [123]

The impact of a wind turbine close to a property "takes a property of substantial value and takes away all of the characteristics that are the strengths of that property," Bounds said. "The visual impact takes away value. The noise takes away value. The property owners complain that the wind turbines take away value and there is no way for them to escape."[124]

In Maryland, a wind farm developer demonstrated the diminution of value when it bought two abutting properties to their wind farm and were unable to sell them for close to their purchase price. They bought one property for $104,447.50 and sold it for $65,000. They bought another property for $101,049.00 and shortly thereafter sold it for only $20,000.[125]

Studies have shown that fear of wind farms can negatively affect purchase prices. In his February 2009 study, "Impact of Wind Turbines on Market Value of Texas Rural Land," Appraiser Derry Gardner studied 350 acres of premium ranch land that were put on the market for $2.1 million. A prospective buyer agreed to the sale price but backed out when the seller disclosed a 27-turbine wind farm within a 1½ mile radius from the property. The seller discounted the land by 25%, but the buyer still declined to purchase. As of the study's publication, after two years on the market there has been little interest in the property despite its other positive characteristics.[126]

Independent studies have shown an average diminution of value up to -37% when the turbine is on the property; up to -26% average diminution for properties within 1,056 – 2,112 feet of a turbine; and up to -25% average diminution for properties within 1.8 miles of turbines. Properties can also suffer an additional 15-25% diminution in value due to infrastructure construction (clearing, blasting, digging, etc.), high voltage transmission power lines (HVTL) to transport generated electricity, substations, additional traffic for servicing turbines and HVTLs, and additional roads.[127]

Wind farms have the potential to impact local property values.[128] As the number of houses near to, or with a view of the installation increases, the likelihood of aesthetic or economic objections seems to increase.[129] To calm property owners, one township recommended that the wind farm developer provide property value assurances that are transferrable to subsequent owners of the wind facility.[130] Developers may wish to consider

compensating the community in some fashion that benefits even non-participants, such as impact payments to the township. Resulting benefits, such as reduced property taxes, may help to address concerns about inequities.[131]

Noise

Turbines make noise. The amount of noise can change with atmospheric conditions, wind speed, temperature, and terrain. Noise, particularly low frequency noise, travels not only seismically but also airborne over terrain. Hills and valleys can create a megaphone effect that can directionalize, combine and intensify the sounds of multiple turbines.[132,133] It can be noticeable for long distances in more remote areas with existing low ambient levels.[134] At the turbine's hub, the noise ranges from 100-105 dBA. People can differentiate sounds up to 3 dBA above background levels.[135]

The wind industry has said that the windy nature of rural locations often masks the quiet nature of modern turbines, even for "the very few individuals" located close enough to hear it.[136] However, turbine noise greatly affects people even a mile away, and low frequency noise can make people irritable.[137] Industry advocates say little, if anything, about infrasound or low frequency noise.

The environmental noise pollution from wind turbines built too close to dwellings causes serious discomfort and often health injury. Oftentimes those affected did not object to the construction, accepting the developer's assurances that noise would not be a problem.[138]

A common argument in support of wind turbines is that their noise is at lower sound pressure levels than highways and roadways. In contrast, a 2007 study found that noise annoyance associated with wind turbines hasn't decreased because the absolute noise level they create is less important than the character of the noise produced.[139] In other words, annoyance doesn't depend so much on the volume of sound created, it depends on what it actually sounds like. Wind turbines produce no constant tonality, making the creation of a noise standard challenging.[140]

The main issue appears to be low frequency sound waves. Two to three Hz can cause vomiting and other serious health issues. Twelve Hz can cause hallucinations.[141] Because of the deep foundations necessary to stabilize large wind turbines, LFN is transmitted down and throughout the contours of the land, often follows bedrock and even accelerates to emerge randomly miles from its origin.[142] Audible noises and LFN vibrations should be considered in siting along with the potential additional noise caused by broken machinery such as a failed bearing.[143]

Quality Of Life

To many, turbines are visually distracting, out of place and threaten residents' peace and quality of life.[144] Strobing light and shadows affect feelings of peace and solitude.[145]

Turbines generate flicker and shadows that can distract nearby motorists.[146] They also interfere with television signals, thus affecting the quality of life for nearby residents.[147]

Turbine-generated noise has an adverse impact on quality of life and may adversely impact the health of those living nearby. Research links noise to adverse health effects such as sleep deprivation and headaches. Sleep deprivation may lead to physiological effects such as a rise in cortisol levels – a sign of physiologic stress – as well as headaches, mood changes, and inability to concentrate. Initial research into the health impact of wind turbine noise (including the 'visual noise' of shadow flicker) reveals similar findings.[148]

Even proximity to small wind farms can have a serious impact on nearby residents. Concerned about the potential effects of a 22-turbine wind farm near their town, the township of Lincoln, Illinois surveyed its residents in 2001 and found that, on average, 42% were bothered by blade flicker and noise, had been awakened by turbine sound, and had TV reception problems. Nearby property owners also cited increased lightning activity, increased traffic hazards, annoyance at the tower's blinking lights, emergence of strange symptoms, and fears of EMFs. These tangible and intangible issues had an impact on the market value of nearby real estate. Reluctance to live near the turbines dramatically increased with proximity. For example, 41% of residents would not build or buy a home within 2 miles of the turbines. Within a half mile, 61% would not build or buy a home. And a quarter mile away from the turbines, 74% would not build or buy a home.[149] Wind farm developers said property values wouldn't suffer. But the town zoning administrator did his own empirical research and found that sales within 1 mile of the windmills prior to their construction were 104% the assessed value, and properties selling in the same area after construction were at 78%. Sales more than a mile away were at 105% the assessed value before and 87% after. They also found several properties have taken much longer than normal to sell.[150]

In New York, a landowner with a turbine on his property 2,000 feet from his house says the turbine rattles his windows, and he can hear some turbines a mile away in his house. The wind company said the turbine noise wouldn't exceed the sound of a refrigerator 900 feet away. He was joined by two other neighbors with similar complaints. They added that fellow neighbors in proximity to the turbines started experiencing seizures, anxiety attacks, learning disorders and other ailments once the turbines started running. Neither he nor the other leaseholders nor the town has received any promised compensation because the turbines are not selling into the grid. They were told the lights would be the softest available but they were instead much brighter than anticipated.[151]

Several case studies conducted by the wind industry show that landowners care little about nearby wind farms. In Oregon's Stateline Project, a 127-turbine farm covering 15 square miles in 2001 only sparked concerns over wildlife protection.[152] Southwest Minnesota has been building wind farms since 1995 ranging from 17 turbines to 143. Very few issues were raised during the review and permitting process and only after being built have issues emerged regarding poor television reception in proximity to the farms, additional noise generated by loose pieces of material within the blade at low speeds; cleanup of materials associated with turbine or blade modifications; complaints about aesthetic detriment; and bird health issues.[153]

In Highland County, Virginia, members of the rural mountain community fears that a proposed 19-turbine, 400-feet-tall-each project will blight their rural landscape and destroy the

area's scenic beauty. The wind farm developer claims the turbines can power 20k homes. Community response has been very negative. Residents are afraid the turbines will kill tourism – their only industry – and negatively impact property values.[154]

A proposed 67-tower wind farm near Delavan, Illinois sparked strong opinions among its affected community. Supporters say it will bring additional property tax revenue, jobs and clean energy. Its opponents say it will be an eyesore, a dangerous obstacle to crop dusters and would lower property values. An acoustical engineer from Michigan testified that the turbines would create noise that could affect nearby residents.[155]

In addition to landscape blight, many landowners are upset when the wind farms bring new transmission lines to transmit the wind energy to metro areas. But utilities are generally dismissive of such concerns. As the spokeswoman of Texas utility Oncor put it, "the importance of the transmission lines outweighs the aesthetic worries."[156]

In Europe, where wind farms have existed and operated for many years, many people do not want to be near them, especially in scenic areas.[157]

Wind Energy Production

Wind energy is gaining momentum in Wisconsin largely due to favorable geography, but it has its flaws. A typical coal-fired generating plant produces 500-600 megawatts of electricity per hour. Most wind turbines operate on average 30% of the time.[158] Invenergy, LLC forecast that their 133 turbines would generate 200 megawatts per hour.[159] However, the wind industry's average production percentages show that Invenergy's Forward Wind Farm in Fond du Lac and Dodge counties would generate 60 mWh (average).[160] In order to equal a fossil-fuel power plant, Invenergy would have to increase its farm 8 to 10 times its original size. A power plant typically covers a 40-acre footprint. Invenergy's wind farm covers a township. They would have to cover half a county to equal the output of one fossil-fueled power plant, and then only when the wind blows.

To make up the difference when the wind stops blowing, traditional power plants have to be constantly on (or "spinning") and generating reserve capacity equal to the maximum total power of wind turbines[161] – ready at any moment to be "ramped up" to stabilize the grid. This fluctuating backup system of spinning and ramping makes traditional power plants run inefficiently and increases fuel consumption (emissions). Keeping the necessary additional reserve capacity, and factoring in ramping up and down, will increase the fuel consumption (emissions) at least 8-10% compared with the steady operation of traditional power stations.[162]

Over 20 years of use in Europe, wind generated power has proven to be variable, unpredictable, uncontrollable and "routinely disappointing," according to UK energy expert, David White.[163]

In his 2007 study, "Calculating the Real Cost of Industrial Wind Power: An Information Update for Ontario Electricity Consumers," Keith Stirling, MA, summarized the Washington D.C.-based National Research Council of the National Academies 2007 report on the environmental impacts of wind energy projects. He summarizes their findings thusly, "Wind energy development will provide no reduction in emissions of sulfur and nitrogen oxides, the

pollutants responsible for acid rain and ground-level ozone. Regarding carbon dioxide, industrial wind turbines will offset national emissions by only 1.2-4.5% from the levels that otherwise would occur from electricity generation. [Most expert estimates are much lower however, usually around .0003%]. Wind power will not reduce carbon emissions of the U.S., but merely will slow the increase by a small amount."[164]

Even with generous government subsidies, wind energy is the highest cost option of available renewable energy sources.[165] It becomes more expensive to consumers once required backup and additional infrastructure are factored in. The high cost is caused by: A) the need to maintain backup generating reserve to cover times when the wind does not blow, B) the need to stabilize the grid when wind produces power that is not needed by current demand, and C) Government subsidization and tax benefits for the wind industry.[166]

Wind-power increases the complexity of the transmission and distribution system, and it is therefore inevitable that transmission losses [often estimated at 10%] will increase because of the additional miles of power lines required, both factors increasing costs.[167]

To help fund a new wind farm in Minnesota that will send its energy to Wisconsin, Alliant Energy proposes to raise electric and natural gas rates by 2010 – resulting in citizens having to pay nearly $9 more per month per household on their electric bill and $2.40 more per month per household on their gas bill. The farm will include 122 turbines, 400-feet tall each with 130-foot blades. As of July of 2009, Wisconsin citizen watchdog groups were criticizing Wisconsin's Public Service Commission's minimal review and questioning the project's need.[168]

In his introduction to his Environmentally Responsible Wind Power Act of 2005, U.S. Senator Lamar Alexander stated, "Wind produces puny amounts of high-cost unreliable power...Congress should not subsidize the destruction of the American landscape."[169]

To promote wind energy, many government entities have not factored in the real emissions impact of matching both demand and wind output simultaneously. As a result, many current policies incorrectly assume that CO2 emissions savings are guaranteed by the introduction of wind-power, and ignore wind power's difficulties and costs.[170]

Ireland's Electricity Supply Board published evidence in 2004 showing that as the level of wind capacity increases, the CO2 emissions increase with the variation of wind-power output.[171] Unlike natural gas or coal, wind energy cannot be physically stored on an industrial scale. Consequently, generation and demand have to be continuously balanced on the grid. Fossil-fuelled capacity operating as reserve and backup is required to accompany wind generation and stabilize supplies to the consumer.[172]

Operating gas turbines by ramping up and down generates more CO2 per kWh of electrical generation than if the gas turbines were operated on the normal planned load. Dependent on the weather forecasts, it may be possible to shut down some capacity for brief periods, but this may frequently be for only a matter of hours. Fuel is then wastefully consumed and CO2 emitted as the plant is started up again, without any power being generated, before it is returned to load-bearing grid service. Gas turbines are not made to handle frequent ramping and start-ups. This not only increases the CO2 emissions, but also causes otherwise avoidable wear and tear, and so shortens the periods between overhauls, thereby adding to maintenance costs and eventually resulting in a 15% increase in electricity cost.[173]

Merging wind-generated power into the power system is more complex than simply shutting down traditional power plants whenever the wind blows. The feed-in capacity can change frequently within a few hours.[174,175] And half of the time, wind power in-feed is less than two-thirds of its annual average.[176,177] Starting up and shutting down power plants may take minutes or hours, depending on the type of plant, while power may be needed in seconds. Unlike a conventional plant, wind output is not related to customer demand. Maximum wind production may occur during low customer demand periods, or at times of peak demand there may be little or no wind-generated power.

Canada knows all too well the irregular nature of wind. In Ontario, Canada they found that wind output changes have shown one distinct pattern: winds tend to be calm when consumers need electricity most. Northerners use the most electricity in summer – their weakest season for wind. Although winter is the strongest season, on the coldest days, when people use the most power, wind output tends to be poorest. Over the typical day, wind output peaks around midnight and bottoms out around 8 a.m., contrary to daily consumption.[178]

While Ontario's new wind generation has reduced fossil fuel generation when wind output is available, the wind production pattern – output falls during the early morning – has offset this benefit by lowering the fuel efficiency of the flexible fossil generators used for ramping, increasing air emissions per unit of production, and increasing maintenance costs.[179]

Ontario's 2006 Energy Probe reviewed a 2004 German study of their grid reliability and found that the proposed tripling of wind capacity in Germany by 2020 is alone driving a need for quintupling generation reserve requirements.[180] Wind power construction must be accompanied by almost equal construction of new conventional power plants, which will be used very nearly as much as if the wind turbines were not there.[181,182]

Germany hosts approximately 11,000 turbines which provide 4.7% of Germany's gross demand. Even then the electricity is sporadic because the wind blows when it likes, as it likes, and where it likes – which, unfortunately, is rarely in places where large quantities of power are required.[183] Likewise, the Danes, long held as a prime example of wind energy in action, reported in 2004 that increased development of wind turbines did not reduce their CO2 emissions.[184]

The increased use of wind power in Germany has resulted in uncontrollable fluctuations in generation due to the random character of wind power feed-in. This significantly increases the demands placed on the control balancing process and increases grid costs. Their massive increase of new wind farms in recent years has greatly increased their need for fossil-fueled reserve capacity.[185,186]

As wind power generating capacity increases, its ability to displace conventional sources decreases. Wind power is essentially adding surplus capacity rather than replacing conventional plants. One-third of the time, widespread wind power facilities in the U.K. (which boasts the best wind resource in Europe) would be producing at less than 14% of the turbines' capacity.[187,188]

Wind farms only provide electricity when the wind is strong enough but not too strong. As they suddenly provide electricity when the wind changes, the grid operator must match this changed supply of electricity to the existing demand. This is achieved by switching a power station to spinning standby mode so it can provide electricity when the wind changes again.

Spinning reserves provide no useful electricity and do not reduce emissions from power generation.[189]

Promoters of wind energy routinely overstate environmental benefits. They advocate that each kilowatt-hour (kWh) of electricity produced by a wind turbine displaces the same amount of fuel-use and emissions associated with a kWh of electricity produced by a fossil-fuel generating unit. However, the saving of CO2 emissions is not proportional to the amount of fossil-fueled power that it displaces. Necessary spinning reserve fossil-fired capacity emits more CO2/kWh than if the plant were optimized, thus offsetting much of the benefit of wind.[190] In addition to the assumption of kWh-per-kWh offsets, wind energy advocates often use outdated information about emissions when making their claims, not taking into account the difference made by newer, cleaner burning fossil fueled plants.[191]

The more wind power capacity is in the grid, the lower percentage of traditional generation it can replace. A wind farm of 24,000 turbines with a generating capability of 48,000 MW would replace just 2,000 MW of conventional generation, the equivalent to two medium-sized coal stations.[192]

The greater the distance between the source of generation and center of demand, the greater the losses during transmission. Currently these losses are estimated at 10-15%.[193] This is a problem since most wind turbines are in rural locations and far from the need.

Even at 10,000 turbines across the country, the UK will still not be able to supply 15% of its energy through wind turbines by 2020. Environmentalists say it's necessary to stop Global Warming while others point out how thousands of more wind turbines will blight their land.[194]

The high cost and low return of wind farms is acknowledged by the U.S. National Association of Attorney Generals. In a 2008 presentation, they concluded that, despite being "green" wind farms are a high-cost alternative with a large footprint but small power output.[195]

As we have seen from empirical research gleaned from a worldwide search, wind turbines produce very little electricity.[196] They have a high capital cost,[197] and poor capacity utilization.[198] Why, then, is wind-power the beneficiary of such extensive support if it is incapable of providing consistent power to replace traditional power plants, does not achieve the CO2 reductions required, and causes cost increases in backup, maintenance and transmission, while at the same time discouraging investment in clean, firm generation capacity?[199]

Wind Farms = Tax Havens

In light of the technical limitations of wind turbines, it makes sense to ask why wind farms remain so popular. Two factors seem to take precedence. Firstly, the U.S. government is requiring states to provide a certain percentage of their energy with green energy solutions by 2020. Utilities have to find some alternative energy to invest in. The second reason appears to be that utilities receive generous subsidies and tax incentives to build wind farms. The tax breaks include federal and state accelerated depreciation, production tax credits, and reduced (or forgiven) property and sales taxes.[200]

Wind farms are very attractive to utilities looking to bury taxable income. For example: A company proposing a new 300 megawatt wind farm costing $300,000,000 would be able to:

1. Shelter approximately $132 million from federal income tax liability in the tax year when the project went into service, an additional $67.2 million in the second year, $40.3 million in the third year, and the remaining $60.5 million in the next 3 years because of generous accelerated depreciation allowed for wind farms.[201]
2. Deduct an additional $14,191,200 per year for 10 years from its federal tax liability because of federal Production Tax Credits of $0.018 per kWh for all electricity produced.[202]
3. Escape significant corporate income tax liability because the federal accelerated depreciation reduces taxable income.[203]
4. Avoid most normal liabilities associated with other taxes including Business and Occupation taxes and property taxes.[204]

The above federal and state tax breaks add up to a total of $325,434,600 for the first 10 years. The tax breaks for wind farm owners shift tax burdens to remaining taxpayers, further degrading expected local economic benefits. The value of the tax breaks to the wind plant owner could easily exceed the owner's income from the sale of electricity, particularly in the early years of the project.[205]

Wind farms are heavily dependent upon large ratepayer and taxpayer subsidies and mandates to compete against conventional electrical power generation sources.[206] Electricity sales contribute approximately 30% of a renewable station's income, while the remaining 70% comes from indirect subsidy paid for by the consumer, whether they have elected for 'green' energy or not.[207]

Since opposition to wind farms can lead to costly delays, some New York energy companies were found to be unethically influencing municipal officers to allow the development of develop wind farms. As a result, New York's Attorney General drafted a Wind Code of Ethics to publicize every aspect of future wind farms and restrict such companies from influencing officials. Since there were no exiting ethical laws concerning the municipal officers, the Attorney General sought to rectify it with this work-around.[208] However, the Code is voluntary, and signers are required to help fund a government agency whose job it is to regulate the signers. The effectiveness of such a code is symbolic at best.

Economic Impact

How do wind farms impact local economies? Industry advocates say wind farms will add jobs and tax revenues to local communities, while their opponents say their adverse impacts on property values, tourism and the environment effectively neutralize any perceived economic benefits. Champaign County of Ohio estimated that a 100MW wind farm would yearly generate the tax dollar equivalent of 449 homes; and they estimated a 300MW farm would generate the tax dollar equivalent of 1,347 homes. They anticipate significant positive local property tax impacts are possible – assuming they can tax and collect at local levels.[209]

Unfortunately, wind farms contribute little to county property taxes. In some states, wind energy producing equipment is exempt from property taxes, and taxable items may be limited to the foundation and tower structure. Some developers also apply for additional local tax relief.[210]

Additional tax revenues are frequently mentioned as a positive reason to build wind farms.[211] General Electric, a major wind turbine manufacturer, claims that over the long term wind farms will add $250 million to the US Treasury.[212] However, they acknowledge they will only begin to "pump money into the US Treasury" once the Production Tax Credits expire.[213] PTCs are good for the first 10 years of a wind farm's production. They project 10 million metric tons per year of CO2 emissions avoided.[214] They project creating thousands of short-term construction jobs with a long-term employment of 1,600 over 20 years or more of operation.[215] In contrast, the Township of Bethany, New York, found in 2007 that, beyond the temporary construction phase, wind farm projects have little to no significant job impact.[216]

Despite potential benefits of wind farm projects, The Bacon Hill Institute – a public policy research group – studied a proposed wind farm in Nantucket Sound and found it failed the cost-benefit test recommended by the U.S. government for assessing large-scale projects. The wind farm developer stressed the value of wind power as a source of clean, renewable energy. But the study found that the overall economic costs of the project would exceed benefits by $211.8 million. Without $241 million from state and federal subsidies, the project would not be financially viable. And while the farm may generate some wind energy jobs, the impact on tourism would result in a net loss of 1,000 local jobs.[217]

Losing tourism is a major concern of any locale that depends on the allure of their land to attract visitors and support the economy. The success of rural enterprises is inextricably linked with the maintenance and conservation of a healthy, attractive and irreplaceable rural appeal.[218] Wind turbines are largely seen as a chief threat to such areas.

Rural tourism is big business in the UK (worth appx. $26.7 billion) and supports up to 800,000 jobs. In a 2006 study, the UK's Small Business Council examined the impact wind farms would have on small businesses – specifically those dependent on rural tourism. They found that 75% of visitors say the quality of the landscape and countryside is the most important factor in choosing a destination. Between 47% and 75% of visitors felt that wind turbines damage the landscape quality. Of the three areas they studied, they found that 11% of visitors would avoid the first area, resulting in a loss of $48.5 million and 800 jobs. Approximately 7% of visitors would not return to the second area, resulting in a loss of $117 million and 1,753 jobs. In the third area, just 5% would stay away, but its lost affluence would result in $668.5 million lost along with 15,000 jobs. In some areas, 49% of all sectors of rural businesses experienced a negative impact.[219]

In a separate tourist area of the UK, five wind farms are proposed totaling 71 turbines along 18 miles. In a pilot survey of 1,500 visitors, the Council found that approximately 95% of the visitors said wind turbines would spoil their enjoyment of the landscape. And this spoiling directly translates into less business from tourism and lost jobs.[220]

They studied another tourist area in the UK, and found that two-thirds of local businesses said turbines are visually intrusive. While 54% thought wind turbines would increase their 'green' credentials, 27% believed it would still have a negative impact on the tourism

industry by reducing visitor numbers. After the details of the tower heights were revealed the next year, the 27% grew to 39% who felt the 400-foot-high turbines would make visitors stop visiting completely.[221]

In North Devon, an area renowned for its beauty, a before-and-after survey was conducted to gauge visitors' feelings toward possible wind farms. Before details of their 300' height were revealed, 34% were generally favorable and 66% unfavorable towards turbines. After the size and location of the turbine proposals was revealed, the number of 'unfavorable' visitors rose to 84%. When asked if wind farms would affect their choice of holiday destination, less than 50% claimed that they would still choose North Devon. A further 39% said they would choose North Devon but subject to the size and location of the wind farms. Eleven percent would completely avoid North Devon.

Scotland is also proposing wind farms, but a visitor survey found that 15% of visitors would not return if wind turbines are built – resulting in a potential loss of $133.7 million and 3,750 jobs.[222]

In Vermont, the state government wants green energy at the potential cost of impacting its natural beauty.[223] But even in a prime location like on the top of a windy ridge, wind turbines sit idle 40% of the time.[224,225]

Wind farms negatively impact pastoral beauty, thus severely damaging rural Vermont's main industry: tourism.[226] Tourists don't want to pay to look at wind turbines, but wind supporters claim the turbines themselves will become an attraction and boost tourism.[227] The wind industry tried making them attractions in the UK, and both failed. In 1999, a visitors' center was built in Norfolk, UK – then home to one of the largest turbines in the world. It ran out of money and closed in 2002. Then in 2001, a $9.1 million visitor center was built with hopes of attracting 150,000 annual visitors to its wind farm. Despite opening to much publicity it attracted less than a tenth of projected visitors, and it went bankrupt. Its CEO said, "Sadly, just like many eco-attractions, they're not sustainable; there's just not enough interest."[228]

Conclusion

After reviewing articles and studies on wind energy, wind turbines appear to have a negative impact on the property values, health, and quality of life of residents in close proximity. Of the studies that found no impact on property value, nearly all were funded by wind farm developers or renewable energy advocacy groups. Of the studies and reports showing property loss, the average negative effect is -20.7%.

It is equally reasonable to conclude that some residents in close proximity to wind turbines experience genuine negative health effects from Low Frequency Noise, infrasound and blade flicker. Of the studies and reports cited, an average setback of little over a mile should significantly lessen detrimental health effects. In addition to noise and flicker issues, disrupted TV and cell phone receptions contribute to negatively impact the quality of life for residents living in close proximity to wind turbines.

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Health Effects of Wind Turbine Noise

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Industrial wind turbines produce significant amounts of audible and low-frequency noise. Dr. Oguz A. Soysal, Professor and Chairman of the Dept. of Physics and Engineering at Frostburg State University in Maryland, measured sound levels over half a mile away from the Meyersdale, PA, 20-turbine wind farm. Typical audible (A-weighted) dB (decibel) levels were in the 50-60 range, and audible plus low-frequency (C-weighted) dB were in the 65-70 range.[1] 65-70 dB is the loudness of a washing machine, vacuum cleaner, or hair dryer.[2] A difference of 10 dB between A and C weighting represents a significant amount of low-frequency sound by World Health Organization standards.[3]

The noise produced by wind turbines has a thumping, pulsing character, especially at night, when it is more audible. The noise is louder at night because of the contrast between the still, cool air at ground level and the steady stream of wind at the level of the turbine hubs.[4] This nighttime noise travels a long distance. It has been documented to be disturbing to residents 1.2 miles away from wind turbines in regular rolling terrain,[5] and 1.5 miles away in Appalachian valleys.[6]

At night, the WHO recommends, the level of continuous noise at the outside a dwelling should be 45 dB or less, and inside, 30 dB or less. These thresholds should be even lower if there is a significant low-frequency component to the sound, they add – as there is for wind turbines. Higher levels of noise disturb sleep and produce a host of effects on health, well-being, and productivity.[7]

The decibel is logarithmic. Increasing the dB level by 10 multiplies the sound pressure level by 10. Increasing the dB level by 20 multiplies the sound pressure level by 100 (and 30 dB multiplies by 1000, etc.). Thus the 65 dB measured day and night half a mile from the Meyersdale wind farm has a measured intensity 100 times greater than the loudest continuous outdoor nighttime noise (45 dB) recommended by the WHO.

Typical ordinances proposed or passed for NY State communities considering industrial wind turbines allow A-weighted noise levels of 50 dB and construction of turbines only 1000 ft. from dwellings. These ordinances meet neither WHO nor NYS DEC standards, especially compared to the very low ambient noise levels (with dB levels typically in the 20's) in rural NY.[8]

The health effects of excessive community noise are carefully documented in the WHO report with reference to scientific and medical literature. Effects relevant to wind turbines, in terms of dB levels and noise type, are paraphrased and summarized from this report:

- For people to understand each other easily when talking, environmental noise levels should be 35 dB or less. For vulnerable groups (hearing impaired, elderly, children in the process of reading and language acquisition, and foreign language speakers) even lower background levels are needed. When noise interferes with speech comprehension, problems with concentration, fatigue, uncertainty and lack of

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self-confidence, irritation, misunderstandings, decreased work capacity, problems in human relations, and a number of stress reactions arise.[9]

- Wind turbine noise, as described above and experienced by many turbine neighbors, is easily within the decibel levels to disturb sleep. Effects of noise-induced sleep disturbance include fatigue, depressed mood or well-being, decreased performance, and increased use of sedatives or sleeping pills. Measured physiologic effects of noise during sleep are increased blood pressure and heart rate, changes in breathing pattern, and cardiac arrhythmias.[10] Certain types of nighttime noise are especially bothersome, the authors note, including those which combine noise with vibration, those with low-frequency components, and sources in environments with low background noise.[11] All three of these special considerations apply to industrial wind turbines in rural NY State. Children, the elderly, and people with preexisting illnesses, especially depression, are especially vulnerable to sleep disturbance.

- Noise has an adverse effect on performance over and above its effects on speech comprehension. The most strongly affected cognitive areas are reading, attention, problem solving, and memory. Children in school are adversely affected by noise, and it is the uncontrollability of noise, rather than its intensity, which is most critical. The effort to tune out the noise comes at the price of increased levels of stress hormones and elevation of resting blood pressure. The adverse effects are larger in children with lower school achievement.[12]

- What is commonly referred to as noise "annoyance" is in fact a range of negative emotions, documented in people exposed to community noise, including anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, and exhaustion.[13] Numerous reports from neighbors of new industrial wind turbine installations document these symptoms. The percentage of highly annoyed people in a population starts to increase at 42 dB, and the percentage of moderately annoyed at 37 dB.[14]

Low-frequency sound is also sensed as pressure in the ears. It modulates the loudness of regular audible frequencies, and is sensed as a feeling or vibration in the chest and throat.[15] Neighbors of industrial wind turbines describe the distressing sensation of having to breathe in sync with the rhythmic thumps of the turbine blades, especially at night when trying to sleep.

The participants in noise studies are selected from the general population and are usually adults. Vulnerable groups of people are underrepresented. Vulnerable groups include people with decreased personal abilities (old, ill, or depressed people), people with particular diseases or medical problems, people (children) dealing with complex cognitive tasks such as reading acquisition, people who are blind or hearing impaired, fetuses, babies and young children, and the elderly. These people may be less able to cope with the impacts of noise exposure and at greater risk for harmful effects than is documented in studies. Attention needs to be paid to them when developing regulations and setback requirements for industrial wind turbines and other sources of annoying and debilitating noise.

Wind turbines also create moving visual disturbances, especially early and late in the day when the long shadows of moving blades sweep rhythmically over the landscape. That portion of the population which is susceptible to vertigo, unsteadiness, or motion sickness (including many children and a large proportion of the elderly) will be vulnerable to unsteadiness and nausea when subjected to this visual disturbance. People with seizure disorders are susceptible to triggering of seizures by the strobe effect of seeing the sun through the moving blades.

To protect the public health, it is critical that industrial wind turbines not be placed within a minimum of 1.5 miles of human dwellings (homes, hospitals, residential schools, nursing homes, prisons, etc.) or schools. In mountainous terrain the setback should be greater, especially in topography with long parallel ridges and valleys as in the Appalachians.

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