

LARGE FILING SEPARATOR SHEET

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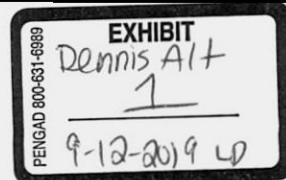
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Wind Public Meeting

Dennis Alt EX.1



https://www.nny360.com/top_stories/number-three-wind-told-to-listen-to-world-health-organization/article_2028944c-3c46-542a-afdf-7384a484cef1.html

Number Three Wind told to listen to World Health Organization turbine noise standards

By JULIE ABBASS

jabbass@wdt.net Sep 3, 2019 Updated Sep 3, 2019



Invenergy's Number Three Wind Farm will have to consider the cumulative effect of noise made by neighboring wind farms, Maple Ridge and Copenhagen, pictured, when calculating its own noise impact. Julie Abbass/Watertown Daily Times

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LOWVILLE — Judges in the state Article 10 approval process for large energy projects made recommendations that would require Invenergy's Number Three Wind Farm to do better in a number of project areas to secure the coveted Certificate of Environmental Compatibility and Public Need before construction can begin.

information gathering.

In order to verify the results of Number Three's modeling assumptions, the Public Service Department did some modeling of its own.

"The Public Service staff modeling results showed that 34 non-participating receptors [residents] exceed the short-term design goal of 45 dBA with levels as high as 48 dBA... combined with the Maple Ridge and Copenhagen facilities, 68 receptors [residents] exceed that design goal with levels as high as 51 dBA."

As a result, they recommended the Siting Board require Number Three to re-model the noise impact of its project, taking measures at both about 5 feet (1.5 meters) and 13 feet (4 meters) above ground and calculate the cumulative impact of existing turbines from the Copenhagen and Maple Ridge wind farms on residents.

Citing a lack of key details in the Number Three proposed sound monitoring process, the judges advised adding a condition requiring Number Three follow post-construction noise monitoring and complaint procedures recommended by Public Safety based on the precedence of Cassadaga and Baron Winds wind farms that have passed through the Article 10 process.

Judgments were also made on the potential harm the wind project could cause to protected species of protected grassland birds and bats.

Number Three could be expected to file a final Endangered or Threatened Species mitigation plan within two months, including methods to "fully avoid impacts" on the threatened Upland Sandpiper and Northern Harrier grassland bird species, or, if it can prove avoiding impact isn't possible, steps it will take to minimize impact and provide value to the species.

The DEC had suggested to avoid impacting the birds, the company should move nine turbines and all infrastructure from the birds' habitat area, create an 820-foot buffer around the occupied habitat during breeding season with no construction from April 23 to Aug. 15.

“The recommended Certificate Conditions... are designed to ensure that the Project’s impacts are minimized and avoided to the maximum extent practicable, that the Project will be constructed and operated in compliance with all applicable State and local environmental and public health and safety laws and regulations,” the document states.

While back-and-forth negotiations throughout the past year resulted in a number of changes and conditions agreed upon by the wind farm and various parties to the process, if the state Board on Electric Generation Siting and the Environment accepts the recommendations made by Presiding Examiner Maureen F. Leary, administrative law judge for state Public Service, and Associate Examiner Molly T. McBride, administrative law judge of the DEC, Number Three still has significant work to do, especially relating to noise control.

Noise from turbines can be made by mechanical components, a “whooshing” sound in certain weather conditions from acoustic pulsations and the controversial “infrasound,” which is less “heard” and more sensed as a constant due to vibrations and pulses, the document said.

Number Three had disputed the negative impact of the noise on health and referred to it instead as an “annoyance,” setting a 45-decibel limit.

“WHO 2009 and WHO 2018 along with the positions of Department of Public Service staff and Department of Health provide the Siting Board with a sufficient basis in the record to reject Number Three Wind’s position that wind turbine noise at levels below 46 dBA is not associated with health impacts.”

Based on the World Health Organization’s findings, the judges recommend a 40-decibel long term limit outdoors, 30 decibels indoors and a short term, eight-hour, outdoor limit of 42 decibels for residents that do not participate in the project and 50 decibels for those that do.

Number Three had not set an indoor limit.

The judges also noted that the wind company arrived at its plan based on faulty

Recommendations require the company to monitor its impact on any endangered or protected species over the life of the project and make changes to decrease it as necessary, including the number of animals, especially the birds and bats, killed because of the turbines throughout its 30-year duration.

Referencing DEC staff testimony given earlier in the summer, the judges wrote “wind turbines are currently the single greatest known source of mortality for several bat species in North America,” and that “post-construction fatality studies in New York State revealed that most turbine-caused fatalities are to migratory tree bats.”

The judges recommended the siting board accept the agreement the DEC and Number Three reached in June to institute a “curtailment” program to guard Northern Long Eared Bats, a protected species in the project area.

Under the program, turbines use will be limited when wind speeds are below a certain point between July 1 and Oct. 1, beginning 30 minutes before sunset and continuing until 30 minutes after sunrise when temperatures are greater than 50 degrees Fahrenheit.

Although flicker, or the shadows, cast by the turning turbine blades in the right conditions, has been often cited by the grassroots Tug Hill Alliance for Rural Preservation and other county residents as an issue, the judges did not recommend the 30-minutes per day limit on operations causing flicker.

Instead, they followed the precedent set by the Baron Winds project requiring Number Three to either temporarily “curtail” wind turbine operation in response to complaints to keep flicker under the 30-hour annual limit or “to provide physical mitigation measures.”

Among previously agreed upon certificate conditions minimizing the project’s visual impact, Number Three had disputed being required to use or consider installing the Aircraft Lighting Detection System, subject to FAA approval, which would turn the red lights on based on radar detection of aircraft.

The judges, however, agreed that it would be an important tool to decrease the visual impact of the project at night and should be examined.

With regard to removing the wind farm, or “decommissioning” it, after it has run its course, the judges found Number Three’s plan to be insufficient and recommended a number of conditions before certificate approval.

In the revised plan, Number Three would estimate the cost to remove all wind farm components and restore access roads without including income from salvaging or re-selling the materials and provide an irrevocable letter of credit to cover the total costs.

Every five years, those amounts will be reconsidered and the letter updated, if the recommendations are followed.

Turbines that have not been working for over a year should be removed by the company automatically, the judges said.

Issues including invasive species, plants and forests, wildlife excepting birds and bats, ice throw, turbine collapse, electric and magnetic fields and compliance with state energy policies were among those that were judged to have been sufficiently addressed by Number Three and various experts via documentation or testimony already provided.

Certificate conditions, in some of these cases, were already agreed upon after previous proceedings.

The 254-page document was filed online Aug. 22, on the state Department of Public Service’s site dedicated to the project.

Recommendations for 138 certificate conditions and 32 additional documentation packages verifying the completion of those conditions clarify steps the wind company must take if the siting board follows the judges’ advice.

In July, the siting board chairman informed Number Three that the extensive changes to the project amounted to a revision. A 45-day extension to the pre-set 12 month timeframe to the Article 10 process that would have ended in September was put in place and the company was required to submit \$75,000 in additional intervenor funding.

Workplace Noise: More than just “All Ears”

Posted on June 28, 2018 by Ellen Kerns, MPH, CPH, COHC and Elizabeth Masterson, PhD, CPH, COHC

Noise is everywhere, but how loud does it need to be to cause harm? While many people know that loud noise can hurt their ears, they don't know how loud is too loud or how long they can listen before it becomes harmful.

- Noise around 85 decibels (dBA) – which is loud enough that you must raise your voice to be heard by someone three feet away (arm's length) – can damage your hearing after repeated exposures lasting 8 hours or more. Equipment, like printing presses and lawn mowers, and activities like vacuuming, or using earbuds or headphones with the volume set around 70%, all average about 85-90 dBA.
- When noise reaches 95 dBA – which is loud enough that you must shout to be heard by someone at arm's length – it can put your hearing at risk in less than an hour. Bulldozers, ambulance sirens, chain saws, bars/nightclubs and large sporting events are all louder than 95 dBA.

Noise Can Hurt More Than Your Ears

In addition to damaging hearing, loud noise can cause other physical stress as well as mental stress. Often the short-term effects of such stress go unnoticed or are blamed on other things. These symptoms can range from feeling tired and/or irritable to having temporarily high blood pressure or muffled hearing. Over time, with repeated exposure to loud noise, more lasting conditions can develop, such as hearing loss (a permanent condition), and it is unknown if these exposures may also lead to more lasting cardiovascular conditions, such as high blood pressure.

While it has been established that noise causes hearing loss, there is new research exploring whether noise can also contribute to high blood pressure, high cholesterol and heart disease. Recently, a new NIOSH study, titled “Cardiovascular Conditions, Hearing Difficulty, and Occupational Noise Exposure within U.S. Industries and Occupations (<https://onlinelibrary.wiley.com/doi/full/10.1002/ajim.22833>)”, looked into the relationship between loud noise at work and conditions like high blood pressure, high cholesterol and hearing difficulty. This study found:

- Twenty-two million workers experience loud noise on the job each year.

- Most hearing difficulty cases among workers (58%) were linked to loud noise on the job and could be prevented if the noise was reduced to safe levels.
- Nine percent of high cholesterol and 14 percent of high blood pressure cases among workers could be linked to loud noise on the job.
- Workers with a history of loud noise on the job were less likely to have had their blood pressure or their cholesterol checked.

Fortunately, workplace noise exposure can be reduced and occupational hearing loss entirely prevented with today's hearing loss prevention strategies and technology. This NIOSH study also highlighted the importance of workers getting screened regularly for hearing loss, high blood pressure, and high cholesterol, and the benefits of workplace health and wellness programs. These programs have been shown to have a substantial return on investment, by reducing losses in productivity from disease progression and boosting morale. Workers exposed to loud noise may especially benefit from these programs.

If you want to help get a discussion started please pose a question in the comment section below.

Visit the [NIOSH Occupational Hearing Loss Surveillance website](https://www.cdc.gov/niosh/topics/ohl/)

(<https://www.cdc.gov/niosh/topics/ohl/>) for more information, including industry sector-specific statistics on hearing loss, tinnitus, and noise exposure.

Visit the [NIOSH Noise and Hearing Loss Prevention website](http://www.cdc.gov/niosh/topics/noise/)

(<http://www.cdc.gov/niosh/topics/noise/>) for guidelines and recommendations for employers and workers to help reduce noise exposure at the workplace.

Ellen Kerns, MPH, CPH, COHC, was an Epidemiological Fellow in the NIOSH Division of Surveillance, Hazard Evaluations and Field Studies and is now a Research Data Analyst at Children's Mercy Hospital.

Elizabeth Masterson, PhD, CPH, COHC, is an Epidemiologist in the NIOSH Division of Surveillance, Hazard Evaluations and Field Studies

Posted on June 28, 2018 by Ellen Kerns, MPH, CPH, COHC and Elizabeth Masterson, PhD, CPH, COHC

Categories [Hearing Loss \(https://blogs-origin.cdc.gov/niosh-science-blog/category/hearing-loss/\)](https://blogs-origin.cdc.gov/niosh-science-blog/category/hearing-loss/)

5 comments on “Workplace Noise: More than just “All Ears””

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Barry Clayton says:

June 29, 2018 at 10:31 am (<https://blogs-origin.cdc.gov/niosh-science-blog/2018/06/28/noise-effects/#comment-395534>)

I am familiar with the NIOSH REL for noise and revised criteria document. What does NIOSH use or recommend for a dosimeter threshold setting when conducting personal noise monitoring (e.g., 80 dB, 70 dB, no threshold) and why?

OSHA and ACGIH use 80 dB threshold. The EU noise directive and UK Noise at Work regulations do not specify a threshold.

Reply (<https://blogs-origin.cdc.gov/niosh-science-blog/2018/06/28/noise-effects/?replytocom=395534#respond>)

Chuck Kardous and Elizabeth Masterson says:

July 2, 2018 at 11:30 am (<https://blogs-origin.cdc.gov/niosh-science-blog/2018/06/28/noise-effects/#comment-395562>)

Thank you for your question. NIOSH recommends using the 80 dB threshold for dosimeters when conducting personal noise monitoring. The main reason is that noise levels below 80 dB (A) were found to contribute very little to the overall exposure. This information can be found in the NIOSH Occupational Noise Exposure Criteria document at:

<https://www.cdc.gov/niosh/docs/98-126/pdfs/98-126.pdf>

(<https://www.cdc.gov/niosh/docs/98-126/pdfs/98-126.pdf>)

daythammy88 says:

July 6, 2018 at 11:03 pm (<https://blogs-origin.cdc.gov/niosh-science-blog/2018/06/28/noise-effects/#comment-395598>)

Thanks so much

Reply (<https://blogs-origin.cdc.gov/niosh-science-blog/2018/06/28/noise-effects/?replytocom=395598#respond>)

Krishnan Sundarram says:

May 11, 2019 at 3:12 am (<https://blogs-origin.cdc.gov/niosh-science-blog/2018/06/28/noise-effects/#comment-399390>)

Ohio OSHA : What you need to know

Rules. Ohio is not a "state plan" state; that is, it does not have a federally approved occupational safety and health regulatory program. Therefore, private sector workplaces are regulated by the federal standards. The state has adopted by reference the federal safety standards (except ionizing and nonionizing radiation) for public sector employers and has adopted its own stricter requirements for employee rights to refuse work, employee medical records, injury and illness records, and for penalties. See the state section *ENFORCEMENT* for more information about the penalties for public sector workplaces.

For safety safety a Limited Time receive a **FREE** Safety Special Report on the "50 Tips For More-Effective Safety Training." Receive 75 pages of useful safety information broken down into three training sections. **Download Now** (<http://safetydailyadvisor.blr.com/2013/12/50-tips-for-more-effective-safety-training/>)

Administration and enforcement. OSHA administers and enforces workplace safety and health regulations at private facilities in Ohio. The Ohio Bureau of Workers' Compensation (BWC) administers the state standards for public sector workplaces.

State Requirements

BWC'S SAFETY AND HYGIENE SERVICES ORGANIZATION

BWC regulates public sector employers and provides compliance assistance and training services to such employers under the state's Public Employment Risk Reduction Program (PERRP).

The purpose of PERRP is to ensure that public employees in Ohio have a safe and healthful work environment. The public sector employer "must furnish to each public employee a workplace free from recognized hazards that are causing or are likely to cause death or serious physical harm."

Compliance. BWC conducts workplace safety and health inspections at public sector workplaces, enforces the provisions of PERRP, and provides consultation to correct hazards.

PROPERTY
VALUES &
WEALTH
TRANSFER

Republic Wind Farm
OPSB Hearing to Collect Public Comments
September 12, 2019

Cheryl Mira OPSB

GRAND TOWNSHIP
EMERSON CREEK

TEST MONY

Good Afternoon OPSB,

My name is Cheryl Mira. I live at 11110 State Route 269, Bellevue Ohio 44811. I am testifying today because I live in the Emerson Creek footprint, another Apex project that surrounds Bellevue. From my backyard, we will have 2 turbines within a 0.8 mile, 9 about 2.5 miles, and the ability to see almost every turbine in the Republic and Emerson Creek Wind projects.

My father loved Bellevue and he was proud to be a lifelong resident of Bellevue. He would be devastated to see what is happening today to Bellevue and the surrounding communities. My father was lifelong friends with families on both sides of this great divide -- "For or Against Wind Turbines".

My presentation is focused on DECREASING PROPERTY VALUES & TRANSFER OF WEALTH. If the Republic Wind Project is approved, there is a high probability that Apex's other four wind projects will be granted approval -- Emerson Creek, Emerson Creek II, Emerson Creek West, and Honey Creek. I am asking the OPSB to look at the ramifications and the impact of ALL of these projects collectively on the community -- five projects covering approximately 250,000 of lease acres.

If Republic Wind Farm is granted the right to build 47 industrial size turbines with a max height of 602 feet with a blade diameter of 492 feet, the State of Ohio and the OPSB will be giving Apex the authority to wipe Bellevue off the face of earth. Yes, it might not be overnight but in five years or less Bellevue Ohio will not exist, along with the villages of Republic, Flat Rock and Monroeville.

When the people hear the turbines and they will, when people experience their flicker shadows during the day and strobe lights at night, when people start having health issues -- migrate headaches more frequently or for the first time, sleep deprivation and unexplained heart issues well before their age, homeowners **will try** to sell their houses. The children of Flat Rock will not be able to move.

Property values will decline and this is when wealth transfer begins. I know that Apex will try to tell us otherwise. Unknowing residents are forced to sell their homes for substantially less than the fair market value before the turbines were considered or forced to abandon their homes, that's when the real investment fraud begins with innocent non-participating citizens experience negative wealth transfer. Bellevue, Republic, Flat Rock and Monroeville will experience foreclosures, banks will be forced to cover defaulted mortgage notes, citizens become a burden on the Medicaid system/low income housing, and older citizens who were

Republic Wind Farm
OPSB Hearing to Collect Public Comments
September 12, 2019

depending on their home investment to cover their nursing home days are suddenly penniless. These individuals become the financial responsibility of the State of Ohio.

Big wind companies are not the victims. **The non-participating taxpayers are the victims here.** In my numerous internet searches on this topic, I discovered several similar comments like this one from Steve Rusk, dated September 5, 2018, regarding the devaluation of his Scott, Ohio home by 77%:

"It's all a dirty business, when one of these "renewables" projects comes to your community those directly under it's footprint forfeit their rights in the matter immediately. The money the project brings gets front page attention, it's victims get no such mention. I was given no options or offer of compensation, my home was worth \$73,000, after they built the Blue Creek Wind Farm around it the property last sold for \$16,500. Neither I nor my neighbors have been compensated for this disaster. 10038 Elm sugar Rd. Scott, Ohio. This is no different from the energy programs in China and India where they just take your property, then give you ten acres of desert and call it compensation. We just get to sit here while the property degrades."

A second example of declining property values, Prairie Breeze Wind Farm in Tipton County, IN. In March 2013, Michael McCann, an independent appraiser, was commissioned by Indiana Attorney General because of his evaluation & consultation experience with over 20 wind projects in over a dozen states. Mr. McCann's scope was to evaluate property value impact and zoning compliance evaluation. The Prairie Breeze Wind Farm had 16,000 acres leased, up to 94 turbines & 150 MW, 427 to 492 feet to tip of blade (slightly shorter than the Republic turbines by 110 to 175 feet), and setbacks of 1,250 feet.

As a result of his study, average property value diminution within 2 miles of turbines was 25%. However, if a home was closer:

- < 0.5 mile (2,640 ft) 35 to 80% reduction
- ¾ mile - (3,960 ft) 25 to 80% reduction
- 1.5 mile (7,920 ft) 25 to 40% reduction
- 3 miles (15, 840 ft) 20 to 25% reduction

Mr. McCann concluded that the Tipton County setbacks were inadequate to avoid significant loss of value or impaired use & enjoyment of neighboring property. Today, each of Indiana's counties vote on their own setback rules and have some of the strictest wind regulations. One county Kosciusko Indiana in particular has set backs of 3,960 feet or 6.5 x height or turbine to property lines whichever is greater, plus 32 dba, zero shadow flicker, and most importantly property value guarantee for landowners within 2 miles of a wind turbine.

pg 263

Cheryl Mira pg. 3

Over the months, I have shared numerous documents with ^{the} Board via website and directly, I just want to summarize some of the most interesting facts, the Board was warned by numerous authors that when wind companies decided to move

move into highly populated rural areas with their taller turbines and shorter setbacks that the general public would fight back. OPSB was urged to increase buffer zones between the turbines and higher populated rural areas, and to think about compensating injured homeowners and/or to avoid lawsuits for declining property values. The article also mentioned how General Electric refused to site towers that did not meet their own minimum published standards (1.5 times hub height + rotor diameter) for ice throw, or about 1,300 feet for a 350-foot turbine with a 300 foot rotor. In my opinion, this would make Ohio's setback distances of 1,125 feet dangerously close for the safety of our residents and for significantly for our higher towers of 602 feet which indicates Ohio's current setback are significantly too short. The article also talked about how the Governor Strickland established the OPSB and the Farm Bureau executives were at every meeting sitting in the front row making sure their interests were being incorporated into the OPSB regulations.

The Farm Bureau executives have had years to communicate their interests to the OPSB.

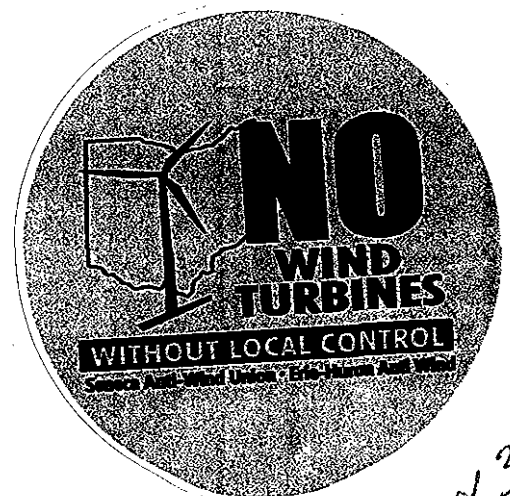
I along with so many others in this room are asking the OPSB to deny Apex their certificate to build.

In Conclusion, hear us. We are fighting back.



ess the Board.

attached
supporting
documents
115 pages



pg. 3 of 3

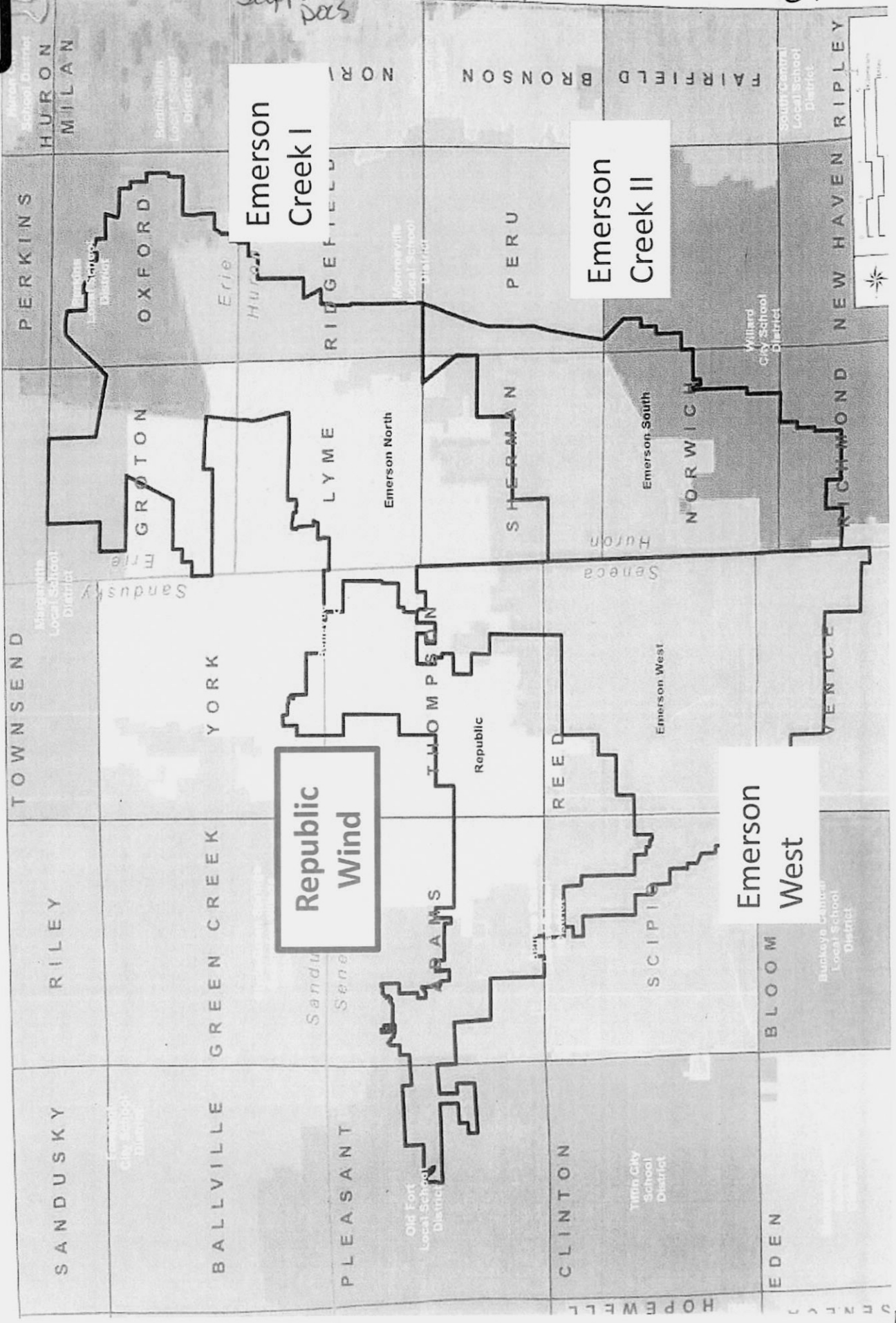
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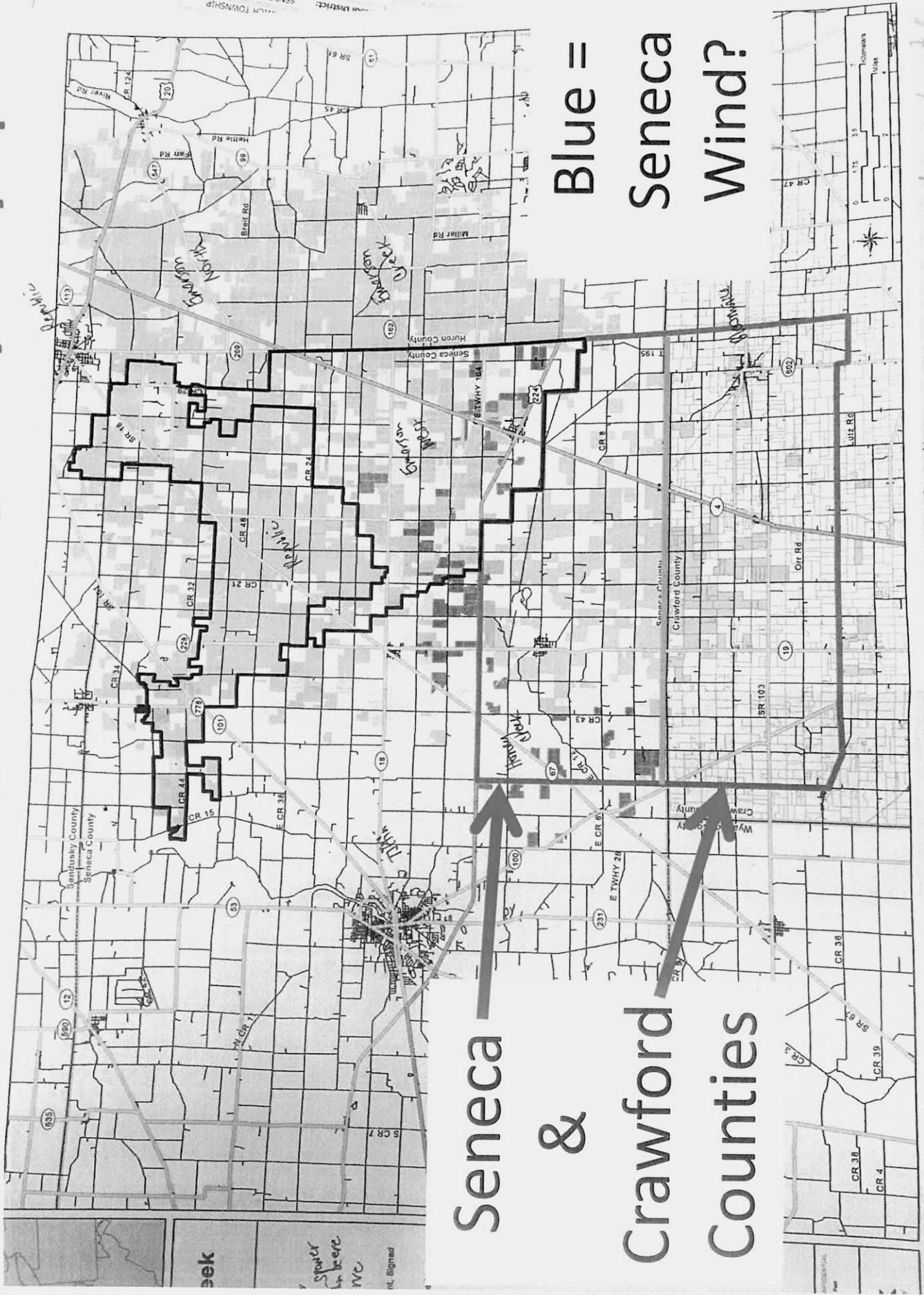
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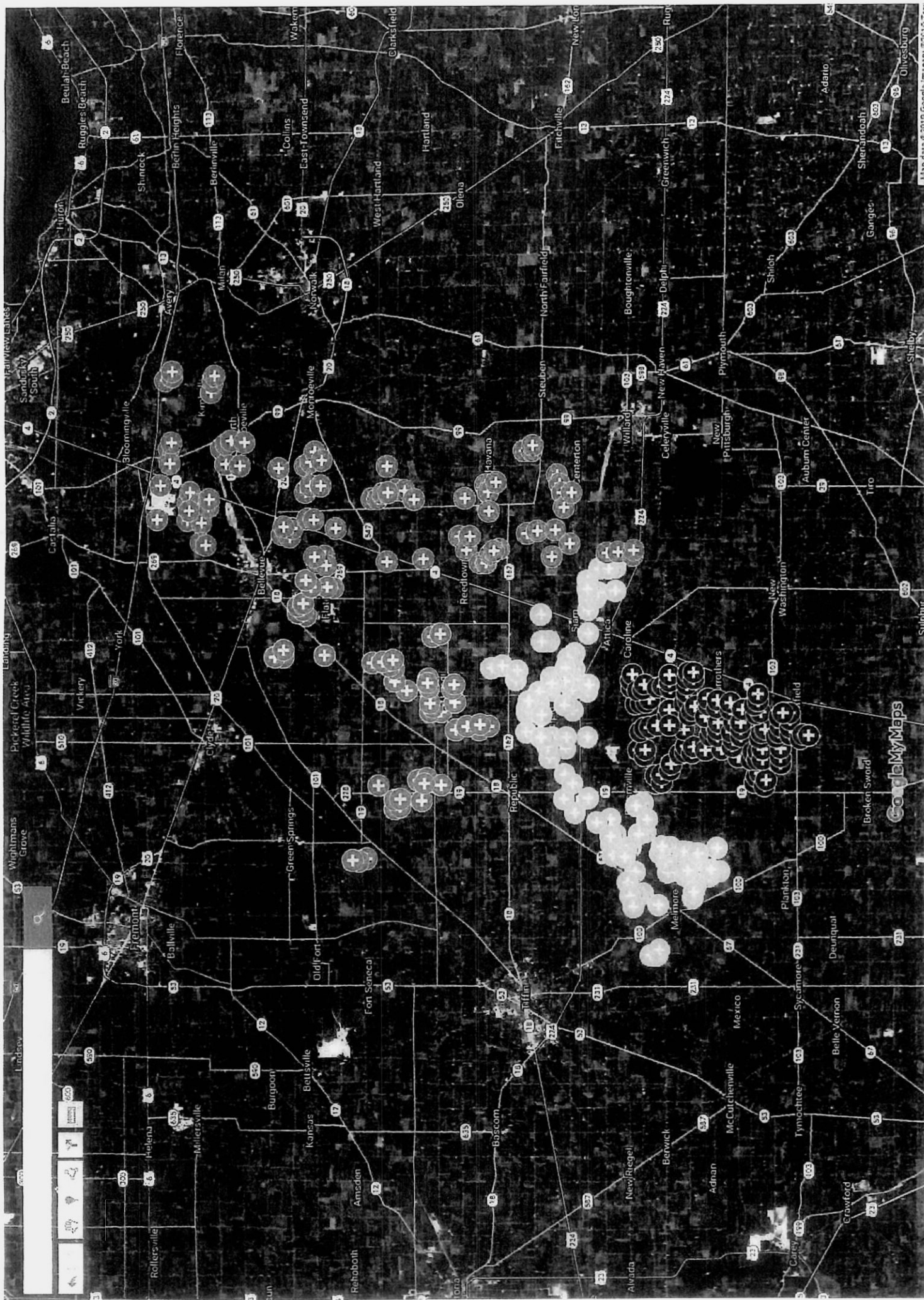
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FOUR APEX Projects: Republic Wind, Emerson Creek Wind I and II? and Emerson West Wind



Honey Creek Project- brought to you by Apex





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Energy Tax Reform: Scrap the Baucus Proposal (Part IV: Negative Wealth Effects)

By Glenn Schleede -- January 22, 2014

[**Editor note:** This is the final excerpt of a January 15 letter by Mr. Schleede to the Senate Finance Committee concerning the Baucus tax-reform proposal (December 18, 2013). Part I (<http://www.masterresource.org/2014/01/baucus-energy-tax-reform-1/>) reprinted the executive summary and conclusions; Part II (<http://www.masterresource.org/2014/01/bachus-energy-tax-reform-2/>) the high cost/low value of windpower. Part III (<http://www.masterresource.org/2014/01/backus-energy-tax-reform-3/>) the negative environmental effects of continued subsidization of windpower, including the "cleanliness" standard of the Baucus proposal.]

"Tax breaks and subsidies for wind transfer wealth from ordinary taxpayers and electric customers to "wind farm" owners, electric customers in some states, and the voluntary purchasers of high cost electricity from wind."

During the past 20 years, a variety of tax breaks and special subsidies for the wind industry have had massive wealth transfer impacts. The proposed production tax credit (PTC) and investment tax credit (ITC) would extend such impact for years into the future. The Committee apparently has ignored the negative impacts of these transfers.

Three examples illustrate the depth of the wealth-transfer problem.

1. Wealth transfer from ordinary taxpayers to "wind farm" owners

Wealth is transferred from the pockets of ordinary taxpayers (and/or their children and grandchildren who inherit the national debt) to the pockets of “wind farm” owners.

This occurs because the PTC or ITC permit “Wind farm” owners to escape tax burden, with the result that ordinary taxpayers who do not enjoy such tax shelters must pick up the burden. During times of deficit spending, tax liability escaped by “wind farm” owners adds to amounts that must be borrowed to cover the deficit and, therefore adds to the huge and growing national debt burden that will fall on our children and grandchildren.

2. Wealth transfer from taxpayers in some states to “wind farm” owners & electric customers in other states

These transfers occur principally when political leaders in some states enact “Renewable Portfolio Standards” (RPS) that require electric distribution companies to provide specified shares of the electricity generated from wind or other renewable sources. Such electricity is almost always higher in cost (and lower in value) than electricity produced by existing conventional energy sources.

Such measures create an artificial, high priced market that is available only to owners of facilities producing electricity from “renewable” energy. The higher cost of this electricity to distribution companies is passed along to electric customers.

Critically important, however, is the fact that the cost of this electricity to distribution companies and their electric customers would be even higher if it were not for the tax breaks received by the companies generating the “renewable” electricity – the costs of which are transferred to ordinary taxpayers.

The practical effect of renewable portfolio standards and tax breaks for wind energy, working together is a wealth transfer from taxpayers across the country to the electric customers in states served by utilities that distribute the “renewable” electricity.

Clearly, senators and congressmen from states without substantial wind generating facilities are voting against the interests of their constituents when they vote FOR wind tax breaks and subsidies. They are endorsing the outward transfer of their constituents' wealth.

3. Wealth transfer from ordinary taxpayers and electric customers to companies, universities, government agencies, and other organizations that sign up to buy wind power or that buy “Renewable Energy Certificates” (RECs)

Organizations that sign up to “buy” electricity generated from wind or other renewable sources generally do so for one or both of two purposes:

- (i) to burnish their environmental or “green” credentials with the public, media, and government officials, or
- (ii) to engage in arbitrage.

Those who engage in this activity avoid that part of the true cost of the wind energy that is covered by tax breaks and subsidies since the price they agree to pay when signing a purchase power agreement (PPA) or contracting for RECs is generally *lower* than it would be if it were not for the tax breaks and subsidies available to the owner of the “wind farm” or other renewable energy facility.

These voluntary purchasers of “green” electricity or RECs benefit from a wealth transfer since the cost of tax break or subsidy is ultimately borne by ordinary taxpayers (or becomes a part of the national debt).

Google recently announced purchases of electricity produced by wind for three of its data centers. Based on the amount of the expected purchases, the tax burden that is shifted to ordinary taxpayers is approximately \$350 million ([tp://www.masterresource.org/?s=Google](http://www.masterresource.org/?s=Google)).

Google apparently has also benefitted by engaging in arbitrage with its wind power purchases. The transactions permit Google to lock in a fixed price for a long period of time (a hedge) and, in effect, Google is able to trade a low value electricity supply (i.e., intermittent, volatile, unreliable electricity from wind generally produced when least needed) for a much higher value reliable electricity supply for its data centers that is available from the grid whenever needed. [1]

[1] Comment (<http://www.masterresource.org/2013/10/google-green-play-375-million-dollars/#comments>) of Ron Promboin (11/1/13) at MasterResource.

2 Comments

Ken Langford () • January 22, 2014 at 10:04 pm

Windfarms in Fairbanks and Anchorage Alaska have done little to reduce fossil fuel use or CO2 because both intermittent and unreliable systems are balanced by hydroelectric power. The only benefactors of these systems are the manufacturers and developers.

Reply

Weekly Climate and Energy News Roundup | Watts Up With That?

(<http://wattsupwiththat.com/2014/01/26/weekly-climate-and-energy-news-roundup-121/>) • January 26, 2014 at 7:38 pm

[...] <http://www.masterresource.org/2014/01/backus-energy-tax-reform-4/#more-29375>

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Industrial Wind Siting: Getting Tough (Part 2: Ohio)

By Sherri Lange -- February 3, 2016

"As you can see, with larger turbines coming on line, we now have understandings of the effects over distances longer than previously assumed, and that requires us to rethink setbacks. The Shirley Wind Project (https://en.wikipedia.org/wiki/Shirley_Wind)[in Wisconsin] has engendered such severe health problems that the Public Health Unit declared the wind project a "human health hazard." (<http://www.bccrwe.com/index.php/8-news/16-duke-energy-s-shirley-wind-declared-human-health-hazard>)

The Ohio Power Siting Board (<http://www.opsb.ohio.gov/opsb/>)(OPSB) has consulted with interested parties to update requirements for industrial wind turbines in the state regarding siting, wildlife impacts, health and safety, construction impacts, decommissioning, shadow flicker, ice throw, and noise (including *infrasound*).

Governor Kasich has instituted five year re-evaluations of the regulations and statutes under the Common Sense Initiative (<http://business.ohio.gov/docs/ExecutiveOrder2011-01K.pdf>)(Executive Order 2011-OIK). The consultation described here is carried out under the OPSB's second finding and order (<http://dis.puc.state.oh.us/DocumentRecord.aspx?DocID=a2287031-6ff4-452e-b72c-73f69ae5ad6a>)in case number 12-1981-EL-BRO, finding 17, which welcomes further consideration of concerns expressed by the Stakeholders.

The two sides are well represented in this important initiative. Committed Ohio anti-wind voices include lawyer Chris Walker for Union Neighbors United (<http://www.safesetbacks.com/>)(UNU), lawyer Sam Randazzo for Greenwich Neighbors United (<http://www.greenwichneighborsunited.com/>)(GNU), along with well-known wind critic and energy writer, Tom Stacy.

They, and others, are up against the ubiquitous representatives of the wind energy industry, namely Iberdrola representatives in the Mid Atlantic Renewable Energy Coalition (<http://www.marec.us/>)(MAREC), and Ever Power (<http://www.google.com/url?>

sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKewiNhoTqwdrKAhUBeyYKHSCBBwEQFggcMAA&url=http%
3A%2F%2Feverpower.com%
2F&usg=AFQjCNGTWa3nHeICZVDbpAsLTkh7kd5usA&bvm=bv.113034660,d.eWE).

Will Ohio's new standards recognize infra-sound as a sound component for regulation? Will the impacts of aerial spraying be considered, as well as field-tile damage remediation? Will there be uniform adoption of L90 measurements? And, finally, will Ohio's new standards be enforced?

The letter below (NA-PAW, North American Platform Against Wind Power (<http://www.na-paw.org/>)) is now posted on OPSB's website (<http://www.opsb.ohio.gov/opsb/index.cfm/calendar/stakeholder-workshop-on-opsb-wind-rules-jan-29-2016/>).

Offices of the Public Utilities Commission of Ohio Room 11B 180 East Broad Street Columbus, Ohio 43215

Attention Mr. Matt Butler

January 28, 2016

RE: Invitation to stakeholders to comment on industrial wind applications OHIO

CASE NUMBER: 12-1981-GE-BRO

Dear Chairman Andre T. Porter, Members of the Board James Zehringer, Craig Butler, David Goodman, Richard Hodges, David Daniels, Jeffrey Lechak, and Mr. Matt Butler

cc: Ohio Governor John Kasich, Presidential Candidate

Thank you very much for the opportunity to address you with our input with respect to the above Case Number, 12-1981-GE-BRO. The North American Platform Against Wind Power represents over 370 North American groups and thousands of individuals, many of whom are your constituents. We also have the privilege of working with our European counterparts, EPAW (The European Platform Against Wind Power), with its 850-plus member groups. We are researchers, and distributors and analysts, as well as activists, with upwards of 10,000 hours of current news and information and research on turbine effects on wildlife, acoustics, and human health.

The Board under RC 4906.20(B)(2) requires enactment of rules as follows:

[T]he rules shall prescribe reasonable regulations regarding any wind turbines and associated facilities of an economically significant wind farm, including, but not limited to, their location, erection, construction, reconstruction, change, alteration, maintenance, removal, use, or enlargement and including erosion control, aesthetics, recreational land use, wildlife protection, interconnection with power and with regional transmission organizations, independent transmission system operators, or similar organizations, ice throw, sound and noise levels, blade shear, shadow flicker, decommissioning, and necessary cooperation for site visits and enforcement investigations.

We respectfully submit that our understanding of the effects of industrial wind proliferation is changing. Also, we are sadly compiling a global history of devastating effects on economies. *Not a single country that we are aware of has done a cost benefit study prior to engaging.* With deep appreciation, we hope that others will take the example of the Governor and OPSB and adopt five year re-evaluation or recovery periods, where the Common Sense Initiative (Executive Order 2011-Oik), allows a thoughtful and consultative process so that contradictory, out of date, immaterial, inappropriate or even harmful regulations, with possible unintended consequences, may be altered.

In light of this consultation, we submit the following comments re: Revisions to Ohio Adm.Code 4906-4-08.

"Ohio Adm.Code 4906-4-08(C)(2)(b) must be changed from 1,125 feet in horizontal distance from the tip of the turbine's nearest blade at 90 degrees to the exterior of the nearest, habitable, residential structure located on adjacent property, to 1,125 feet in horizontal distance from the tip of the turbine's nearest blade at 90 degrees to the property line of the nearest adjacent property."

CONSIDERATION OF SETBACKS

Firstly, we congratulate Governor Kasich and the OPSB for issuing setbacks (http://www.science20.com/news_articles/new_ohio_law_requires_wind_turbines_to_be_built_farther_from_homes 138699) related to property lines, not residences.

A good deal has materialized with world level understanding of wind turbine and health effects. The reports of adverse effects are the same, with up to 20% of a community in close proximity, being affected. Some report effects from fairly long distances, as in France at 32 km, and in AU at 10 km. Mr. Rick James, an esteemed American acoustician, wrote this to NA-PAW:

*I have advocated for 1.25 miles (2km) since my 2008 paper with Kamperman, just for the audible sounds. Nina Pierpont said 1.25 miles based on her work. This distance was agreed upon during a conference call between Nina, George Kamperman and myself while we were preparing our respective manuscripts. Considering the infra and very low frequency sound the information for Shirley Wind indicates 2.5 miles. (Our emphasis) I have data to show that some are affected out to double that distance. Schomer has said 2.5 miles after considering Shirley and Cape Bridgewater. Cooper has said 4km (2.5 miles) based on Cape Bridgewater. Swinbanks in his 2015 Glasgow paper states that wind turbines 3km from his home in Michigan's Thumb cause vestibular and functional disturbances for him personally. Paul Gipe, who was working with AWEA at the time understood this. His 1996 book, Wind Energy Comes of Age, says 1.25 miles because of quiet rural/wilderness conditions and larger wind turbines on the horizon. **Those larger wind turbines are here.** (Our emphasis)*

Any of those distances would preclude wind turbines anywhere except the most isolated places and off shore without a lot of property being bought. Yet, wind turbines in remote and off-shore locations would adversely affect wildlife as I state in my comments on the NY Apex Lighthouse Wind Preliminary Scoping Statement.

As you can see, with larger turbines coming on line, we now have understandings of the effects over distances longer than previously assumed, and that requires us to rethink setbacks. The Shirley Wind Project has engendered such severe health problems that the Public Health Unit declared the wind project a "human health hazard." (<http://www.bccrwe.com/index.php/8-news/16-duke-energy-s-shirley-wind-declared-human-health-hazard>)

It would be, in our view, highly advantageous for the OPSB to include recognition in its siting rulings of the advancement of understanding also of ILFN (Infra and Low Frequency Noise). There really can be no proper mitigation of health complaints without this consideration, and affording residents protection. This is a matter of public leadership: it should not, in our view, be left to individual communities to prepare elaborate bylaws to protect citizens.

Dr. Sandy Reider also indicates that it is a "disservice" to ignore or deny these health impacts:

The Vermont Health Department and the Vermont Department of Public Service persist in reassuring us that there are no significant health effects related to industrial wind turbines under Vermont's current noise standards.

Such a blanket statement is not only incorrect, it is a disservice to the Vermonters who are already experiencing adverse health effects, such as headaches, vertigo, nausea, anxiety, ringing in the ears and, most importantly, chronic repetitive sleep disruption. There is an ongoing academic debate about the mechanisms behind these effects (direct vs. indirect, the nocebo "it's all in your head" effect, audible vs. inaudible infrasound), but little disagreement that some persons living too close to these large wind turbines are suffering, whatever the mechanism.

Critical methodological shortcomings plague many of the large-scale industry or government-sponsored studies that state agencies rely upon to establish protective sound levels:

- Failure to measure the full sound spectrum, in particular ignoring the very low frequencies that are likely responsible for many of the reported adverse health effects.*
- They assume a constant sound pressure and tone, not at all like the impulsive sound produced by large turbines, which has its own distinct signature that differs from other environmental sources (planes, trains, automobiles, wind, leaves rustling).*
- Sound levels are often averaged over an hour, or longer, making it possible for periods of very loud intrusive sound to fall within an "acceptable" calculated level.*
- Measurements are usually not taken indoors, where the sound may be more intrusive due to the well-established resonance effects of low frequency sound.*
- Most importantly, the large studies fail to focus their investigations on those households that are most severely affected.*

In spite of these research design limitations, a recently released large Health Canada study found that at wind turbine sound pressure levels greater than 35 dB(A), health-related complaints will increase, and at levels greater than 40 dB(A) a significant number of persons will be "highly annoyed" (meaning adverse health effects, especially sleep disturbance).

The current Public Service Board threshold of 45 dB(A) of audible sound through an open window, averaged over an hour, has actually never been proven safe or protective. Some studies recommend that audible sound should not exceed 35 dB(A), or 5 dB(A) above normal background sound levels. (This is crucial in rural areas where background noise is minimal, particularly at night). The level should be a maximum, not an hourly average. Above 35 dB(A) there are likely to be significantly more complaints, particularly difficulty sleeping.

Several recent small, well-designed, independent clinical studies (Ambrose & Rand, Nissenbaum, Pierpont, Shomer, Cooper, Thorne) that do take the aforementioned factors into consideration, all conclude that lower, more protective noise limits for these huge industrial wind installations are needed (for more details: docs.wind-watch.org/DRSANDYREIDER_042413.pdf (http://docs.wind-watch.org/DRSANDYREIDER_042413.pdf)).

Given the above noted experts' views, and the recent ground breaking study by Steven Cooper in AU, (<http://stopthesethings.com/2015/04/14/senates-wind-farm-inquiry-steven-coopers-evidence-on-his-groundbreaking-study/>) it is the opinion of NA-PAW that the unfortunate experience of the residents at the Shirley Wind Project in WI serves as an extremely useful learning curve, and that a setback of 2.5 miles is therefore recommended for Ohio and all others in the process of updating their policies and mandates. (We are pleased to supply you with the copious binders of studies and evidence collected by this community.)

The declaration of Duke's Shirley Wind turbines as a "Human Health Hazard" (http://www.bccrwe.com/images/stories/BCCRWE_Press_Release_%20101614Final.pdf) follow a yearlong study linking the signature of inaudible low frequency noise (created by the passing of the massive turbine blades past their supporting towers) to the homes that have been abandoned and to the homes where people continue to suffer. The Board of Health was asked to look at the study's raw data, the evidence linking the sound data to the wind turbines, peer reviewed medical research and the complaints of the people living in the conditions around Duke's Shirley Wind project. They looked at the facts, they listened to the residents, and they studied the medical literature, and then made the connection between Shirley Wind's operations and the suffering in Glenmore – declaring the wind turbines a "Human Health Hazard."

Additional Note

UNU has suggested ice throw setback considerations be changed for non-participating residences and properties, and we respectfully suggest that all properties should have benefit of being thus protected by law. Even if one property owner suggests that he or she will waive that consideration, it would be, in our view, in the manner of providing public safety for all to have universal guidelines.

Ohio Adm. Code 4906-4-08(B)(IKc) requires an applicant to provide results of a literature survey of plant and animal life within at least one-fourth mile of the project area boundary, including results of aquatic and terrestrial plant and animal species that are of commercial or recreational value, or species that are designated as endangered or threatened. UNU argues that this would be inadequate for mobile endangered species inclusive of the Indiana bat that may move in and out of the area; therefore, a broader range for a literature survey should be adopted.

WILDLIFE

NA-PAW fully concurs with UNU that wildlife study and impact assessment corridors must be much broader and that these areas must be suitably surveyed and protected. We respectfully request that a bylaw wildlife clause recently proposed by Somerset NY, be adopted at the State level in Ohio.

"Wildlife Impacts: An analysis of impacts on local wildlife shall be prepared, addressing impacts anticipated during construction, reconstruction, modification, or operation of each WECS. Wildlife impacts to be considered shall include, at a minimum, anticipated impacts on flying creatures (birds, bats, insects), as well as wild creatures existing at ground level. An assessment of the impact of the proposed development on the local flora and fauna. The analysis will include migratory and resident avian species and bat species. The scope of such assessment shall take into consideration New York State Department of Environmental Conservation and the United States Fish and Wildlife Service studies, standards and recommendations and must at a minimum consist of pre-construction data of three years, and literature/ studies/survey for threatened and endangered and species of concern and migratory species that provide relevant information on critical flyways and migration routes, and shall describe the potential impacts of any proposed facilities on bird and bat species, and an avoidance or mitigation plan to address any impacts, as well as plans for three-year post-installation studies. The reports shall provide sufficient information to allow the Town Board to make a determination on any mitigation conditions or a denial of permits as provided in standards for Commercial/Industrial WECS Section.

As noted by UNU, the Indiana Bat

(<http://www.fws.gov/midwest/endangered/mammals/inba/inbafacts.html>) requires immediate and long term protection at every level, in order to ensure its existence. Bats usually have only one pup per year, and as we all know, are currently under siege by two major events: white nose syndrome, and industrial wind turbines. They are attracted to turbines, to the insects that are likewise attracted to the lights. Thus, the turbines become eco death traps. The agricultural and health positive impacts of the presence of bats, any kind of bats, are well known.

NA-PAW recommends a wildlife study corridor of 3 miles surrounding any single or multiple wind turbine installation. We also recommend as in the Somerset bylaw, pre and post construction studies of three years of all bird and bat species, including insect life, as well as all important migration routes, and that these shall be **independent studies**, with recommendations and mandated measures on how to mitigate possible impacts. (Ohio is home to about 13 known species of bats: each bat consumes about 1000 insects per hour.

Bats are nature's ecological treasures, saving us from disease, and providing natural insect control regarding crops. The saving to agriculture (<http://www.sciencemag.org/news/2015/09/bats-are-worth-1-billion-agriculture>) is noted to be about one BILLION per year worldwide.)

We emphasize that any and all wildlife impacts assessments must be carried out **independently**, as UNU attests. The facts are sadly now before us that developer led surveys and mortality studies, are not factual, but are often voluntary, and to our knowledge, mostly corrupted. We know that the mortality count areas, are just covering the span of the turbine blades circumference measurement, not inclusive of the area where birds and bats are flung to their deaths, or are quickly scavenged by predators. With these facts at hand, we now know that 90% of mortality is UN REPORTED. The USFWS numbers of bird and bat kills, which they estimate at around 575,000 birds and 600,000 bats per year, are closer to between 13 and 31 MILLION per year in the USA alone. How long can numbers like this be sustained, and apologized for? The green mantra of killing birds and wildlife and vast areas of habitat "for the good of our future children," has been exposed widely, and frankly, we cannot afford this assault on Nature much longer.

We completely concur with UNU on these matters immediately below:

(f) Ohio Adm.Code 4906-4-08fB)aKdl requires an applicant to provide results of field surveys of plant and animal species identified in the literature survey. UNU proposes that these field studies be required for all endangered species identified in the survey or when the applicant has knowledge of an endangered species within a specified distance of the project area. (Our emphasis: we submit that 3 to seven miles or larger circumference be applied, as particular to the geography and migration routes and known habitats of endangered or at risk species.)

(g) Ohio Adm.Code 4906-4-Q8fB)(IKe) requires an applicant to provide a summary of any additional studies that have been made by or for the applicant addressing the ecological impact of the proposed facility. UNU proposes the applicant be required to submit copies of all studies that the 12-1981-GE-ORD developer has knowledge of and access to even if they were not completed specifically for the developer.

(h) Ohio Adm.Code 4906-4-08fBK2Hblfvii) requires an applicant to provide avoidance measures for major species and their habitat. UNU proposes that the term "major species" be defined in the rules to, at a minimum, include species of commercial or recreational value or an endangered or threatened species.

(i) Ohio Adm.Code 4906-4-08(B)f3Kc) requires an applicant to describe (and guarantee, OUR addition) post construction monitoring of wildlife impacts. UNU proposes an applicant be required to specify measures for mitigation and construction avoidance regarding these species. In addition, UNU proposes that mitigation be mandatory and all monitoring be done by state employees or third-party contractors working on behalf of the Board with the costs to be paid by the certificate holder.

CONCLUSION

We would also mention that the wind industry is a system that operates with virtually no controls. There are more accidents, and industrial deaths (<http://www.caithnesswindfarms.co.uk/accidents.pdf>) than with any other source of electricity. There is what some call a "humanitarian disaster" on hand, worldwide, as many flee homes from ILFN and noise and vibration, lose jobs from sleeplessness, and financially are greatly reduced, if not completely "finished." These are facts.

But the most egregious fact is that industrial wind is an obsolete, non-performing, fully mature technology, no longer deserving of subsidies. In 2014, a study from India reports that point two of one percent of the world's power was achieved from about 250,000 industrial machines. NET ZERO. What a complete waste. The only thing wind power produces, is higher costs of electricity, and attendant job losses.

The Fraser Institute in Canada (<http://www.torontosun.com/2014/10/30/fraser-report-seeks-end-to-wind-turbines>), Canada's Premier think tank, indicated last year that wind turbine subsidies drain jobs and suck money from people's wallets. It further recommends that "The Ontario government should announce an immediate moratorium on new wind and solar power facilities, and revisit existing contracts that commit Ontarians to paying well above market rates for renewable electricity, the authors conclude." "Wind and solar power systems provide less than 4% of Ontario's power but account for 20% of the cost paid by Ontarians, yet the government wants to triple the number of wind and solar generators," energy analyst Adams said in a statement. "That's a good deal for wind and solar producers but a raw deal for consumers." (*In 2014, the Fraser Institute was ranked as the top think tank in Canada* (<https://www.fraserinstitute.org/sites/default/files/fraser-institute-2014-annual-report.pdf>) and among the top 20 think tanks in the world (19th out of 6,618) in the Global Go To Think Tank Index Report published by the University of Pennsylvania.")

We urge the Ohio Power siting Board to carefully consider the above recommendations in light of new and current facts around wind factories.

Thank you again for this opportunity.

Sincere best wishes,

Sherri Lange: CEO NA-PAW, North American Platform Against Wind Power; Founding Director, Toronto Wind Action; Executive Director, Canada, Great Lakes Wind Truth; VP Canada, Save the Eagles International www.na-paw.org (<http://www.na-paw.org/>) www.ontariowindaction.org (<http://www.ontariowindaction.org/>); www.greatlakeswindtruth.org (<http://www.greatlakeswindtruth.org/>)

RESOURCES

<http://www.fws.gov/midwest/wind/wildlifeimpacts/inbafatalities.html>
(<http://www.fws.gov/midwest/wind/wildlifeimpacts/inbafatalities.html>)

<http://stopthesethings.com/2015/04/14/senates-wind-farm-inquiry-steven-coopers-evidence-on-his-groundbreaking-study/> (<http://stopthesethings.com/2015/04/14/senates-wind-farm-inquiry-steven-coopers-evidence-on-his-groundbreaking-study/>)

<https://www.wind-watch.org/news/2016/01/24/ignoring-harm-of-noise/> (<https://www.wind-watch.org/news/2016/01/24/ignoring-harm-of-noise/>)

<http://www.bccrwe.com/index.php/8-news/16-duke-energy-s-shirley-wind-declared-human-health-hazard> (<http://www.bccrwe.com/index.php/8-news/16-duke-energy-s-shirley-wind-declared-human-health-hazard>)

http://www.bccrwe.com/images/stories/BCCRWE_Press_Release_%20101614Final.pdf (http://www.bccrwe.com/images/stories/BCCRWE_Press_Release_%20101614Final.pdf)

<http://www.fws.gov/midwest/endangered/mammals/inba/inbafactsht.html> (<http://www.fws.gov/midwest/endangered/mammals/inba/inbafactsht.html>)

<http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/mammals/little-brown-bat> (<http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/mammals/little-brown-bat>)

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<http://www.caithnesswindfarms.co.uk/accidents.pdf> (<http://www.caithnesswindfarms.co.uk/accidents.pdf>)

http://www.science20.com/news_articles/new_ohio_law_requires_wind_turbines_to_be_built_farther_from_homes-138699

(http://www.science20.com/news_articles/new_ohio_law_requires_wind_turbines_to_be_built_farther_from_homes-138699)

<http://www.torontosun.com/2014/10/30/fraser-report-seeks-end-to-wind-turbines> (<http://www.torontosun.com/2014/10/30/fraser-report-seeks-end-to-wind-turbines>)

Steven Cooper's testimony (<http://stopthesethings.com/2015/04/14/senates-wind-farm-inquiry-steven-coopers-evidence-on-his-groundbreaking-study/>) at the Senate Hearings (Special Select Committee on Wind Turbines)

Mr Cooper: I am an acoustical consulting and vibration engineer based in Lilyfield, a suburb in Sydney. I am here in the capacity of myself and my company, although I am the author of the Cape Bridgewater wind farm noise study, which was funded by Pacific Hydro. The study is a small telephone book, and I do not intend in terms of my submission to go through that study. It identifies problems, issues, measurements and results that occurred from the wind farm study. For simplicity one can go to the executive summary in the conclusion. The importance is that study has been hailed around the world as finding new information and material previously not put together or understood with regard to wind farms. It is such a point that I have been invited to a number of conferences in America to talk about this very study.

Also:

Low Frequency Noise and Infrasound

Mr Steven Cooper from the Acoustic Group submitted that there are 'low frequency, infrasound components' in wind turbine noise that have: **...a unique signature associated with turbines and you can measure them near the turbines and measure them up to seven kilometres away...and seven kilometres away I can see this signature and the pattern is there.**

Community Affairs Committee Report

"You cannot hear it because it is lower than the threshold of hearing, both in frequency and in level, but it is there. Professor Hansen added that low frequency noise is particularly difficult to avoid, as the techniques used to mitigate higher frequency are significantly less effective: The problem with wind farm noise is that it is dominated by low-frequency noise by the time it gets to people's residences. Many residences, especially if windows are open, are sort of transparent to that noise. The noise level at low frequencies is not much less than what it is outside, whereas the higher-frequency noise—if there is a little bit left—gets attenuated through the walls of the house and the roof. What you are left with when you are inside is a dominant low-frequency noise, and there is no higher-frequency noise to mask it. There is nothing to mix with it. It is just this low-frequency, annoying noise.

8 Comments

Carm Hofen (<https://wolfhillblog.wordpress.com/>) • February 3, 2016 at 9:11 am
(<https://www.masterresource.org/humanprogress-org/tupy-on-fueling-industrial-revolution/#comments>)

The explicit subtext in this submission by Sherri Lange, CEO NA-PAW, about the siting of industrial wind turbines is that they should actually not be built anywhere because, in fact, they are economically utterly useless, and environmentally extremely destructive. The wind energy industry and its license-granting government partners with their wind-favouring, anti-democratic "green" legislation have become what amounts to an oppressive, heartless kleptocracy, robbing and disenfranchising the taxpaying people, with those in rural areas paying the highest price of all. When will the insanity stop? Siting here, or siting there—it's all totally beside the point. The killer machines must be outlawed, and the draconian legislation that gives their owners free rein to maraud, intimidate, coerce, despoil, and defraud have to be repealed.

Reply

Sherri Lange (<http://www.na-paw.org;www.ontariowindaction.org;www.greatlakeswindtruth.org;>) • February 3, 2016 at 9:56 am (<https://www.masterresource.org/uncategorized/563ef44271374528b00548f15e693004/#respond>)

Hi Carm,

Mary Kay Barton echoes your mindset completely. Our mindset. Still, wherever the siting discussion comes up, we can find an entry, and make the point for zero threshold.

<http://www.masterresource.org/windpower-problems/industrial-wind-net-loser/>

(<http://www.masterresource.org/windpower-problems/industrial-wind-net-loser/>)

Thanks so much for your cogent commentary. Utterly useless, and destructive. Not much more to say, but yet the hype and spin continues. Note that the industry this past week, under guise of university research by a PhD student, and others from "renewables" and geography departments, promotes again, the idea that if communities are paid enough, co-opted, basically, they will not complain so much. This is not a new ploy. They once in a while spin out university level tales of how to mitigate community discontent and objection.

Tell this theory to the residents of Falmouth, Mass, or at the notorious Shirley Wind Project, WI. The mere idea that money is the salve, that entire communities can be tamped down and bought, is very insulting. Mercifully, there are communities everywhere who stand up to bullies; even those with silver tongues and a few crumbs to share. The Somerset/Yates fight is one to watch. Well, they ALL are to watch, really.

Thanks again.

Reply

Carm Hofen (<https://wolfhillblog.wordpress.com/>) • February 3, 2016 at 11:50 am
(<https://www.masterresource.org/uncategorized/48249-revision-v1/#respond>)

Thanks, Sherri, you are so right about taking advantage of every opportunity, as you have so brilliantly done, to "make the point for zero threshold." With iron-tight laws written expressly for the wind industry so it can unleash *useless-but-subsidy-rich* wind turbines without any inconvenient impediments, the people face tough, seemingly insurmountable obstacles to stopping the monstrous ruination of the landscape, communities, wildlife, human health, natural beauty, property rights, and personal wealth. People have to recognize that they are the victims of a massive scientific deception—manmade global warming/manmade climate change. There is a direct connection between the phony global climate emergency and the towering destructive wind turbines. The deliberate UN-led demonization of both CO2 (i.e. invisible, odorless, non-polluting plant food) and fossil fuels (that lift people out of poverty and give them knowledge, health, safety, comfort, longevity), is used as a well-orchestrated smokescreen for a bid for unelected, unaccountable global governance, wealth redistribution, erosion of national sovereignty, and an end to personal freedoms. That is why rural people have to endure the pointless industrialization of the landscape. Unless and until we can elect politicians not tainted by and dependent upon the \$1.5 trillion "climate change" industry, who are willing to stand up and tell the real evidence-based truth, and who will implement moratoriums on bogus-green schemes, repeal the draconian "green" laws, and kick out foreign-funded eco-zealous "charitable" activist groups, the future looks grim indeed.

Reply

Sherri Lange () • February 3, 2016 at 12:21 pm (<https://www.masterresource.org/uncategorized/48249-revision-v1/#respond>)

Could never say it better than you and Suzanne have done here. Very clear the chain of deliberate misinformation. It is in our view the largest fraud ever perpetuated....even on the poorest people of the globe.

Reply

20

Suzanne Albright (<http://GreatLakesWindTruth>) • February 3, 2016 at 9:59 am
(<https://www.masterresource.org/uncategorized/48249-revision-v1/#respond>)

Thank you again, Sherri Lange for this concise and accurate reporting, and also to you Carm Hofen. You are exactly right- these horrific turbines should not be built anywhere. If close to humans, there is human harm on many planes. If moved to the wilderness, the destruction to wildlife will ultimately destroy mankind anyway! When do humans realize that there is a balance of nature that if interrupted, will eventually destroy the ecosystem that is crucial to our existence? A perfect example of this is the slaughter of raptors by turbine blade collisions. Wind supporters continue to downplay this occurrence, but the numbers, as Ms. Lange states, are vastly under-reported, and will increase incrementally with every new turbine that is erected. As the turbines get larger and taller, migrating raptors (these monstrosities are often placed in migratory flyways due to the wind and updraft in these areas) will be increasingly butchered. Raptors are an "indicator" species- meaning they are very sensitive to environmental changes in their ecosystem, and thus can give early warning that a habitat is suffering. We share the same habitat, meaning the air, water, food, etc., and they are among the first species to be affected by these environmental pressures. By allowing their destruction, we lose this indicator of our own environmental health.

Ohio is faced with a massive amount of harm from coal, in its current form of usage for energy, no one will deny that. But wind is NOT the answer. It is merely a trade off of one form of harm for another. The massive amount of money, taken from tax and rate payers, to support wind could have been far better spent for R&D of reliable, affordable, less harmful ways to produce energy. Instead, turbines continue to be built, resulting in horrendous harm to people and the environment, while coal continues to be the primary source of reliable back up (never shutting down ANYWHERE) in Ohio (and elsewhere), and we all pay twice monetarily! Where is the logic that I seem to be missing?

Reply

Michael Spencley () • February 3, 2016 at 1:12 pm

Much appreciation to Ms. Lange for articulating this submission so effectively and to Master Resource for publishing this piece. This is a very cogent, well researched and well referenced submission to the OPSB. This communication should be adopted as an "Early Warning" standard submission for any industrial wind project.

Who could not be shocked and dismayed when reading this information?

-Public Health Unit declared the wind project a "human health hazard".

-Gross misinformation about mortality rates for birds and bats published by government institutions.

-Moratorium on wind projects called for by top 20 World Think-tank, The Frazer Institute.

Particular thanks for giving this top exposure by including Ohio Governor John Kasich. After receiving this submission, I can't imagine why he would not put a moratorium on all Ohio projects in keeping with his Common Sense Initiative. It would be great exposure for his Presidential Candidacy and showcase his keen appreciation of requiring the economics to work for the public.

Keep up this excellent work.

Reply

Sherri Lange (<http://www.na-paw.org>) • February 5, 2016 at 5:03 pm
(<https://www.masterresource.org/uncategorized/48008-revision-v1/#respond>)

The ideal situation would be to create an Ohio bred and born moratorium. What many do not realize are the medical and sometimes profound effects of infra sound. Some now suggest that 7 km (Steven Cooper), or 10 km, or even 30 km is safer, and with 10-20% of a given population possibly affected, children and the elderly most vulnerable, why would anyone take chances? Some are calling this a humanitarian disaster, and others say it is a "pandemic." The effects are the same world wide.

LFN and infrasound must be included in zoning regulations...

Thanks for your comments!

Siting Wind Ohio | Great Lakes Wind Truth (<http://greatlakeswindtruth.org/newsworthy/siting-wind-ohio/>) • February 17, 2016 at 1:46 pm (<https://www.masterresource.org/uncategorized/48607-revision-v1/#respond>)

(<http://www.masterresource.org/ohio/siting-wind-ohio-tough-2/>) [...]

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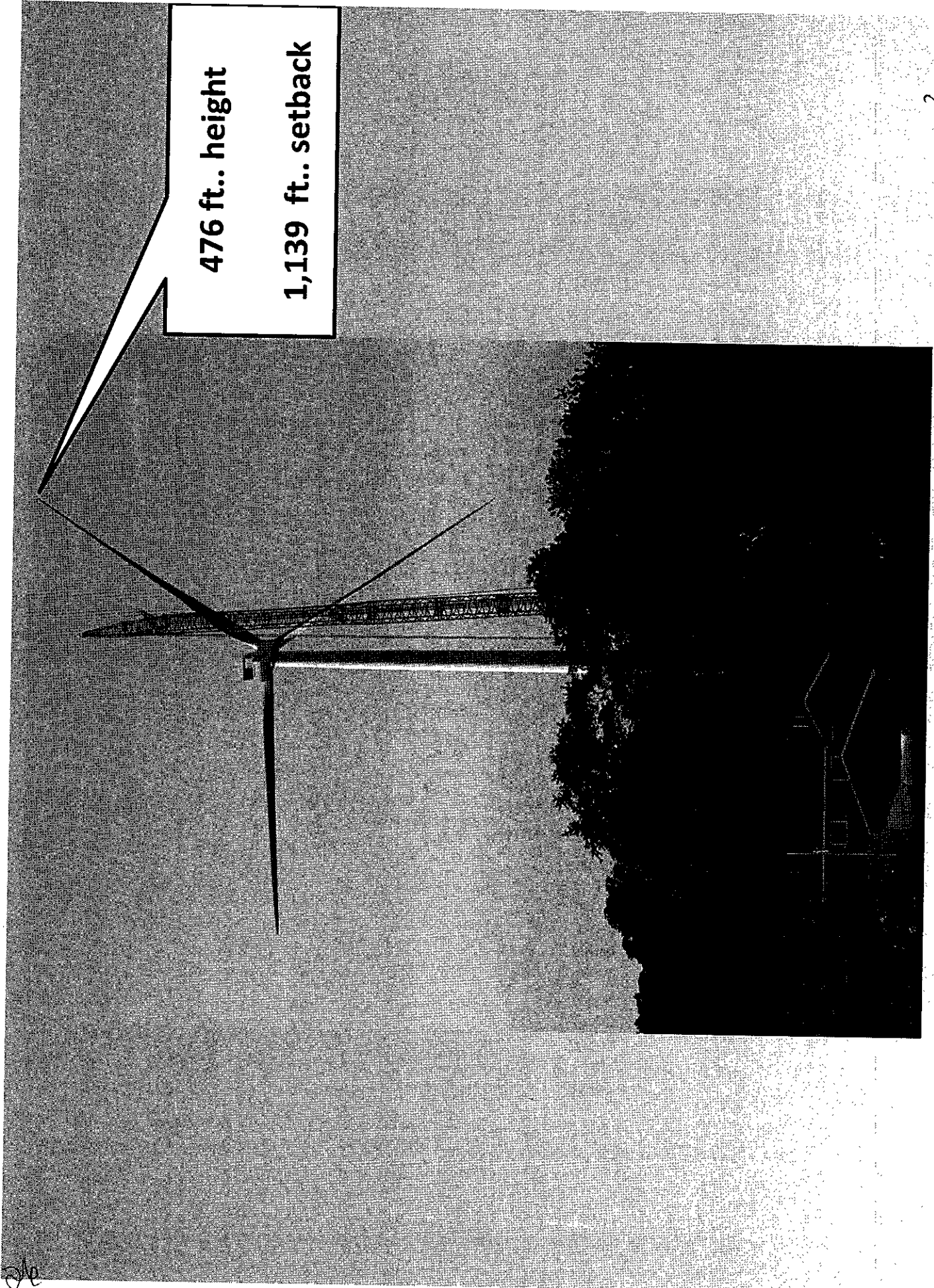
(<http://www.masterresource.org/>)

**JUWI Wind
Prairie Breeze Wind Farm, LLC
Tipton County, Indiana**

**PROPERTY VALUE IMPACT &
ZONING COMPLIANCE
EVALUATION**

**McCann Appraisal, LLC
March 20, 2013**

© 2013



476 ft.. height

1,139 ft.. setback

Qualifications

Michael S. McCann, CRA

- Over 30 years experience appraisal & consulting
- Most types of commercial, industrial & residential property
- State Certified General Appraiser, licensed multiple states
- Certified Review Appraiser (CRA)
- Member of Lambda Alpha International – Inducted on basis of expertise with property value impact studies
- Qualified as expert witness in 21+ states, state & federal courts
- Appraised variety of property value damage situations
- Consultant to governmental bodies, developers, corporations, attorneys, investors and private owners
- Appointed by Federal Court as a Condemnation Commissioner
- Appointed as arbitrator & umpire for property value disputes
- Evaluated & consulted 20+ wind projects in over a dozen states
- Prepared and presented a webinar regarding wind turbine impacts on property values for the Appraisal Institute – peer reviewed & approved for continuing education of Members

Anti-wind activist or lobbyist?

- No !
- Michael McCann is an independent appraiser, bound by USPAP
- Professional opinions are based on objective analysis of empirical data
- McCann asked to testify due to extensive experience regarding wind farm value impacts
- Characterization, claims or allegations to the contrary are *FALSE*

McCann Study

- ✓ Review of Tipton County Ordinance, proposed setbacks, Conditional Use approval criteria
- ✓ Review of existing character of project area
- ✓ Review of nuisance factors and stigma typically associated with nearby wind projects, established by existing residential and AG uses
- ✓ Review of prior McCann empirical value studies
- ✓ Literature review - wind projects impact on property values
- ✓ Recommendations to Tipton BZA & County Board regarding setbacks & impact mitigation

JUWI Project Summary

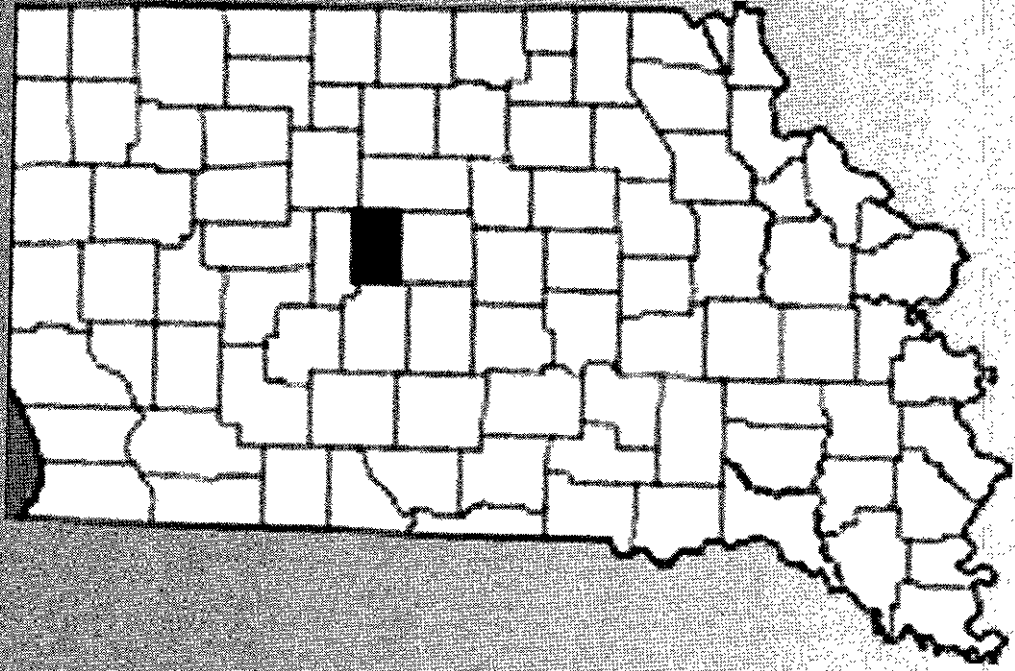
- 16,000 acres leased for “footprint”
- Up to 94 turbines & 150 MW (63 to 94)
- 1.6 to 2.4 MW each nameplate capacity
- 427 to 492 feet to tip of blade
- Setbacks of 1,250 feet

TIPTON COUNTY ZONING ORDINANCE

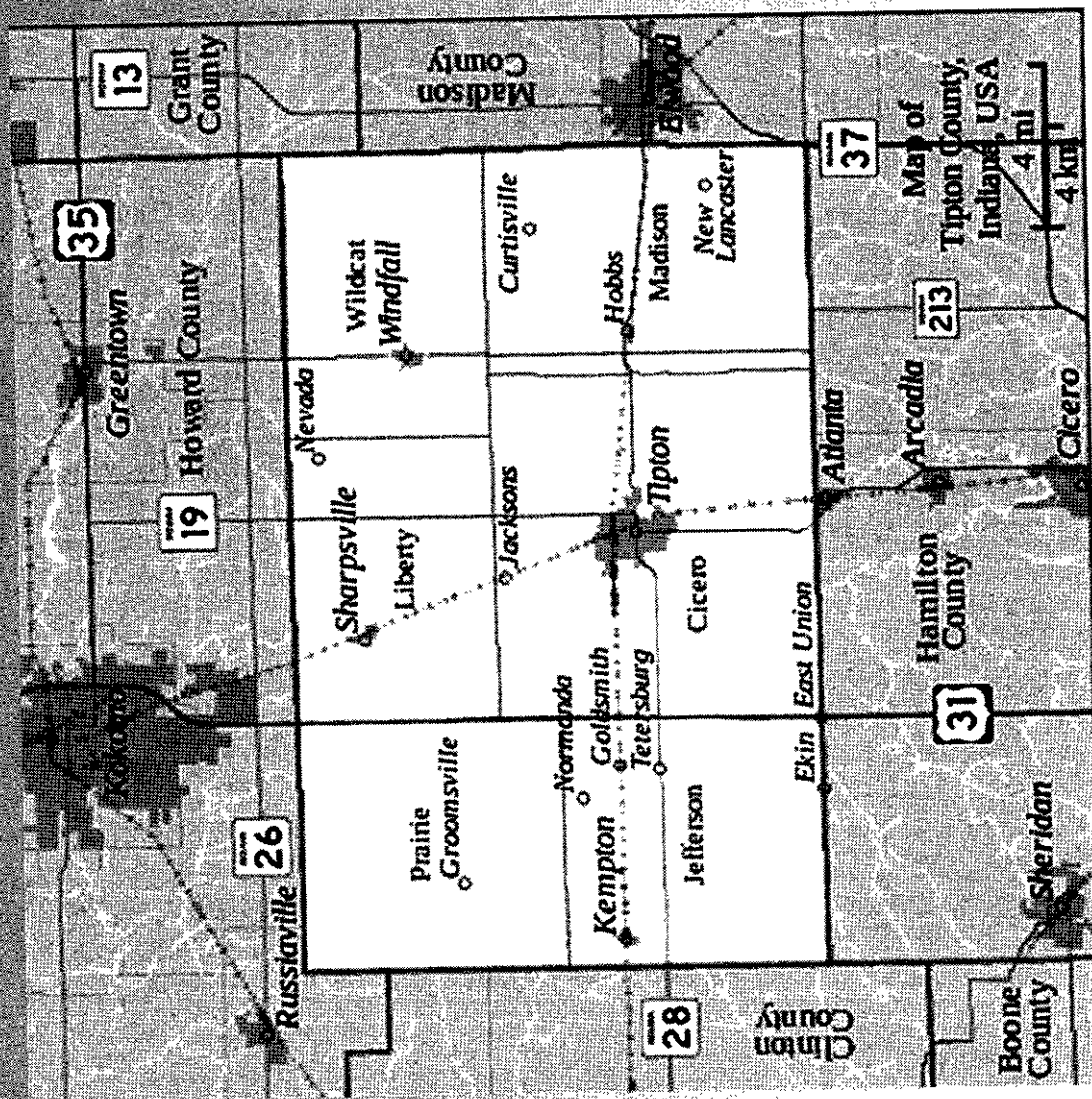
- **Section 808: Conditional Use**

C. The use and value of the area adjacent to the property included in the Variance will not be affected in a substantially adverse manner.

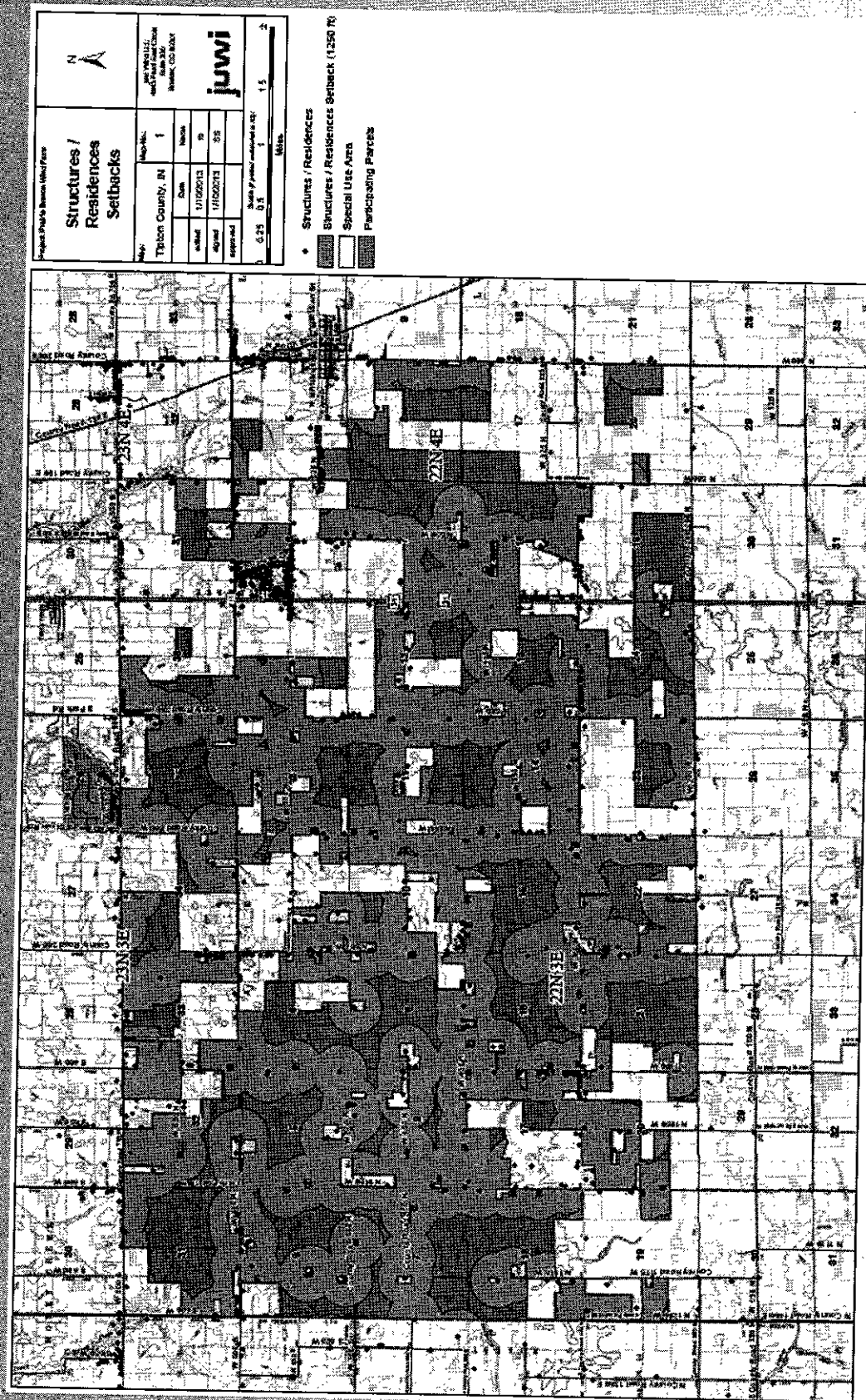
Location Map



Tipton County



Residential Setbacks - Proposed



Nuisance & Related Issues

- **Noise** – Audible & LFN
(Increases above ambient = nuisance)
- Pulsating nature (Amplitude Modulation)
- 24/7 potential
- **Visual** - Shadow flicker
- Aesthetics & Vistas
- FAA lights
- **Safety** - Blade throw & ice throw
- Aviation safety – aerial spraying
- **Essential character** of area changes to Industrial Overlay
- **Health stigma**
- Established via clinical studies & research by M.D.'s
- Annoyance has different clinical meaning – causes health impacts
- Sleep disturbances
- Many adverse health reports to 2 miles or more
- LFN impacts parallel health reports – Not limited to view
- LFN travels great distances, penetrates walls/roofs

Nuisance – Real Estate Issue

- Decreases desirability as a residential setting (*both sides of market*)
- Sellers often can't sell. When they are able, prices usually reflect substantial discount
- Buyers typically avoid dominant industrial setting
- Introduces a "Detrimental Condition" for 25 square mile footprint plus 2-3 miles beyond footprint

What are the facts?

- Studies that focus on close proximity are relevant
- Studies that minimize or ignore nearby sale data are misleading or irrelevant
- “Pooling” data from multiple, diverse locations tends to set wide parameters that conceals actual impacts

Sales > 2 miles

14

Sales located within 2 miles

Sale #	Address	Sale Date	Price	Grantor	Grantee	Style	Size SF	\$/SF
1	629 W. Chestnut	Oct 2003	\$37,000	Estes	Lipe	1.5	1,161	\$31.87
2	323 W. Chestnut	Oct 2004	\$40,000	Reed	Hovious	1.5	1,425	\$28.07
3	1019 Steward Rd.	May 2003	\$40,000	Houle-Ward	Reyns	2	1,408	\$28.41
4	91143 Paw Paw	Mar 2005	\$187,000	Zaylik	Pachero	2	1,571	\$119.03
5	1224 IL Rte. 251	Jun 2003	\$138,000	Gittleson	Kowalski	2	1,272	\$108.49
6	339 Chestnut St.	Jan 2003	\$72,000	White	Flynn	2	1,684	\$42.76
7	630 W. Chestnut	Sep 2003	\$126,000	Eddy	Morath, Sr.	1.5	1,728	\$72.92
8	427 Chestnut St.	Oct 2003	\$87,000	Hesk	Route, Jr.	1.5	1,380	\$63.04
9	138 Cherry St.	Sep 2004	\$80,000	Hammond	Alexander	1.5	1,326	\$60.33
10	536 W. Cherry	Oct 2004	\$63,500	Johnson	Fitzpatrick	1.5	999	\$63.56
11	885 Compton Rd.	Oct 2004	\$68,900	Boysen	Gellings	1	480	\$143.54
12	518 W. Cherry St.	Apr 2003	\$87,500	Allen	Beckman	1	927	\$94.39
13	222 Maple St.	Dec 2004	\$150,000	Clark	Cummings	1	1,852	\$80.99
14	444 W. Main St	Mar 2005	\$109,900	Miller	Michaels	1	1,402	\$78.39
15	2874 Beemerville	Jul 2003	\$367,000	Finlboner	DGNB TRT	1	2,201	\$166.74
Average sale price								\$78.84

35

2009 Study Summary

Avg Sale Price > 2 miles = \$104.72 SF

Avg Sale Price < 2 miles = \$ 78.84 SF

Difference in Sale Price = \$ 25.89 SF

Average Value Diminution Within 2
miles of turbines **25%**

Paired Sale Analysis

- “A quantitative technique used to identify and measure adjustments to the sale prices or rents of comparable properties; to apply this technique, sales or rental data on nearly identical properties are analyzed to isolate a single characteristic’s effect on value or rent.”

Recognized Methodology

- ***Real Estate Damages – An Analysis of Detrimental Conditions*** (pg. 19 -22), recognized methods of applying a Detrimental Condition Sales Comparison Approach includes the use of a Sale/Resale analysis or a Paired Sale Analysis.

McCann 2012 Study

Lee & DeKalb Counties

- Detailed Paired Sales analysis
- Target & Control sale data selected on basis of sales near turbines (Target) being paired with comparable sales (Control) at much greater distances
- Target sales average distance = 2,618 feet
- Control sales average distance = 10.1 miles
- Current empirical data finds 23% to 33% (**avg. 26%**) impact from inadequate setbacks

Paired Sale Analysis Summary

Lee County Study Area

Target Area			Control Area						
Pair #	T#	Distance Feet	CDOM	SP/LP %	C#	Distance Miles	CDOM	SP/LP %	Impact %
1	1-T	7,860	535	71.4	1-C	10.0	55	100.0	(27.0)
2	1-T	7,860	535	71.4	2-C	16.0	167	87.2	(30.3)
3	2-T	1,469	1,041	70.0	3-C	11.7	544	90.0	(11.9)
4	2-T	1,469	1,041	70.0	4-C	16.3	176	101.0	(24.0)
5	3-T	3,660	339	71.0	3-C	11.7	544	90.0	(15.5)
6	3-T	3,660	339	71.0	4-C	16.3	176	101.0	(25.6)
7	4-T	315	625	82.0	5-C	4.0	241	82.0	(22.5)
8	4-T	315	625	82.0	6-C	4.8	601	94.0	(23.1)
Lee Averages		3,326	635 1.74 yrs	73.6		10.5	297	92.4	(22.5)

DeKalb County Study Area

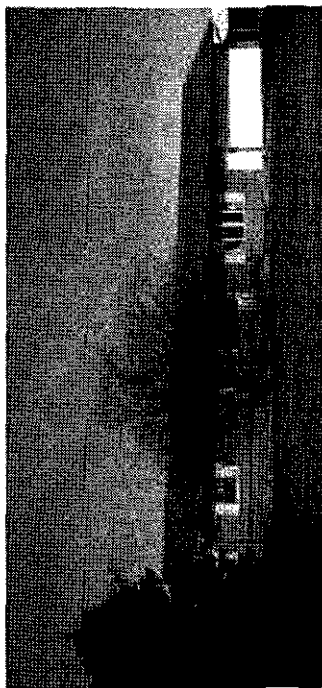
1	1-T	1,000	712	51.0	1-C	10.3	138	90.0	(46.9)
2	1-T	1,000	712	51.0	2-C	5.0	1	95.0	(41.6)
3	1-T	1,000	712	51.0	3-C	11.7	409	90.0	(43.8)
4	2-T	2,139	815	75.0	4-C	11.4	379	81.0	(15.9)
5	3-T	1,880	386	74.0	4-C	11.4	379	81.0	(15.6)
DeKalb Averages		1,637	638 1.75 yrs	66.7		9.6	232	89.0	(32.8)

Lee & DeKalb combined		2,618	636	70.6		10.1	271	91.0	(26.4) ₂₀
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Related Study Results

- CDOM is 1 year longer near turbines
- Sale Price as a % of list price is 70.6% vs. 91%, or 20% lower near turbines
- DeKalb FPL turbines are larger and nearer Target residential sales, on average, and empirical appraisal results find greater impact with shorter Setbacks

DeKalb County Paired Sale #3 1-T & 3-C



Near Turbines = Target



Far from Turbines = Control

Category	DeKalb Sale 1-T	DeKalb Sale 3-C	Adjustments + (-)
Address	13801 Tower Rd., Lee, IL	27779 Five Points Rd., Sycamore, IL	
Turbine Distance	1,000 ft. approx. from NWC property line	11.7 miles SW of property	
CDOM	712 days; 3 listings	409 days	
OLP	\$275,000	\$239,900	
SP/OLP %	51%	90%	
Sale Date	Nov. 2012	Feb. 2012	
Sale Price	\$140,000	\$215,000	(\$11,300)
GBA/SF	1,439	1,507	
\$/SF	\$ 97.29	\$ 142.67	(Difference not relevant)
Built	1979	1966	
Tot/BR/B	5 rm/3 br/1 bath	6 rm/3 br/1 bath	
Basement	2 br's, fam rm, bath	full, unfinished	
Garage	2 car attached	2 car attached	
Acres	5	4.18	
Out Bldgs	4	1	
Quality	Avg.	Avg.	
Condition	Avg.	Avg.	
		at \$10k/acre	\$ 8,200
		(Est. contribution of 3 bldgs)	\$ 10,000
			0
			0
			\$ 33,945

Unadjusted Sale Price Analysis

Actual Sale Price Far Sale	\$215,000
Actual Sale Price Near Sale	(\$140,000)
Difference	(\$75,000)
% Difference	-34.9%

Adjusted Sale Price Analysis

Adjusted Sale Price (MV of near sale)	\$ 248,945
Near Sale Price	\$ (140,000)
Indicated Turbine Value Impact to Near Sale	\$ (108,945)
Impact %	-43.8%

Sale 1-T



1,000 ft setback

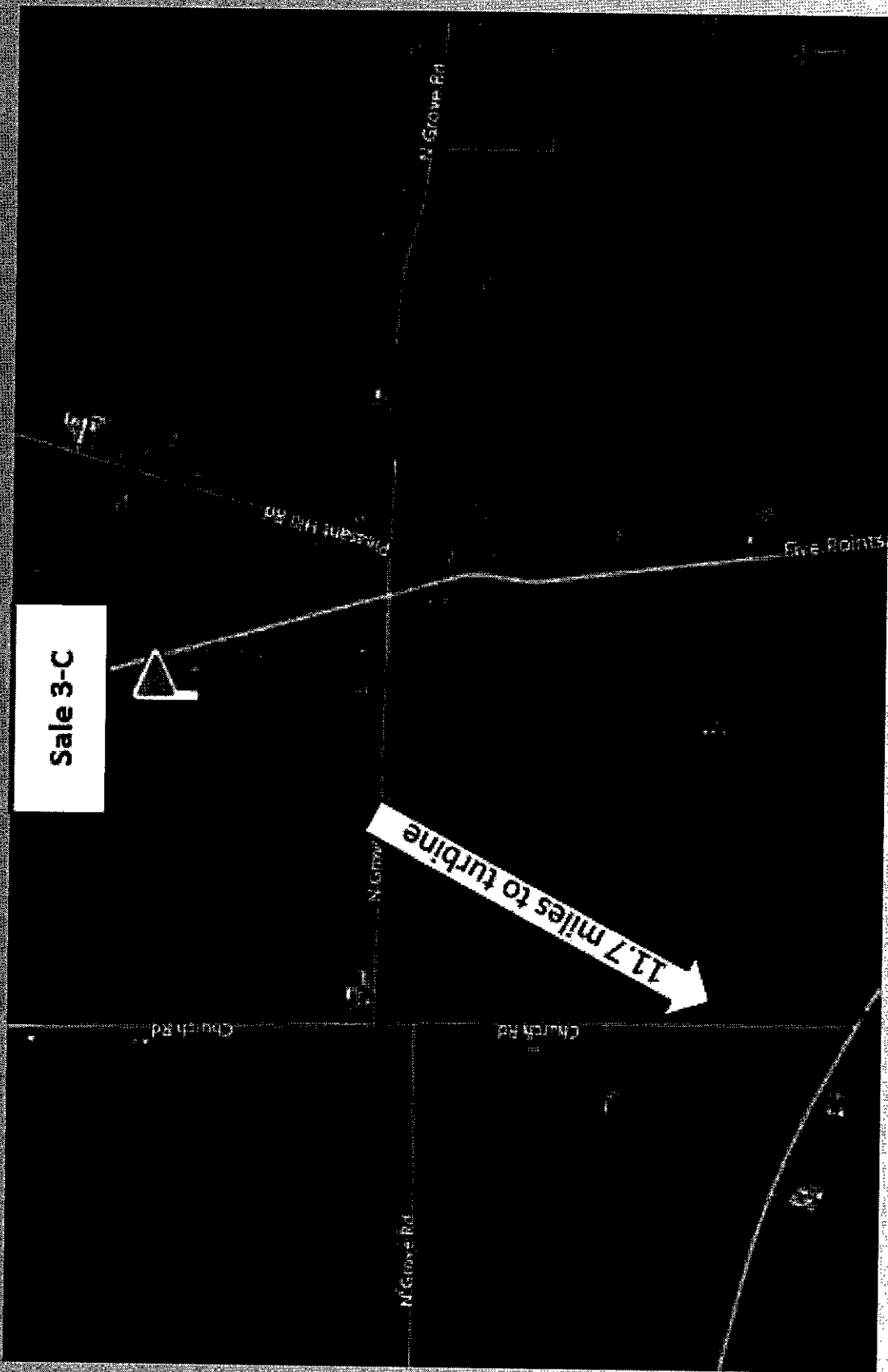
County Line Rd

County Line Rd

Tower Rd

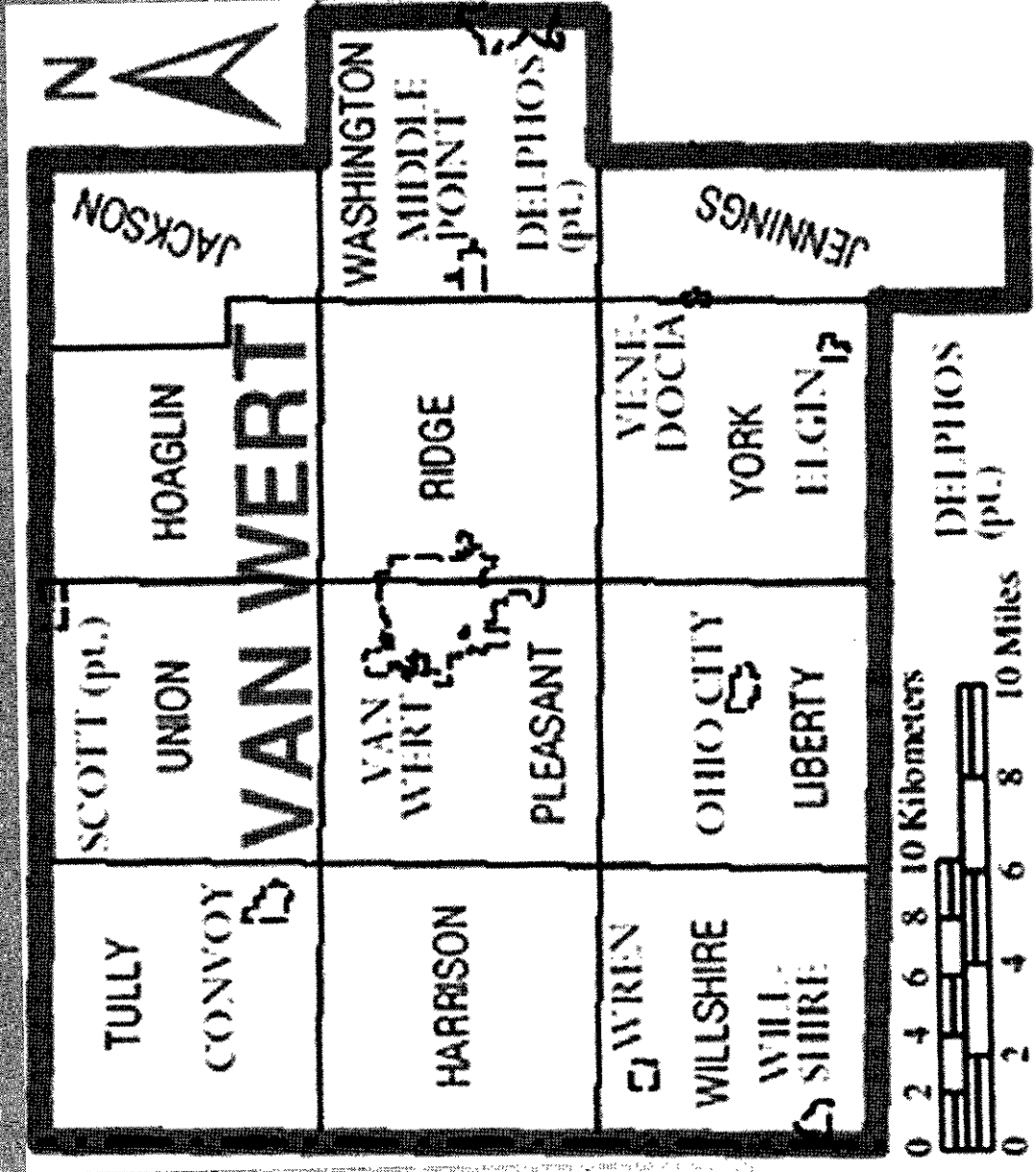
Willett Rd

Willett Rd



McCann 2012 Study

Van Wert County, Ohio



Van Wert County, Ohio 2012 Residential Sale Summary

Township	# Sales	# Sales via Foreclosure	% via foreclosure	Avg. Price*	Avg. \$/Sq Ft*	Setting
York & Liberty	11	1	9%	\$78,980	\$41.08	6 miles away
Union & Hoaglin	15	7	47%	\$58,417	\$31.97	Footprint
Difference	+ 4	+ 6	+38%	(\$20,563)	(\$9.11)	
% Difference				(26%)	(22%)	

*Excluding related party – Family sales

LANSINK RESALE STUDY SUMMARY

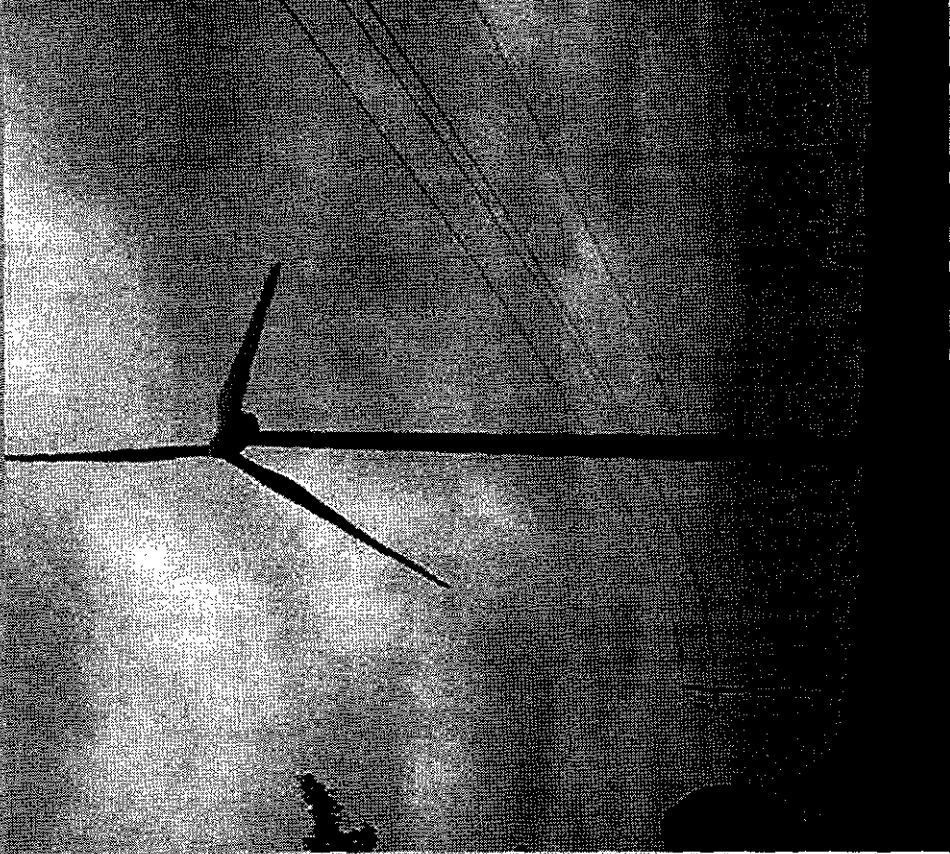
Conclusion: Clear Creek, known as Frogmore-Cultus-Clear Creek, about 18 Wind Turbines		Conclusion: Melancthon, 133 Wind Turbines	
1	1480 Lakeshore Road, Norfolk	1	375557 6th Line, Amaranth
2	71 Norfolk County Road 23, Norfolk	2	97121 4th Line, Melancthon
3	47 Concession Road A, Norfolk	3	504059 Highway 89, Melancthon
4	43 Old Mill Road, Norfolk	4	582340 County Road 17, Melancthon
5	1575 Lakeshore Road, Norfolk	5	582328 County Road 17, Melancthon
6	1527 Lakeshore Road, Norfolk		
7	1921 Lakeshore Road, Norfolk		
Median		Median	
Average		Average	
Low		Low	
High		High	
	-44.17%		-48.27%
	-55.18%		-58.56%
	-22.47%		-23.24%
	-32.96%		-26.66%
	-27.67%		-37.30%
	-28.88%		
	-38.48%		
	-32.96%		-37.30%
	-35.69%		-38.81%
	-22.47%		-23.24%
	-55.18%		-58.56%

Ben Lansink Resale Study - 2012

Sale and Resale, Property: 504059 Highway 89, Melancthon

The average Orangeville & District Real Estate Board Residential MLS® price January 2007 was \$254,803 and August 2009 when 504059 Highway 89, Melancthon resold the average price was \$302,550 resulting in a Change of 18.74%.	Average Price January 2007	\$254,803
	Average Price August 2009	\$302,550
	\$Change	\$47,747
	%Change	18.74%
The property, 504059 Highway 89, Melancthon, was purchased by Canadian Hydro Developers, Inc. in January 2007 for \$305,000 but would have resold August 2009 for \$362,153 as a result of the passage of time.	Actual Price January 2007	\$305,000
	%Change	18.74%
	\$Change	\$57,153
	Adjusted Price August 2009	\$362,153
However the Actual Price when the property resold to Egresits / Gooder in August 2009 was \$278,000, a loss of -\$84,153.	Actual Price August 2009	\$278,000
	\$Difference	-\$84,153
	%Difference	-23.24%
	Diminution in Value: -23.24%.	

Sale and Resale Property Melancthon, Ontario



LITERATURE REVIEW

Summary

Wind Turbine - Property Value Impact Studies

Independent Studies

Author	Type	Year	Location	Method	Distance	Impact %
Lansink	Appraiser	2012	Ontario	Resale (1)	< 2 miles	(39%) Avg. 23%-59%
Sunak	Academic RWTH Aachen University	2012	Rheine & Neuenkirchen	OLS Geographic Weighted Regression (2)	2 Km	(25%)
Heintzelman Tuttle	Academic Clarkson University	2011	Upstate NY	Regression Resale & Census Block	1/10 to 3 miles	Varies to > (45%)
McCann	Appraiser	2009 - 2012	Illinois, (3) MI, MA, WI	Paired Sales & resale	< 2 miles	(25%) 20% - 40%
Gardner	Appraiser	2009	Texas	Paired Sales	1.8 miles	(25%)
Kiellisch	Appraiser	2009	Wisconsin (4)	Regression & Survey	Visible vs. not visible	(30-40%) (24-39%)
Luxemburger	Broker	2007	Ontario	Paired Sales	3 NM	(15%) \$48,000
Lincoln Twp.	Committee (5)	2000- 2002	Wisconsin	AV ratio 104% v. 76%	1 mile	(28%)

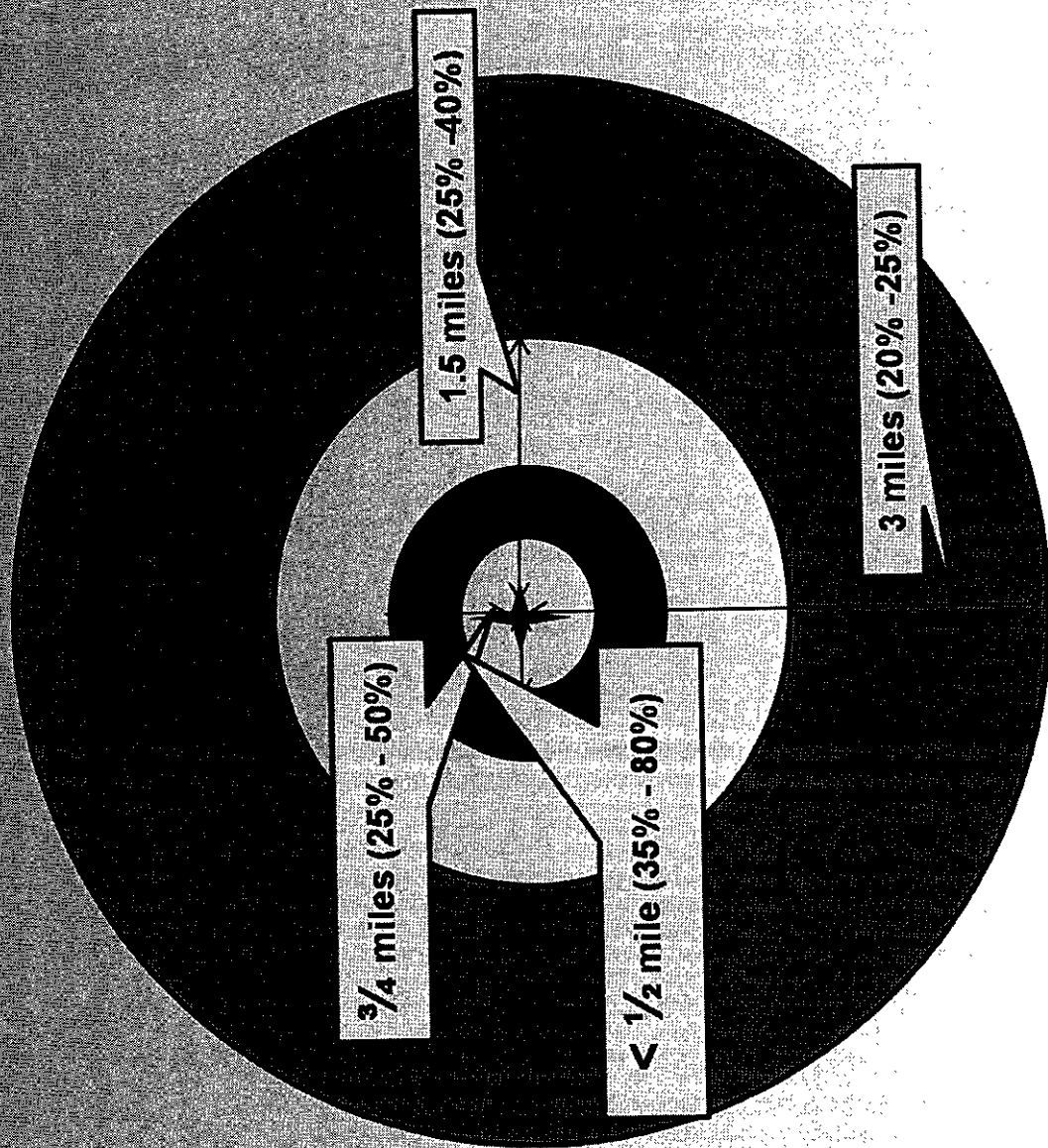
Wind Industry Funded Studies

Canning & Simmons	Appraisers (CANWEA)	2010	Ontario	Regression Paired Sales	Viewshed (6)	(7%-13%) (9%) No SS
Hinman	Academic ISU - REP Student thesis	2010	Illinois	Pooled Regression Realtor survey	3 miles 1/2 mile	No SS (11.8%) (7)
Hoen	USDOE funded LBNL	2009	9 states	Pooled regression	5 miles 3k ft - 1 mile	No SS (5.6%) (8)

Literature Review Footnotes

- (1) Lansink Resale study uses resales from developer to private buyers, with Easement in Gross condition of sale. Buyer accepts noise impacts, etc., waives liability
- (2) Lots only. No pooling of data
- (3) McCann Illinois study & research updated, multiple states
- (4) Kielisch regression lot sales; Realtor survey residential
- (5) Committee compared actual sale prices vs. AV and found homes up to 1 mile sold @ 76% of AV, and > 1 mile @ 104% of AV
- (6) Usually cited as being a study that found no impact. However, all methods used yielded negative numeric indication. Author concludes no statistical significance.
- (7) Cites Realtor who believes no impact on value > 3 miles. Concludes some results indicate "wind farm anticipation stigma" (11.8%)/Pg 55. Author states "the results neither support nor reject the existence of a wind farm nuisance stigma after the wind farm achieved commercial operation....likely due to only 11 properties selling during operations within 1 mile of wind farm." Good neighbor payments to some nearby neighbors. Values near wind farm appreciated \$13,524 after operation, following \$21,916 decline measured under anticipation stigma theory. (Net loss of \$8,392 pre- vs. post operation./Pg. 120.
- (8) Study excludes developer resales with 36% & 80% discounts from buyout price. Pooled data from 9 states 24 projects insures lack of statistical significance for value loss examples near turbines. Other sales nearby excluded due to deviation too far from mean and resale.

APPROXIMATE SETBACK IMPACTS



COMPREHENSIVE PLAN

Approval Criterion

“The proposed use shall promote the objectives of the zoning ordinance and shall be consistent with the comprehensive plan.”

Staff Report

“The central theme of the current Comprehensive Plan is farmland preservation.”

Conflicts with Comp Plan

- ✓ Aerial spraying of farmland impaired or eliminated as an option within 1/2 mile to 1 mile of any turbine
- ✓ Applicators who will fly within 1/2 to 1 mile have raised rates by 50%
- ✓ Some evidence that turbines change temp & moisture content of soils, and impact production
- ✓ 1.1 X setback creates a "no-build" zone or easement on farm land that is not participating

Fundamental Market Study

- Risk of ownership of non-participating farms is elevated by turbine proximity

Example

- Assume \$275/acre cash rent
- Assume \$7,500/acre land value – good soils
- $\$275 / \$7,500 = 3.67\%$ Cap Rate (ROI)
- Increased risk warrants 50 basis point premium
- $\$275 / 4.17\% = \$6,595 / \text{acre}$, or \$905/acre loss (12%)

Conclusions

- ✓ Tipton County Ordinance setbacks are inadequate to avoid significant loss of value, or impaired use & enjoyment of neighboring property
- ✓ Project is not consistent with Comp Plan goal of farmland preservation, from a valuation perspective

Basis for Professional Opinions

- ✓ Independent studies consistently find significant value diminution
- ✓ Appraisal studies are superior – Focus on paired sale data, resale studies, “nearby” data
- ✓ Wind Industry commissioned studies use only regression analysis
- ✓ Data “pooling” assures no statistical significance of any value loss examples
- ✓ Non-appraisers do not comply with USPAP, on several levels
- ✓ Industry favored LBNL study found to not be reliable for any public policy purposes
- ✓ Clarkson & Sunak studies use regression, but do not pool data
- ✓ Value loss conclusions are statistically significant
- ✓ Clarkson useful for distances as near as 1/10 mile
- ✓ McCann and other studies collectively support conclusion that proximity impacts values - (25%) to (40%)
- ✓ Nearest homes subject to value loss +/- (40%)
- ✓ Loss of aerial spraying option and other issues impair full rights of farm ownership (non-participating)

RECOMMENDATIONS

1. **Deny project for not meeting Conditional Use Zoning Criteria**
2. **If approved, increase setback from neighboring residential to at least 2 miles (*Developer can negotiate waivers / easements within 2 miles*)**
3. **Limit hours of operation (*Exclude night time*)**
4. **Limit height**
5. **Limit noise to 5 dBa above ambient at neighboring property**
6. **Radar activated FAA lights**
7. **Condition annual license based on project nuisances eliminated and/or effective resolution**
8. **Condition Approval on a bonded **Property Value Guarantee** (PVG) out to 3 miles**

PVG's are necessary

- Financial gain to developer and landowner/lessor should not be at expense of neighboring property owner equity.
- If applicant believes claim of no property value impact, then there will be no significant impact to them with a PVG requirement or condition.
- Several Illinois counties and numerous examples nationwide have required some form of PVG, for wind farms, landfills, etc.
- LBNL author recognizes need for PVG's to manage risks (*LBNL often cited as study claiming no value impact!*)

CERTIFICATION

The undersigned, representing McCANN APPRAISAL, LLC, do hereby certify to the best of our knowledge and belief that:

FIRST: The statements of fact contained in this consulting report are true and correct.

SECOND: The reported analyses, opinions and conclusions are limited only by the reported assumptions and limiting conditions and represents the personal, impartial and unbiased professional analyses, opinions, and conclusions of the undersigned.

THIRD: We have no present or prospective interest in the property that is the subject of this report and no personal interest with respect to any of the parties involved.

FOURTH: We have no bias with respect to the property that is the subject of this report or to the parties involved with this assignment.

FIFTH: Our engagement in this assignment was not contingent upon developing or reporting predetermined results.

SIXTH: Our compensation for completing this assignment is not contingent upon the development or reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal.

SEVENTH: Our analysis, opinions, and conclusions were developed, and this report has been prepared in conformity with the Uniform Standards of Professional Appraisal Practice.

EIGHTH: Prior to testimony, a physical inspection was made by McCann Appraisal, LLC of the property that is the subject of this report. The undersigned also utilized photographs, maps and property record card data for characterizing and understanding the character of the subject property.

NINTH: No one other than the undersigned provided significant real property appraisal assistance to the person signing this certification.

TENTH: The undersigned, McCann Appraisal, LLC has not previously consulted and testified regarding the subject property.

IN WITNESS WHEREOF, THE UNDERSIGNED has caused these statements to be signed and attested to.

Michael S. McCann

Michael S. McCann, CRA
State Certified General Real Estate Appraiser
License No. 553.001252 (Expires 9/30/2013)

Indiana Communities fighting Big Wind's Onslaught.

Welcome to Indiana Wind Watch

We are a self-funded grassroots organization of volunteers in Indiana concerned about the health, safety, and welfare of Hoosiers forced to live near industrial wind turbines. It is our mission to protect every Hoosier from the unfortunate fate of living near irresponsibly-sited industrial wind turbines.

If you live in Indiana and are concerned about an industrial wind turbine project being planned for your community, please join us.



"Destruction of our natural heritage masquerades as the pursuit of green energy." *Helen Douglas*

ok

turbines include:

- Adams
- Benton
- Cass
- Clinton (moratorium)
- Fayette
- Fountain
- Gibson
- Henry
- Howard
- Huntington
- Jay (moratorium after projects approved)
- LaGrange
- Madison
- Newton
- Posey
- Randolph
- Starke
- Warren
- White
- Boone (banned)
- DeKalb (zero shadow flicker)
- Delaware (150 ft. tower height restriction)
- Fulton (banned)
- Hamilton (all property owners within the proposed commercial WECS Overlay District are listed as co-applicants, 300 ft. height limit)
- Jasper (1,760 foot setbacks to property lines, 2,400 foot setbacks to homes, wind turbines banned north of 1200 S.)
- Kosciusko (3,960 ft. setbacks or 6.5 X height or turbine to property lines-whichever is greater, 32 dBA, zero shadow flicker, property value guarantee for landowners within 2 miles of a wind turbine, notification of project to all landowners within 5 miles of a wind turbine prior to leases being pursued in the county, non-redacted safety manual required for permit application, pre and post construction water well inspections, wind turbines limited to I-3 industrial zones)
- Marshall (banned)
- Miami (2,000 ft. setbacks to property lines and roadways)
- Montgomery (2,640 ft. setbacks or 5X height of tower to property lines, whichever is greater, BZA may increase setbacks to 3,200 feet should it deem necessary, setback one mile from a town or school, 32 dBA, zero shadow flicker, not an essential service - wind turbines are not a utility, complete decommissioning - all concrete and rebar removed from the soil, property value guarantees for residents within 2 miles of a wind turbine, wind company must notify landowners within 5 miles of a wind turbine prior to pursuing land leases in the county, non-redacted safety manual required for permit application, pre and post construction water well inspections, wind turbines limited to industrial districts)
- Noble (3,960 ft. setback)
- Pulaski (banned)

- Wabash (3,960 ft. setback, zero shadow flicker for non-participants)
- Wayne (banned)
- Wells (banned)
- Whitley (2,640 ft. setback or 6.5 X height of tower, whichever is greater, decommissioning money up front - no bonds)



Current News

[CLICK HERE TO VIEW OPPOSITION TO JASPER COUNTY, INDIANA INDUSTRIAL WIND PROJECTS](#)

NEWS FROM AROUND THE STATE:

At the Statehouse: An amendment was written into SB 535 which will grandfather in Henry and Montgomery county town safety ordinances adopted prior to January 2018. The ordinances will prevent wind turbines from being built within four miles of the town. There are 12 counties in Indiana with no zoning and no protection from wind turbines. Special thanks to all Indiana Wind Watch supporters who reached out to legislators on this issue!

Cass County

withdrew from the Harvest Wind project and canceled their wind lease contracts in Cass, Miami and Fulton Counties!

Clinton County

Clinton County Commissioners enacted a moratorium on wind development. E.ON is interested in a project there but Commissioners seem to be holding the line on their moratorium.

Fulton County

1/19 - Surveyor Seth White (surveyor elect) and new County Council member Ryan Zimpleman both replace pro-wind officials!

In Fulton County, a local citizens group opposing a proposed commercial wind farm chalked up another win. *"Two of three Fulton County Commissioners, Bryan Lewis and Rick Ranstead, signed a pledge stating that **as long as they hold public office they will not allow commercial wind turbines in the county**. Commissioner Steve Metzger, who recused himself from voting on wind related issues due to perceived conflicts of interest, refused to sign, saying he wasn't interested."*

Gibson County - Gibson County is currently under attack by E.ON and without zoning in place, are at great risk. Citizens are rightly concerned about a wind energy project being sited in their community close to homes.

Henry County

Henry County citizens are fighting off three wind companies while election results seemed to be an unofficial referendum on wind development in the county, and the people voted for No Wind candidates! Their four-mile safety town safety ordinances were grandfathered in thanks to the tireless efforts of House Representative Tom Saunders. Wind company Calpine appears to be ignoring that law and has filed for permits for a project, which could force the towns to defend their ordinances in court, even though the law is on their side!

The No Wind Henry County group put forth strong candidates for some key seats in their county and WON every election they had a candidate running in 2018! Ed Tarantino won the Commissioner's race, Susan Huhn, Peg Stefandel and Kenon Gray won County Council seats. We need more citizens across the state who care about the wind issue to take this important step and run for office and local change. New County Council member Susan Huhn was elected president of the board.

Jasper County

On 5/6/19, Jasper County Commissioners voted to approve a stricter wind ordinance that affords more protection for their citizens. Setbacks have been changed to 1,760 feet from a property line and 2,400 feet from a property line. There is a no wind turbine zone north of 1200 S. (which is much of the county). Jasper County citizens are encouraged to remain vigilant.



property lines, zero shadow flicker on non-participants, 32 dBA at property lines, pre and post construction well inspections, property value guarantees for everyone living within two miles of a turbine, property owners within five miles of the project must be notified by the wind company of the project prior to the company getting leases signed and industrial wind turbines are only permitted in heavy industrial zones - because they are not agricultural!

THIS ORDINANCE IS THE NEW SAFE MODEL WIND ORDINANCE FOR THE STATE OF INDIANA!

Here is a link to Kosciusko County's zoning ordinance. Wind energy begins on pg. 47. It is a protective wind ordinance. https://www.kcgov.com/egov/documents/1473175057_30906.pdf

Marshall County

Marshall County citizens achieved a ban on industrial wind turbines in 2013 and remain vigilant. Stan Klotz was elected County Commissioner, term beginning January 2019. He was instrumental in achieving a moratorium on wind development during Marshall County's wind fight.

Miami County

11/18 - Renewable Energy Systems' MET towers came down in Miami County!

Miami County's new ordinance with 2,000 foot setbacks to property lines and roads took effect July 11, 2018. Congratulations, Miami County Property Rights group!

Montgomery County - After a long, hard fought battle, Montgomery County adopted a restrictive industrial wind ordinance on June 10, 2019. Zoning is also adopted in their county for the first time in its history. Special thanks to Commissioners John Frey and James Fulwider for their "yes" votes on this more protective ordinance. Commissioner Phil Bane recently resigned and was replaced with Dan Guard, who did not support the ordinance with his vote. No Wind Farm Montgomery County is an active citizens group of tireless researchers and advocates for the health and safety of their community!

Posey County -

Concerned Posey County citizens have formed a group called Posey County Citizens for Property Rights and are working hard to educate their neighbors about the detriments of E.ON's proposed industrial wind turbines in Posey County. They are joining with Gibson County friends and neighbors to challenge E.ON's project which is reportedly to span Posey, Gibson and part of Vanderburgh County in southern Indiana. This proves that no rural community is safe from industrial wind turbines. It was believed for many years that wind companies would not target southern Indiana due to the poor wind speeds, but we know that if wind companies can build wind turbines higher, they will put them almost anywhere that rural citizens won't fight back and defend their property rights.

Pulaski County -

Pulaski County Commissioners and Plan Commission unanimously voted to ban industrial wind

Tippecanoe County -

Tippecanoe County Commissioners voted to ban industrial wind turbines in February! Their recommendations went to the Plan Commission, where ban language will be drafted and sent back to the Commissioners for final approval. Congratulations, Tippecanoe County residents!

Tipton County Council

The Auditor of Tipton County, Gregg Townsend, appears on a billboard in Montgomery County with a quote saying that Tipton County Supports Wind.

At a Tipton Co. Council, Mr. Townsend was questioned on this public statement appearing on the billboard. The message is being taken as a blanket statement representing the position of the entire County, which members of Council, Commissioner Mullins, and citizens of Tipton County find unacceptable.

Meeting link appears here. Go to the 1 hour 55 minute mark:

<https://livestream.com/accounts/21146465/events/8114286>

Mr. Townsend spoke openly FOR WIND at the Summer Study Hearing at the Statehouse. He spoke as Tipton County AUDITOR, as an OFFICIAL REPRESENTATIVE of his county. After the hearing, one bystander mentioned to Mr. Townsend that he failed to share with the Summer Study Members that Tipton County INCREASED their setbacks AFTER that first phase of turbines was erected.that Tipton County, by and large, does NOT support Wind or further development in the county. Now, Mr. Townsend continues to tout support for Wind Energy, portraying that the entire County enthusiastically supports wind energy, and is encouraging other Indiana counties to do the same. We say: **TAKE DOWN THE BILLBOARD, MR. TOWNSEND.**





Pro Rural Property Rights Candidates Won Big in Primary Elections and replaced Pro-Wind Incumbents in SIX Indiana Counties Fighting Wind Energy Projects including: Cass, Fulton, Miami, Henry, Montgomery and Warren Counties! We are not the "vocal minority" - We are the MAJORITY and we proved it!

Committee votes to consider changes to wind ordinance

BY CAROLINE EGGERS
ceggers@perutribune.com

To the cheers of wind farm opponents, the Miami County Plan/Building Commission voted 5-2 on Wednesday night in favor of considering drastic changes to the county's existing wind ordinance.

Over the past few months, a special committee consisting of the commission members Jason Bowman, Brad Fruth and Jon Reibly created the draft of changes in response to the prospects of Renewable Energy Systems proposal to build 75 wind turbines in Miami County.

Among the new require-

ments set forth in the document:

The center of the base of the wind tower would have to be measured 2,000 feet away from a property line, public road right-of-way, railroads, public utility easements, public conservation lands and the incorporated limits of a municipality or platted community. The current setback is 1,000 feet from a residence.

Substation setbacks from property lines may not be waived unless a recorded written waiver agreement is secured from the affected adjoining non-participating landowner.

An applicant's obligations

shall include removal of all physical material pertaining to the project improvements to no less than a depth of 10 feet below ground level within 365 days of the discontinuation or abandonment of the project, and restoration to the project area to as near as practicable the condition of the site immediately before construction.

Miami County Commissioner Larry West, who is also on the plan/building commission, pointed out that there is a 46-page document on this topic alone already being worked on.



PHOTO BY CAROLINE EGGERS / ceggers@perutribune.com

SHOW AND TELL: Carl Lowe and Dan Thiry displayed a scale model of the turbine height that they built to the Miami County Plan/Building Commission during the meeting on Wednesday evening. Commission members voted to create a new draft wind energy ordinance that would require a setback of 2,000 ft. between a tower and a property line.

See WIND / Page A5

thepaper24-7.com

Reader: Tough day for Montgomery County elected officials

Dear Editor,

Wednesday was a rough day in county politics. The Montgomery County Council held a special meeting with the Montgomery County Commissioners to lay out the commissioners budget for 2019. Projects for the upcoming year were discussed and a budget was presented to the Council for review. Jeff Peters MPA, CPA from Peters Municipal Consultants, LTD presented a budget, followed by Commissioner John Frey outlining his vision for the future of Montgomery County. Among things discussed were several road and bridge projects.

I attended this meeting out of pure curiosity to see what things would be presented by the commissioners. I went in with the expectation that this would be a very long and somewhat boring meeting outlining budgets and funds and grants. Boring, right? Oh my, no!

At one point in the meeting a heated argument broke out and Council President Terry Hockersmith had to put the whole room in a five-minute time out. During this cooling down period, the commissioners and attorney expressed their displeasure in being challenged by one of the council members. The council members remaining

in the room did not engage in this discussion and the topic died down. The meeting soon resumed and everyone behaved long enough to complete the business at hand and reach adjournment.

The largest item of contention was the proposed Memorial Bridge. This is a project to build a bridge over Sugar Creek to connect SR 47 N to US 231 N. Commissioner Frey stated a desire to build up the area along the bridge. This is a five-year project that will cost into the millions. While I do not disagree that this bridge would be most handy for many people in town and a fast cut-through for large trucks to and from the factories on 47N, I did state that I felt it might be a better idea to repair the bridges we have before building a new one. This meeting revealed that Montgomery County has 24 bridges that are in need of repair. Anyone living on the far side of the bridge on 47N knows how much they miss their bridge when it is under repair for five months. I hear it will be done soon.

Later in the day, a private citizen arrived at the courthouse to pick up a Freedom of Information Act request. Commissioner Phil Bane and Commissioner John Frey were notified of the request on Aug. 20. At

that time, word was received that the information would be collected and available for pickup on or before Sept. 4. When Commissioner Frey was asked about collecting the information, he reportedly became agitated, swore at the private citizen and said it would take two more months. He then stated that all that would be turned over would amount to about four emails.

I was told that later that day, an email was received from Commissioner Frey's secretary stating that an additional three

weeks would be needed to produce the requested information.

So, all in all, Wednesday was a tough day for Montgomery County's elected officials. However for those of us in the peanut gallery, it was quite entertaining. I do hope that in the future, our elected officials can at least display a united front for the good of the community, even if they don't really mean it.

Miriam Mershon,
Crawfordsville



WALNUT TOWNSHIP COMMUNITY DAY

SATURDAY, SEPTEMBER 8th
DOWNTOWN NEW ROSS

Theme: Make A Memory
Basketball - Car Show - Concessions
Entertainment - Food - Games - Vendor Market
Hosted by:
WALNUT TOWNSHIP COMMUNITY ORGANIZATION





April 20 at 1:09pm · 🌐

We want to hear from YOU!!

A healthy debate has started in Pulaski Co on a proposed wind energy development. What are YOUR thoughts??

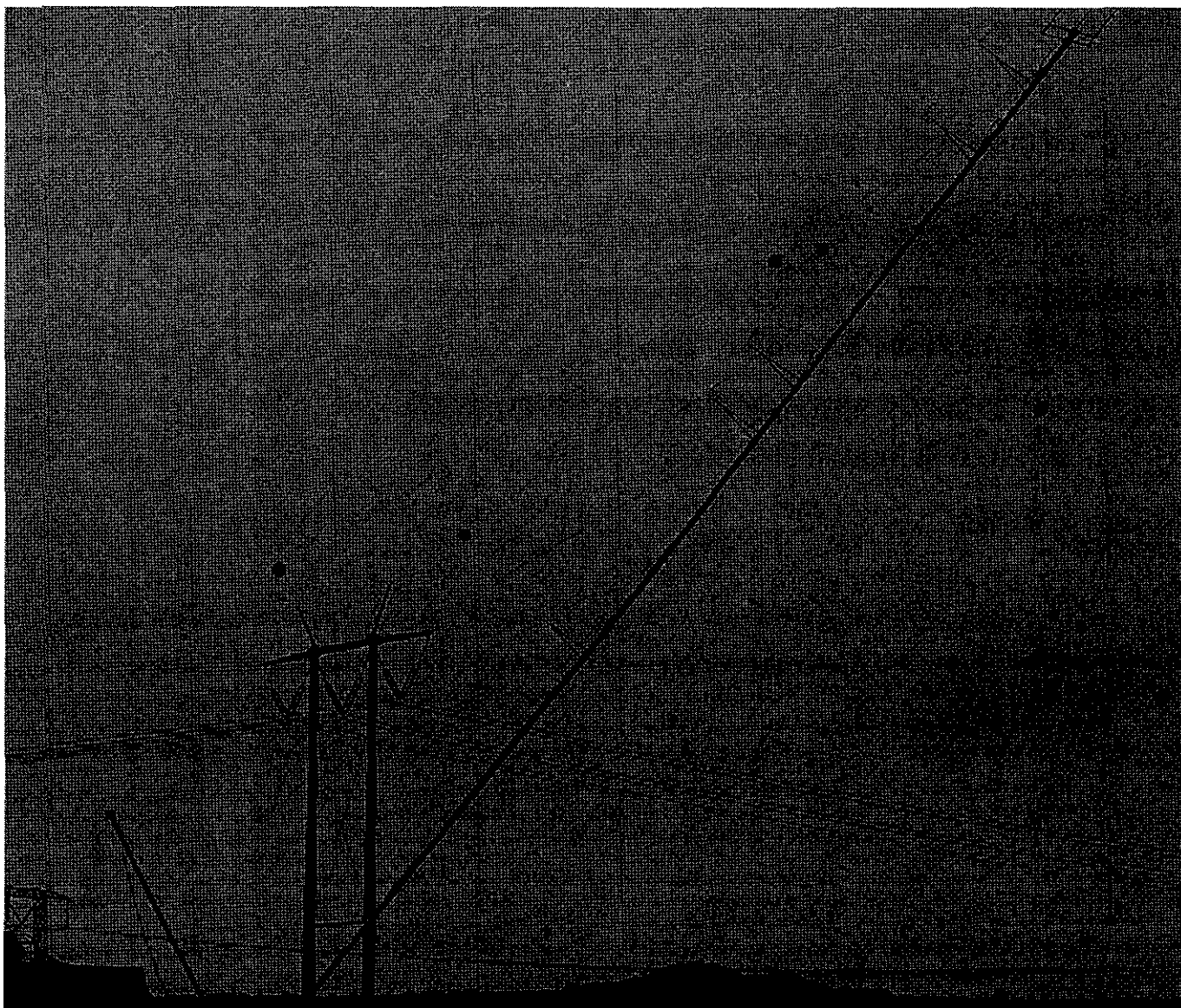
Please take a minute to complete the poll and leave a comment!!


17% For Windmill Project
83% Against Windmill Project ☑**INDIANA WIND
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574 Votes

[PHOTOS](#)[LINKS](#)

Renewable Energy System's meteorological towers in Miami County came down November, 2018!
Fulton and Cass county MET towers have also been removed!



75



Cass County Property Rights group celebrated their candidate for county commissioner, Ryan Browning and Cass County Council candidate



77



What Hoosiers Who Have Joined Us Say

"We are destroying the beauty of America, and compromising the health and happiness of the people who must live near these behemoths, for the almighty dollar. Stand up against greed. Stand up and protect your citizens." -Susie Painter Eichhorn

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* INDICATES REQUIRED FIELD

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Wind Farm Proposal Divides Ranch Community

JOY LAWRENCE | SEPTEMBER 10, 2019 | 4:00AM

About 70 miles northwest of Dallas, a few dozen buildings, a school and gas station make up the unincorporated community of Era. Residents of the area live on wide-open ranches and farms without much more than a handful of trees dotting the horizon.

A wind farm proposal is dividing the quiet, rural community. Residents who oppose the wind farm say that the company's tactics have been misleading and don't properly take into account the impact the towers would have on the community.

"I'm a big supporter of the Green New Deal," said Meredith Ellis, who runs a ranch in the area with her father. "I really like Obama's – how aggressive he was about climate and renewable energy – and for somebody that has philosophically supported those kinds of endeavors, it's hard for me to have that realization of just how wrong this whole thing is."

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Ellis was excited when she first heard about the wind farm. She knew the income from a couple of turbines on the property would be helpful for the ranch and wanted to contribute to renewable energy generation. But the more she learned about the proposal and concerns reported by people living near wind turbines, the less it seemed good. At meetings, wind farm representatives couldn't answer all of her questions.

She started researching wind farms and cross-checked the sources the company listed at the bottom of its informational flier for the Wild Cat Creek Wind Farm. Reading studies and first-person accounts, she decided it might be hard to live near wind turbines, which emit constant noise and have flashing lights at night. Quite aside from her concerns about the irritation from newly introduced noise and lights in a normally quiet and dark environment, Ellis also worries about her son, who has autism and is sound-sensitive. She worries he won't be able to stand the turbines and that they will have to leave the ranch.

A study conducted by the Canadian government and another Canadian study published by the National Center for Biotechnology Information suggest that people who live near turbines can experience decreased quality of life and heightened stress and annoyance. Both the National Institutes of Health and World Health Organization caution that noise pollution is a major concern for both mental and physical health, and a 2009 study in Sweden concluded that wind turbine noise is often more annoying than constant traffic noise.

Part of the concern about the project is that residents don't know exactly how close the turbines will be. Rorik Peterson is the director of development for EDP Renewables, the company that is seeking to build and operate the wind farm. Peterson says the company generally does not place turbines closer than 1,500 feet from residences. From her research, Ellis says she would be OK with turbines no closer than 1.25 miles, or roughly 6,600 feet from her home – the middle number in the range of comfortable distances she found through her research.

According to the company, the wind installation would consist of 52 turbines, the highest of which would be 355 feet, with 235-foot blades spread across about 15,000 acres. To date, the company has about 12,000 acres under lease. The population density of the area is the same as it is for a number of other projects, Peterson said.

"(One of our) key jobs is to work to get the local community comfortable with that," he said.

Over the past couple of decades, wind energy has become an increasingly viable source of renewable energy, one that generates electricity from resources that do not exist in finite supply like coal or oil.

Texas produces more of its power from wind than any other state and is poised to connect many more wind turbines to the energy grid in the coming years, but it does not have strict regulations about noise and placement. Instead, restrictions are left up to individual towns. California, another major wind producer, has wind turbine installation and placement rules for each county. Many of these regulations are strict, requiring specific zoning in order to have even a single turbine.

Like Ellis, Nancy Endres supports renewable-energy projects and would like to see the country reduce its usage of coal, but her property is long and narrow. Her neighbor along one side has agreed to lease some of his land to the wind energy company. Endres worries that the turbines will be right next to the property line and make her house uninhabitable. The energy company would also run a transmission line through the property.

"We would be just a corridor," Endres said. "To put it so close to people is wrong."

Endres would have no say in the placement of the turbines, because they are not on her property. She has lived in Era for 29 years and doesn't know where she would go if she had to move.

Last week, 31 property owners in Cooke County, where the farm would be located, had signed leases with the wind company. In exchange for the land leases, they will receive a cut of the profits from energy generated and rent from the wind company.

Kenneth Sicking deliberated for a year and a half before agreeing to lease part of his ranch to the wind energy company. He looks forward to the income from the turbines and says the visual of them doesn't really bother him.

"I felt like if I put wind turbines on my land it might put a bit of a damper on urban sprawl," he said.

Sicking said he hasn't been told exactly how many turbines he will have on his property. The company has told him two or three. He's hoping for three.

Jared Groce, a local real estate agent and land owner, became interested in the claim that wind farms don't decrease property value. In a healthy economy, tax value should be roughly two-thirds of the total amount the property is worth, he said. Groce examined the price of sale of every home since 2011 within 1,500 feet of a wind turbine in neighboring Muenster. He found that although the tax value of those homes didn't decrease, their sale value was less than their tax value, the opposite of how it should be.

He then looked at property sales and tax value in Cooke County in the same time frame and found that they came out at 64.5% of the total property value. Using these calculations, he estimates that the overall property values in Cooke County near the wind farm could drop by up to 49% of their current value.

"And it's a perfect comparison, windmills are like this, non-windmills are like this," he said, gesturing to show the property discrepancy he estimated between the two counties.

This kind of decrease in property value would hit the community hard, and residents worry that the community would empty out if the wind farm came to town.

"From what I've read, one of the saddest parts is how it divides the community, how people no longer speak to each other, how family members no longer speak to each other." - Meredith Ellis

"We're a small community but with a big school," said Ellis' father, G.C. Ellis. "We draw a lot of kids from a big area and we would see where these windmills are going in, rather than people wanting to move into the area, they're going to be wanting to move out."

Groce describes the sound standing back from a wind turbine as a "whomp" noise and a low vibration that you can physically feel. Others have compared it with the sound of shoes in a dryer. Standing a few hundred feet from the wind turbines at the University of North Texas, three 200-foot towers, the "whomp" sound is consistent. But what's more noticeable is the low-frequency buzzing they emit.

Wind farms can be constructed nearly anywhere, but some locations are more appealing to companies than others. Peterson, the EDP development director, says the location of this particular farm is good because of the amount of wind in

the area and proximity to power lines that can support transmission of the energy generated by the turbines.

According to the *Gainesville Register*, discussion of the wind farm started when EDP requested a reinvestment zone in southern Cooke County. These zones are designed to encourage companies to bring business and jobs to the area. Under chapter 313 of Texas tax code, companies can request a 10-year tax abatement within these zones.

These kinds of tax abatements are critical to the success of a project like the wind farm. In order for the company to be able to offer energy at a competitive price and compensate for the high cost of installation, there needs to be some offset for the high installation costs, Peterson said.

But the major taxing entities must still approve the tax abatement before it's granted. The largest of these in Cooke County is Era ISD. After outcry from residents, the school board voted against the abatement.

Peterson declined to say if the project would need to be altered without the support of the school district, but there are several other taxing entities in the county that could approve or deny abatement, including Muenster ISD. There are a number of factors that must align for the project to go forward, he said.

The wind farm will be operated by EDP Renewables, a subsidiary of Energias de Portugal, a Portugal-based company that operates 49 wind farms in the United States, Canada and Mexico, according to the company's website.

A sample lease agreement for the wind farm obtained by the *Observer* requires the signer to maintain confidentiality about the details of the lease and the company, including payments, operations, equipment, power production and capacity as well as any other proprietary information.

Several community members, including Ellis' parents, are part of a lawsuit alleging that the company and the county did not abide by conflict of interest laws in Texas and seeking a cessation of the company's operations in Era.

One of the initial properties to be leased is owned by family members of one of the Cooke County commissioners. That commissioner, John Klement, recused himself from voting on the tax abatement but voted to approve the reinvestment zone itself, saying he would not benefit monetarily from it.

Both the company and the commissioner had an obligation to file conflict of interest statements and did not, said David

Sampson, one of the plaintiffs on the lawsuit. Sampson, who served as deputy secretary of commerce under President George W. Bush, said he is disturbed by the lack of transparency in the way the company and county operated on this issue. Earlier this month, the judge assigned to the case recused herself.

"There are a lot of interests that overlap in Cooke County," Sampson said.

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Going forward with the plans even after the tax abatement denial would mean that the company had grossly misrepresented itself, because

it initially argued the project would not be possible without the tax relief, he said.

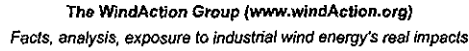
The proposed wind farm is a large source of tension within the county and between neighbors, and it's unclear how that will be resolved.

"From what I've read, one of the saddest parts is how it divides the community, how people no longer speak to each other, how family members no longer speak to each other," Ellis said.

Ellis, Sampson, Groce and Endres still support wind energy, but they don't believe turbines should be placed near residential communities.

Meredith Lawrence is a writer and photographer working on an editorial fellowship for the *Observer*. She is a former reporter for *The Puyallup Herald* and *The Sheridan Sun*. Her work has appeared on Oregon Public Broadcasting, Medium and Fashionista and she holds a master of arts degree from Columbia University School of Journalism.

CONTACT: Meredith Lawrence



None of this is new nor surprising. In 2012, acoustician Howard Quinn wrote (http://sedgwickmaine.org/2016/wp-content/uploads/2016/04/wind_turbine_sound_issues_formatted_aug_2012.pdf) that "[t]he annoying character of wind turbine sound is primarily due to amplitude modulation, which causes the sound level to go up and down continually. ... And, unlike the situation with regard to continuously occurring sound (fans, busy highways), it is very difficult to become accustomed to uneven sound. In fact, many residents have reported being more annoyed with turbine sound over time rather than less. The effect is particularly pronounced with very large turbines featuring relatively low rotation rates, where the amplitude modulation is at its greatest."

Infrasound and low-frequency noise

With audible turbine noise levels potentially well above those calculated by researchers, it is likely noise is reducing the quality of sleep for neighbors. But what about low-frequency and inaudible levels? CCA and McCunney *et al.* dismiss low-frequency emissions claiming these levels are too far below the hearing threshold to be consequential.

This was not the finding of five acousticians including Hessler & Associates (who works almost exclusively for the wind industry). In 2012, which predates CCA and McCunney *et al.*, the researchers measured "unequivocally" ([http://s3.amazonaws.com/windaction/attachments/1732/Report_Number_122412-1_21-18-12_FINAL_\(3\).pdf](http://s3.amazonaws.com/windaction/attachments/1732/Report_Number_122412-1_21-18-12_FINAL_(3).pdf)) the presence of low level infrasonic sound emissions inside a residence near the Shirley wind facility in Brown County, Wisconsin. The low-frequency noise was found to be uniform throughout all rooms and not just those facing the turbines. Long-term, the wife and child residing there reported severe health impacts and the family eventually moved away.

Hessler & Associates agreed "that a wind turbine is indeed a unique source with ultra low frequency energy" and that a "new Threshold of Perception" was needed to assess turbine noise impacts.

Steven Cooper's work (<http://www.windaction.org/posts/42202-cape-bridgewater-wind-farm-acoustic-study-a-review-of-this-study-and-where-it-is-leading#.XHbCOYhKguU>) at the Cape Bridgewater wind facility in Australia found six individuals were able to "sense attributes of the wind turbine emissions without there being an audible or visual stimulus present." More specifically, Cooper found that inaudible turbine sound emissions disturbed his study subjects even when they could not hear the turbines or see them moving. The "adverse reactions to the operations of the wind turbine(s) correlate[d] directly with the power output of the wind turbine(s) and fairly large changes in power output."

Propaganda vs. Perception

The wind industry is heavily invested in a propaganda campaign aimed at convincing the public – and decision makers – that wind turbine noise is safe at any distance. The campaign, in part, involves blaming neighbors and their negative attitudes about turbines for their discomfort while avoiding measuring the actual "swish-thump" of the spinning blades. The campaign also requires dismissing low frequency noise and for good reason. Former Vestas' CEO, Ditlev Engel has admitted that larger setback distances (<http://www.windaction.org/posts/32711-letter-from-vestas-low-frequency-noise-and-wind-turbines#.XHbCOYhKguU>) are the only way to address low frequency and infrasonic impacts, particularly on larger (3MW) turbines. Bigger setbacks means fewer locations for siting turbines near where people live.

Vestas and others can complain, but the damage from turbines can no longer be ignored. There are enough turbines operating worldwide, and enough people impacted, for the public to recognize turbine noise is intrusive and potentially harmful to neighbors. Trivial reports produced by agenda-driven researchers in Iowa are unlikely to divert attention away from this fact.

[1] (#_ednref1) McCunney *et al.* was fully funded through a grant of the Canadian Wind Energy Association. The authors 'declare no conflicts of interest,' yet the paper's primary authors, Robert J. McCunney, MD, MPH, Kenneth A. Mundt, PhD, and W. David Colby, MD each have relationships with the wind industry including, but not limited to, payments received from the wind industry to serve as experts and/or prepare reports for the wind industry that examined the potential health impacts of wind turbines. McCunney *et al.* only states that "Drs McCunney, Mundt, Colby, and Dobie and Mr Kaliski have provided testimony in environmental tribunal hearings in Canada and the USA" with no further declaration as to the nature of those proceedings or their respective paying sponsors.

<http://www.windaction.org/posts/49514-wind-turbine-noise-real-impacts-on-neighbors>

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Wind Setbacks: Safety First (unless you're a wind developer)

By Lisa Linowes (/about#llinowes) – July 1, 2014

"After years of debate there is still disagreement and uncertainty regarding appropriate safety setback distances. This uncertainty has benefited the wind industry. Thousands of turbines are erected throughout the U.S. that are dangerously close to where people live."

Last month, Ohio infuriated wind proponents by passing Senate bill 310 (http://www.washingtonpost.com/business/economy/ohio-governor-signs-bill-freezing-renewable-energy-standards/2014/06/13/730d8b44-f33b-11e3-9ebc-2ee6f81ed217_story.html), a bill that delays the state's renewable electricity standard for two years and eliminates the requirement that half of the renewables mandate be met with in-state resources.

Within days of SB310 passing, Ohio Governor John Kasich approved a change to the safety setback (<http://www.midwestenergynews.com/2014/06/19/industry-setback-changes-will-end-new-wind-farms-in-ohio/>) distances for wind turbines. Under the new law, setbacks will now be measured at the property line of the nearest adjacent property as opposed to the wall of a nearby home. In practice, this will require minimum distances of at least 1,300 feet from property lines to each turbine base.

Wind developers and Ohio's media cried foul over due process claiming the legislature gave no warning of the setback rule change or opportunity for testimony. They insisted the provision was 'anti-wind' driven by coal and oil interests intent on destroying the economics of large-scale wind and called on the governor (<http://www.toledoblade.com/Featured-Editorial-Home/2014/06/06/Wind-jammer.html>) to veto the change.

Industry Setback Recommendations

For decades, the wind industry has advanced the notion that these massive spinning structures can safely be erected a few hundred feet from where people live and gather.

The industry's preferred setback has been 1.1x to 1.5x the height of the tower (including the blade) which was derived from the fall-zone of the tower. We saw variations on this over the years beginning in California, that measured as much as 3-4x the total tower height. In general, there was no consideration in the setback distances for noise nor did the 1.1 to 1.5x setback adequately address ice/blade throw.

In 2006, the California Energy Commission examined setback standards (<http://www.windaction.org/documents/7252>) in the state. The conclusion of the study called for a setback distance just shy of 1000 feet to protect against turbine failure. [1] This distance was less conservative than what Vestas had recommended (<http://www.windaction.org/documents/16496>) (although Vestas has since eliminated this standard from its documentation and claims it is not involved in siting decisions.)

Simple math describing motion shows that ice or debris from a 100-foot long blade can be thrown nearly 1700 feet from the base of the turbine. [2] Turbine manufacture, Vestas, has reported debris from its V90 turbine being thrown 1,600 feet.

Assessing Risk from Turbine Failure

In assessing risk to the public, the wind industry typically assumes a probabilistic perspective where they examine the probability of failure and the chances of an individual being present at the time of the event. If the probabilistic assessment assumes that people are infrequently present when a blade might be thrown, for example, then it's not surprising that the industry reports a low risk of harm even at close range.

According to William Palmer, a utility reliability engineer responsible for analyzing the impact on public safety at a nuclear facility in Ontario Canada, deterministic risk assessments provide a more accurate understanding of risk and necessary mitigation measures. Deterministic risk assessments

require analysts to assume that a person is permanently standing at the limit of risk (edge of the safety zone), and are considered to be there during the accident. If people are nearby all the time, their risk of being hurt is high.

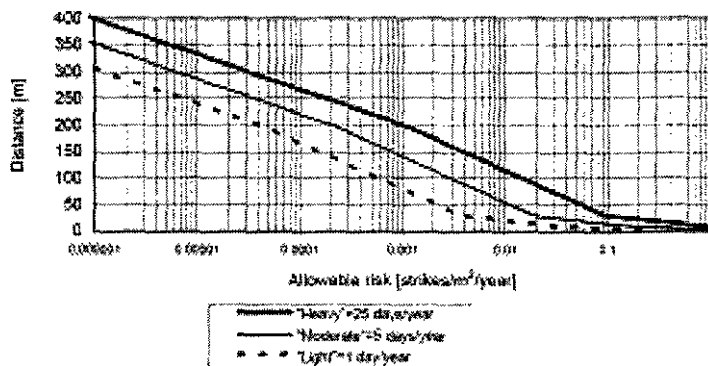
Safety cannot take a back seat to statistical probabilities but that's exactly what communities have accepted from the wind industry for years.

What About Ice Throw?

Project developers often represent that ice throw is unlikely to occur because ice generally melts gradually and slips off the blade and down to the ground below. Iberdrola Renewables made this claim in 2010 prior to receiving approval to construct its Groton Wind facility in New Hampshire. However, according to Iberdrola's Emergency Plan (<http://www.nhsec.nh.gov/2010-01/documents/140620plan.pdf>) written for Groton Wind employees and released this year, "shedding ice may be thrown a significant distance as a result of the rotor spinning or wind blowing the ice fragments."

GE Wind states that rotating turbine blades may propel ice fragments (http://site.ge-energy.com/prod_serv/products/tech_docs/en/downloads/ger4262.pdf) up to several hundred meters if conditions are right depending on turbine dimensions, rotational speed and many other potential factors.

As more turbines are sited in cold climates, the wind industry has considered safety distances based on the level of allowable risk (http://arcticwind.vtt.fi/boreasiv/assessment_of_safety.pdf). [3] The figure below maps distances from the turbines based on the estimated annual icing events at the project site and degree of risk. In colder climates, icing can occur during non-winter months.



([https://www.masterresource.org/wp-](https://www.masterresource.org/wp-content/uploads/2014/07/ice-throw-safety-zone3.jpg)

[content/uploads/2014/07/ice-throw-safety-zone3.jpg](https://www.masterresource.org/wp-content/uploads/2014/07/ice-throw-safety-zone3.jpg))

Very little public information is available that documents the frequency of ice throw and the distances flung from the turbines. Surveys have been conducted of large project operators in an effort to track the size and distance of ice fragments being thrown but the results are inconclusive as there is no way to assess how well the area around the turbines was searched, especially at great distances from the towers. One operator of a wind installation admitted large turbines will throw (<http://www.windaction.org/posts/36424-testimony-of-will-staats#.U7GgyrFnDXM>) a four hundred pound chunk of ice one thousand feet.

Conclusion

After years of debate there is still disagreement and uncertainty regarding appropriate safety setback distances. This uncertainty has benefited the wind industry. Thousands of turbines are erected throughout the U.S. that are dangerously close to where people live.

In the last five-to-six years, communities have adopted setbacks at or greater than the distance codified under Ohio law. More modern ordinances include two setback protections. The first protects property owners from ice/debris flying off the turbines. This ranges from 1300 feet to 1 mile or more away. The second setback distance is implied based on noise limits that cannot be exceeded either at the property line or the wall of an occupied building. If the noise standards are correctly applied, turbines may be erected 1.25-1.5 (or more) miles from the property line/building.

According to Mr. Palmer, the goal of public-safety risk assessment is to ensure that we do not impose risks on unsuspecting members of the public. We agree!

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[1] Noise and ice were not considered.

[2] Distance is dependent on the length of the blade, its angle at the time of the incident, the speed of rotation and the vertical distance from the ground.

[3] The distances in the graph are based on turbines with a 50-meter rotor diameter. Newer turbines have rotor diameters well over 100-meters.

3 Comments

Otter (ClimateOtter on Twitter) () • July 1, 2014 at 1:50 pm

Reposted at Deviantart:

<http://kajm.deviantart.com/art/Wind-Setbacks-NOT-Good-Enough-464813296>

(<http://kajm.deviantart.com/art/Wind-Setbacks-NOT-Good-Enough-464813296>)

Reply

Tom Stacy () • July 1, 2014 at 9:22 pm

While Ohio residents rejoice and thank the legislature and the governor for enacting the increase to the minimum setback distance, members of the public were unsuccessful in determining how the new greater distance of "1,125 ft. + the length of one blade from the nearest non-participating property line" was decided.

The problem with the new law is that eight not-yet-built projects have been approved and are grandfathered in under the old shorter setback distance (1.1 times the height of the machine). We feel that if SAFETY or PROPERTY VALUES played a role in the decision to increase the distance, then not-yet-built projects should forgo grandfathering and be required to adhere to the new statute.

Reply

Craig () • July 3, 2014 at 9:44 am

I get the feeling that this creeping green revolution is going to be met with some destructive opposition at some point. Acts of not so "civil" disobedience to stop these monsters from robbing us and destroying the land they inhabit. It would take little effort to cause windmills and solar panels to fail.

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Wind Ordinance Debate: The 1,000-foot Set-Back Standard (Are environmentalists underregulating themselves?)

By Tony Fleming -- January 23, 2012

Editor Note: Environmentalists like regulation except when it comes to 'green' energy. This post asks: what is the growing acceptance of the thousand-foot voluntary ordinance based on?

In Indiana and elsewhere, many counties are falling all over themselves to adopt the so-called "1,000-foot voluntary industry setback" between large wind turbines and residences.¹ In some states, it has become part of "model" wind ordinances created by wind developers and energy agencies.

This buffer zone (who said these structures were *environmental*?) is starkly smaller than those mandated in several countries widely touted by industry proponents as wind "success" stories. In **Denmark**, for example, the setback is four times total turbine height (or about 2,000 feet for a large turbine), along with a built-in mechanism for compensating abutters for property-value losses.

In **Holland**, it is 1 km (3,280 ft). **Germany's** noise-based setback ranges up to a full mile (1.6 km).

Dozens of jurisdictions scattered around the U.S. and Canada have also adopted larger setbacks, often in the ½- to 2-mile range from abutting residences. All of these larger setbacks are in line with what is recommended by many independent scientific bodies, medical authorities, and acoustical engineers.²

With so many localities adopting the much smaller 1,000-foot distance as a *de facto* setback, however—seemingly with little public discussion—a reasonable person would expect to find reams of scientific and legal information to back it up.

Conflicting Evidence

But despite a concerted and sustained research effort by myself and others, finding a straightforward explanation published by any government agency (or the wind industry) documenting the origin and technical rationale for such a small setback has proven *extraordinarily elusive*.

Instead, what one finds is a remarkably opaque policy-making process wherein any scientific studies reviewed or substantive deliberations that may have occurred are not readily evident from the sparse number of documents publicly available. This post is a progress report, summarizing my attempts to uncover the origin and basis of this setback.

Midwestern States

The first place I turned for an explanation is the Indiana Office of Energy Development (OED), the clearinghouse for state energy policy. The OED wind energy website contained no documents (<http://www.in.gov/oed/2615.htm>) of the state's own making even mentioning things like "model wind ordinance" or "setbacks," but it did turn up copies of wind ordinances from fifteen Indiana counties.³

Nearly every one of these counties has adopted a 1,000-foot setback from occupied structures, but none provides any discussion, or even a hint of accompanying regulatory language, of why this distance was chosen. A further search turned up several in-state news reports that mentioned the term "voluntary industry setback," but they offered nothing about its origin.

Visits to the websites of energy-related agencies in other Midwestern states also shed no light on the origin of "1,000 feet," though it did appear in both the 2003 and 2007 versions of the **Wisconsin** Draft Model Wind Ordinance (<http://betterplan.squarespace.com/wind-siting-ordinances/>),⁴ which was subsequently taken down from the Wisconsin Public Service Commission website.

One 2009 news article from Wisconsin offered some interesting insight, however: when questioned by wind farm neighbors affected by noise and shadow flicker about the 1,000-foot setback in use at that time, a spokeswoman from the Wisconsin Public Service Commission was quoted



(<http://betterplan.squarespace.com/todays-special/2009/10/13/101409-almost-two-years-later-wisconsin-wind-farm-residents.html>) as saying: "We didn't come up with that number. It is not a PSC requirement."

That left local residents wondering, "if the PSC didn't come up with it, who did? And who decided it was safe?"

California

Since my efforts to find a state agency in the Midwest who could speak to the source of the 1,000-foot setback were not bearing fruit, I next looked to the state that is widely viewed as being the epicenter of all things renewable—**California**—which has had some three decades of experience with large wind turbines.

There, the wind industry's preferred setback had for years been 1.1 to 1.5 times the height of the turbine including the blade, measured to the nearest property line and based on the fall zone of the tower.⁵ Variations on this theme persisted over the years, with setbacks ranging up to three-to-four times turbine height.

A study (<http://www.energy.ca.gov/2005publications/CEC-500-2005-184/CEC-500-2005-184.PDF>) published in 2006 for the California Energy Commission summarized the history of setback requirements in the state and attempted to quantify setback distances for debris throw (that is, the radius measured from the turbine base which could potentially be impacted by fragments of blades and other debris resulting from the breakup of a turbine in high winds).

This study looked solely at public safety resulting from debris throw, and did not attempt to examine noise or other setback issues. The authors came up with a setback distance somewhat less than 1,000 feet, while acknowledging that the result is contingent upon the assumptions made.

Using a slightly different set of assumptions, for example, physicist Terry Matilsky of Rutgers University presents (<http://xray.rutgers.edu/~matilsky/windmills/throw.html>) a convincing mechanical analysis indicating that a 1,700-foot setback is needed to protect abutters from both debris and ice throw, a number mirrored by real-world debris-throw experience.

Interestingly, the California study reported (p. 13) that, of the several counties which had existing fixed setbacks of 1,000 feet or less, none set forth any technical explanation for the setbacks. The report also observed that the authors of these setbacks were, in most cases, "wind industry people"

or "ad-hoc public/industry groups" and generally noted the difficulty of both obtaining published rationales for the setbacks, and of relating the statutory setbacks to known or calculated debris-throw distances for the specific turbine models involved.

Like its Midwestern counterparts, the information from the State of California ultimately didn't answer the question at hand, nor was any official government entity evidently willing to publicly justify the "1,000 foot setback" based on empirical evidence—an unsatisfactory result from the perspective of science, which deals in hard numbers and measurable, repeatable outcomes, and certainly not commensurate with the apparent zeal with which this and similarly small setback distances have been adopted by so many local and state governments.

Further, the anecdotal evidence from both Wisconsin ("we didn't come up with that number") and California ("wind industry people") pointed towards the wind industry as the likely source. And who better to speak to this question than the manufacturers of large wind turbines! Yet, what I found there scarcely brought clarity, and left me even more skeptical.

Wind Company Recommendations

Vestas, for example, the Danish company and world leader in wind turbine manufacturing, had this to say to its own staff in the 2007 Mechanical Operating and Maintenance Manual (<http://www.windaction.org/documents/16496>) for its V90 turbine: "Do not stay within a radius of 400 meters (1,300 feet) from the turbine unless it is necessary."

It also went on to say "Make sure that children do not stay by or play near the turbine" (contrary to the setbacks in question, which may place households with children well within that range).

General Electric, the largest domestic turbine manufacturer, has refused to site towers that do not meet their own minimum published standards (<http://www.windaction.org/documents/13913>) (1.5 times hub height + rotor diameter) for ice throw, or about 1,300 feet for a 350-foot turbine with a 300-foot rotor.

Finally, the large German turbine manufacturer **RETEXO** recommends (<http://www.retexo.de/english/wind/seite5a.htm>) setbacks of 2 km (6,562 feet) from its turbine hub, citing both safety and noise considerations.

Wind Trade Group Recommendations

an

Industry trade groups mostly lack such specificity when it comes to setbacks. the **National Wind Coordinating Committee** 's 1998 Permitting and Siting Guide,⁶ for example, suggests that setbacks of 1,000 feet to one-half mile may be needed for noise mitigation; however, the 2002 version of the guide, as well as several newer NWCC publications on siting issues, are silent on setback distances, nor do they discuss the underlying technical basis for specific setback distances, instead relying on malleable terms like "appropriate setbacks" without defining what they are.

The current siting handbook (<http://www.awea.org/sitinghandbook/>) published by the **American Wind Energy Association** (AWEA), the principal U.S. industry trade group and lobbying organization, provides no specific guidance on setbacks, only that developers need to ascertain if local setback ordinances exist.

Wind Powering America's "Wind Energy Guide for County Commissioners (<http://www.nrel.gov/wind/pdfs/40403.pdf>)" also does not mention any specific setback distance. Statements previously attributed to the AWEA website,⁷ have suggested setbacks of 1,600 to 2,467 feet (mainly related to noise), a range that implicitly suggests that local considerations should be taken into account and that one size setback does not fit all situations.

Visits to the websites of several domestic wind developers also failed to find any mention of a "voluntary 1,000 foot setback." More typical are misleading statements like "An operating wind farm at a distance of 1,000 ft. is no noisier than a kitchen refrigerator" and "Regulatory agencies agree that 50 decibels at approximately 1,000 ft. present no sound issues for residents (<http://www.windcapitalgroup.com/WindEnergy/FrequentlyAskedQuestions.aspx>)."⁸ Based on my research, it seems rather disingenuous to say regulatory agencies "agree" when they are essentially silent on the merits of the issue.

My inability to find a clear, scientific explanation for the "1000-foot setback" at any of the above sources finally led me to start looking at local wind ordinances from around the country and world, with the idea that someone, somewhere had already done the work of ferreting out the origins of "1,000 feet." But like the Indiana county ordinances, most local ordinances are just that, an ordinance, without any underlying technical background to accompany it, or at least not that is posted on a readily available webpage. And most county officials in Indiana typically will tell you that they simply followed another county's ordinance with little modification.

But a few localities did compile background information in support of their ordinances, and conveniently made it available in the form of online reports and outlines. Of these, the 2008 Setback Recommendations Report for the Town of Union⁹ (Rock County, Wisconsin) is one of the most comprehensive in regards to presenting a wide range of setback distances from around the world, and discussing their underlying technical basis (see pp. 97-105).

In this process, the town's Large Wind Turbine Citizen's Committee made a concerted effort to determine the basis for the 1000-foot setback used in Wisconsin's 2003 and 2007 model wind ordinances, culminating in the filing of two freedom of information requests to the state agencies that created the ordinance (see pp. 125-199).

No direct answer was given by the agency to support the technical basis of the setback, only incomplete minutes of meetings from 1995-2001, from which it can be inferred that lawyers representing Florida Power & Light (aka, "Nextera," a major wind developer in Wisconsin and elsewhere, including California, around the time all these "1,000-foot" setback ordinances were developed) may have written that part of the Wisconsin model ordinance.

No direct answer was given by the responding agency to support the technical basis of the setback, only what appear to be incomplete minutes¹⁰ of meetings from 1995-2001, from which it can be inferred that lawyers representing utility companies with pending wind projects were actively involved in the process and may have written that part of the Wisconsin model ordinance. This inference was confirmed in a letter (<http://betterplan.squarespace.com/todays-special/2009/3/12/31209-senator-plales-goliath-turbine-siting-reform-bill-and.html>) from the Chair of the Town of Union Planning and Zoning Committee, describing this process to his state senator, and from which the following is excerpted:

The Committee sought to learn the basis for the PSC recommendation and required a Freedom of Information request to learn that there was no rationale for the 1,000 foot setback—that the distance had been provided by a Florida utility.

Some Observations ... and Many Unanswered Questions

The results of my efforts to date can thus be summarized by the following observations.

First, it is extremely difficult to find any publicly available information from state agencies or the wind energy industry that directly addresses the scientific basis for adopting "1000 feet" or similarly small distances as the de facto setback between wind turbines and residences (or any other kind of occupied premise, including public open space).

The vast majority of county ordinances posted on the Internet, and particularly those that mandate such small setbacks, lack any published rationale explaining why a particular setback was established. This seems to be a major regulatory disconnect in view of the apparent zeal with which a considerable number of counties, and some state model wind ordinances, are adopting a 1,000-foot setback.

Second, the relatively frequent use of a 1,000-foot setback appears to result not from a confluence of independent studies or literature reviews, but rather from the common (and readily admitted) practice of one jurisdiction simply “cloning” another’s ordinance with little deliberation or modification. Indeed, other than the California debris-throw study, I found no scientific studies, or recommendations from independent authorities or wind turbine manufacturers, that supported a setback as small as 1,000 feet—and the California study pointed out that 1,000-foot setbacks were in use years before the study itself was commissioned, and could find no technical basis for them.

Simply adopting a setback ordinance because someone else did too does not constitute a scientific basis for that setback, but it does tend to result in a frequent repetition of that distance, both among zoning officials and the media, leading to a perception that it is some kind of “standard” based on empirical evidence.

Third, if there is a consensus among independent authorities, it is towards much greater setbacks, measured in miles or kilometers, not feet. The same pattern seems to be the case with jurisdictions that have taken the time to research the topic and reach their own independent conclusions.

Setback distances of 2,500 feet or more are increasingly common among such jurisdictions, with some recently adopted ordinances specifying as much as 2 km (3 Australian provinces) to 2 miles (an Oregon County). Thus, there is quite a sharp contrast between the “voluntary 1000-foot industry setback” and the kinds of distances these other entities are adopting or recommending.

These contradictions present a number of troubling questions.

Does the 1,000-foot setback have any basis in science? Or is it simply an artifact of wind industry expedience? The anecdotal evidence certainly suggests the latter is the case, as there is little doubt from either the Wisconsin or California experiences that industry representatives and lobbyists, including those with projects in the pipeline, played the major role in formulating those ordinances.

The quote from the Town of Union letter indicates that 1000 feet was simply pulled out of a hat. And, if 1,000 feet does have a justifiable basis in science and legal theory, why aren't government agencies and wind proponents extolling it? Where are the studies and the independent peer review process showing that a setback of 1,000 feet adequately removes the human health and safety issues associated with ice and debris throw, noise, shadow flicker, and other well documented side effects of large wind turbines?

The thousands of reports of such issues from around the world from people who live in such proximity to wind plants can't all be psychosomatic machinations of people ideologically opposed to wind installations: more than a few are from people who are hosting turbines and receiving significant lease payments. Perhaps most importantly, why are the small setbacks promoted by many U.S. wind developers so at odds with the much larger setbacks recommended by various independent bodies and experts who have no stake in this debate?

Conclusion: Are Renewable Energy Advocates Underregulating Themselves?

I can think of one explanation: the production tax credit, the primary Federal incentive to the wind industry, which has existed for decades, and whose value as a tax-avoidance vehicle is exquisitely dependent on producing the maximum number of kWh from any given wind project. It is not hard to imagine the structure of this tax-avoidance vehicle creating an intense need in this heavily subsidy-dependent industry to maximize the density of turbines in a given wind project, a goal that is greatly impeded by more protective setback regulations.

And, it is clearly much easier to achieve this goal when the developer can begin the local siting discussion with a lax setback requirement as the baseline. Along with terms like "voluntary industry setback," this helps create the illusion for local officials and the public that 1,000 feet is an authoritative, widely accepted standard that is protective of the community, when in fact, there is little hard evidence standing behind it.

ENDNOTES

1. Although it is the most common distance in Indiana, 1,000 feet is just one of several arbitrary and unreasonably low setback distances in use in the Midwest, such as Wisconsin's current 1,250 feet and Ohio's vanishingly small 750 feet. "Voluntary industry setback" or similar descriptors, typically offered up by wind developers and compliant extension agents in an attempt to pacify the natives, appear regularly in various media accounts and pro-wind presentations. Here is one of

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many examples: "Let Science be the Guide for Whitley Wind-farm Law (http://nl.newsbank.com/nl-search/we/Archives?p_action=list&p_topdoc=11)," *The Fort Wayne Journal Gazette*, Jan. 26, 2011, page 6A.

2. The National Research Council (1/2 mile or more (<http://dels.nas.edu/Report/Environmental-Impacts-Wind-Energy-Projects/11935>)), French National Academy of Medicine (1.5 km (<http://www.academie-medecine.fr/detailPublication.cfm?idRub=26&idLigne=294>)), and the UK Noise Association (1 mile (<http://www.countryguardian.net/Location.pdf>)) are just a small sampling of many such recommendations.

3. Wind ordinances from 15 Indiana counties can be found here. They are virtual clones of one another, suggesting that little or no independent research or critical thinking was involved in their creation.

4. None of these early setbacks take noise or ice/debris throw into account. Most of the early California wind farms were constructed in remote, largely uninhabited areas like Altamont Pass, and the main concern with setbacks was preventing turbines from falling on or interfering with adjacent turbines via the so-called "wake effect"⁶

5. Wind Turbine Breaks Up in Storm, Throws Debris 500 meters (1,650 feet)] <http://www.wind-watch.org/video-turbinecollapses.php> (<http://www.wind-watch.org/video-turbinecollapses.php>)

6. The 1998 guide was superseded by the 2002 edition and is no longer available at the NWCC website. The list of currently available NWCC siting documents is available here (<http://www.nationalwind.org/publications/siting.aspx?>).

7. The refrigerator analogy is an oft-cited claim by wind developers¹⁷, but like "1,000 feet", pinning down its origin and scientific basis is an extremely slippery business. Try Googling the statement. Or save yourself a lot of time and see what someone else discovered who did just that, here (<http://betterplan.squarespace.com/todays-special/2008/5/30/53008-who-said-an-industrial-wind-turbine-is-no-louder-than.html>). References to this or similar statements (with widely varying distances) can be found at literally hundreds of Internet sites, one of the most instructive being this video (http://www.youtube.com/watch?v=KWyNfN9HJZk&feature=player_embedded).

8. *"Wind Capital Group claims its turbines don't make any more noise than a home refrigerator, but KQ2 returned three different times over the span of a week, and we heard a much different story. The sound was the roar of the turbines filling the air, making Charlie's property sound more like an airport than a horse farm".*

– Channel KQ2 in St. Joe, Missouri reports on a wind farm operating adjacent to Charlie Porter’s horse farm, February 17, 2009 <http://stjoechannel.com/index.php> (<http://stjoechannel.com/index.php>).

9. The Town of Union’s final wind siting committee report and large wind ordinance can both be downloaded here (<http://betterplan.squarespace.com/wind-siting-ordinances/>).

10. In addition to demonstrating the ubiquitous presence of FP&L attorneys as participants in the Wisconsin Wind Power Siting Collaborative—the committee charged with developing the model ordinance and its attendant guidelines—a careful reading of the meeting minutes reveals a number of other irregularities and discrepancies. Among them are an overwhelmingly industry-dominated composition (at times there were no representatives outside of industry, utilities, and pro-wind agencies), failure to incorporate substantive changes into drafts, at least one discussion of a “FP&L project” outside of official meeting minutes, and a strong tendency to quickly squelch counties that were going off the pro-wind reservation while the model ordinance was being developed.

Tony Fleming is a professional geologist from Indiana and long-time student of the energy industry. His primary areas of professional interest include glacial geology, geophysics, ground water, and the geo-ecology of wetlands and natural areas. He received graduate degrees in Geology & Geophysics and in Water Resources Management from the University of Wisconsin, and a BS in Geology from Beloit College.

18 Comments

Mike Giberson (<http://www.knowledgeproblem.com>) • January 23, 2012 at 8:35 am
(<https://www.masterresource.org/wind-offset-distance/wind-ordinance-offset-debate/#comments>)

It is quite useful to demonstrate the somewhat arbitrary nature of the 1000-foot setback, but I disagree with the implied view of science in public policy. Scientific analysis can’t tell us what the public policy answers should be, only what the relevant facts and trade-offs are.

Practically speaking, however, if 1000 feet was inadequate, wouldn’t there be more news reports of injury or property destruction from ice throws or related hazards?

Reply

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rbradley () • January 23, 2012 at 9:28 am

The subjectivity of the 'right' environmental setbacks pits environmentalist against environmentalist. Should the beloved 'precautionary principle' be applied in this case to reject the thousand-foot rule as insufficient?

Environmentalists, please stand up.

Another question is whether a government-created situation—wind park development—allows free-market advocates open-season to use the delay-and-destruct tactics that anti-market environmentalists use elsewhere.

Reply

Jon Boone () • January 23, 2012 at 10:13 am

This is a good cursory review of the situation regarding wind noise. As one of the first to document this phenomenon in the US (see http://www.stopillwind.org/lowerlevel.php?content=Downloads_Video (http://www.stopillwind.org/lowerlevel.php?content=Downloads_Video)), at a time when the 1000 foot setback was not even considered) I realized that wind turbine noise had many faces. The audible noise is heard differentially and depends upon many factors (see:

http://www.stopillwind.org/lowerlevel.php?content=topten_8

(http://www.stopillwind.org/lowerlevel.php?content=topten_8), which was excerpted from my PSC testimony). However, for some people, the real problem is with low frequency noise, for those sensitive to this may encounter significant health consequences resulting from recurring headaches and lack of sleep.

As is the case for wind-induced bird and bat mortality, the hypocrisy shown by federal and state regulators in giving wind a pass on the noise its industry makes is palpable. And disgusting at so many levels of consideration, not least because wind LLCs whine that noise regulations inhibit their free marketing "rights."

All one has to do to see the lunacy of the situation is to substitute fossil fueled plants for wind—to see how quickly substantial noise setback regulations would be in force.

Reply

Tony Fleming () • January 23, 2012 at 4:03 pm

Mike, you raise a good point about the tension that frequently exists at the intersection of science and policy, a place where I have spent my fair share of time. I agree that science cannot (in most cases) "tell us" the policy answers, however, it certainly ought to inform them! Here, I amplify on Jon's analogy that, if anecdotal reports were disclosing a collection of new impacts on residents living proximal to fossil fuel plants or some other politically unfavored activity, you can be sure that the relevant agencies would be on it with all sorts of studies and data collection.

It may be instructive to compare the current wind situation to the complex analyses and extraordinary amount of effort that have been put into assessing cancer risk from trace amounts of industrial chemicals in ground water, where even tenuous evidence of a few-in-a-million risk can trigger fairly strong regulation. Surely the incidence of issues that has emerged around at least some wind projects far exceeds that threshold. But unlike trichloroethylene, wind is "green", so those incidences can't be real.

As shown both in endnote 5 of my post and Matilsky's paper, there is little doubt that ice- and debris throw can extend well beyond a 1,000-foot radius of a turbine. That we haven't seen many reports of property damage and injury from such events probably reflects the relatively short historical record, as until recently, such facilities were mostly located far from inhabited areas. Turbine accidents also tend to be underreported. Lisa Linowes has a good rundown on these topics

(<http://www.windaction.org/faqs/33093> (<http://www.windaction.org/faqs/33093>)).

Rob, the precautionary principle is surely a subjective thing. It tends to be invoked in a scientific context when there is substantial uncertainty over the interpretation of data, or an absence of meaningful data. In the case of wind turbines, it is hard to argue that either of these is the case. There is nothing subjective about wind turbine noise to those who are sensitive to infrasound. What does seem to be the case is an absence of science bearing the imprimatur of those promoting wind, reflecting a longstanding unwillingness to acknowledge the reality of one's own ears and eyes, as manifested through many videos like Jon's. I believe this is a prime example what Jon has aptly called "cognitive dissonance".

As one observer wryly commented, "science is the act of proving one's own assumptions wrong". That's a tough act for anyone, but a trendy green industry and the agencies enabling it seem particularly impervious to such self inspection. Of course, we wouldn't be having this discussion if our energy policies focused on capacity and reliability...

Reply

Jon Boone () • January 23, 2012 at 8:11 pm

6.2.1

Nice response. We might yet be having this discussion, Tony, even if our policy focused upon capacity and reliability, since electricity production of every stripe has its share of perceived nuisances. But at least we would then be involved in making meaningful trade-offs between functional production and the degree and extent to which any nuisances would be permitted in civil society. What is particularly galling about wind technology and the noise it makes is that the issue is so akin to how tall we should sanction ladders used by thieves as they commit second story burglaries.

Reply

julie johnson () • January 24, 2012 at 5:13 pm

In Ohio, the first wind developers established relationships with the Farm Bureau. For several years they traveled the state together under the radar screen. Whether it was the developer or the Farm Bureau, I do not know for certain but they had prepared a grid that showed how many turbines were possible in a township at 1,000 foot setbacks, at 1,500 feet; 2,000 feet and 2,500 feet. The reduction in potentially eligible sites from 1,000 to 1,500 feet was significant. The Farm Bureau went around to all the township trustees and county commissioners telling them that if setbacks were greater than 1,000 feet, wind development was not possible. When a group of citizens pushed back, the State pre-empted local control over siting while the Farm Bureau looked on grinning like the Cheshire Cat. They wanted to make sure their members could farm wind subsidies along with their beans and corn. The deal was struck in Governor Strickland's Office and they knew exactly what they were doing. That is how Ohio wound up with approximately 1,000 foot setbacks. I applaud the Ontario Federation of Agriculture on stepping forward to call the wind industry to account. It is way past time for the Farm Bureau to do likewise.

Reply

tfleming () • January 24, 2012 at 6:08 pm

Good catch, Julie. I clearly overlooked the role of the farm bureau in this travesty. In my experience, the farm bureau never met a subsidy they didn't like, no matter how bad the idea is for the greater community or the country. They have a lot to account for in the ethanol boondoggle, so your story about the stealth wind campaign doesn't surprise me.

It is my understanding that when the unelected bureaucrats of the Ohio "Public" Utility Siting Board usurped wind project siting authority, they actually reduced the setback even further, to 750 feet, an absolutely indefensible number even smaller than the industry's "voluntary" 1000-foot setback. Any idea how that came about? And whether large turbines are being sited that close to homes and schools?

Reply

julie johnson () • January 24, 2012 at 9:46 pm

The Farm Bureau was instrumental in gaining pre-emption for siting. Everpower was the first developer to surface and they hired two Farm Bureau employees. When we challenged their application, the Farm Bureau filed as an intervener and testified against us. When we appealed the Ohio Power Siting Board's certification of the project to the Ohio Supreme Court, the Farm Bureau sat at the front table in the court with the OPSB's atty. They may have filed a brief in support of the OPSB. They need to be held to account. The minimum standard was a closed door deal done without public input. When it was over, a Senator who participated in the talks wrote to the OPSB about the minimums which are based on a formula. The memo is as follows:

"I am enclosing a number of documents for your consideration in the Power Siting Board rules process established by the wind siting amendment. I continue to get emails and calls from disgruntled citizens in Logan and Champaign Counties, who feel the minimum setback established in the statutory provision is not sufficient. Of course, I was somewhat between a rock and a hard place, as Jen [Gov. Strickland aide] did not wish to be any more expansive than what the legislation provides. I keep telling these folks that the legislation specifically empowers the Power Siting Board to make reasonable additional setback requirements.

We are obviously placing a lot of trust in the executive branch and the Power Siting Board to do the right thing and to use science-based credible evidence in determining the correct criteria for where these wind turbines should go. My files are now quite full of manufacturer standards, wind working group recommendations, etc. – most all of which point to a minimum setback standard that is in excess of what we put into the statute. The citizens' concern is that the minimum standard would default to the maximum standard. I hope this is not the case, but perhaps it would be a good idea for us to meet as a small working group in advance of the rules process to get some better handle around how OPSB intends to address this issue in rules. I don't want to make it too hard to develop wind power in Ohio, and I am sure you don't either, but the quicker we could get the executive branch and agency "powers that be" to issue some sort of statement that they intend to take the rules process seriously and to base the rules on a reasoned and scientific approach consistent with best practices and industry standards, the better off we would all be. What do you think?"

That was written in May, 2008. In January, 2011, the Senator wrote again saying:

"In light of the continued correspondence, I would respectfully request that the PSB seriously consider the wind turbine manufacturers' standards for setbacks when determining setbacks for wind turbines in Ohio. As we learned while writing this language and as we continue to be reminded, many of the manufacturers call for setbacks that are more stringent than those provided for in the statute. When scientifically based studies exist that demonstrate a minimum setback that is greater than what is provided for in statute, I do not believe that those studies should be disregarded."

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I think the OPSB is a little bit less cavalier in defaulting to the minimums and as a practice, the developers are placing turbines around 1,000 to 1,200 feet from homes. In doing so, they boast of "exceeding the statutory minimums" even though 1,000 feet is wholly inadequate.

Reply

Urban Hirschey (<http://townofcapevincent.nnymail.com>) • January 30, 2012 at 8:04 am

I have been lead to understand that the World Health Organization has set a standart of two kilometers.

True or False?

Reply

Urban Hirschey (<http://townofcapevincent.nnymail.com>) • January 30, 2012 at 8:06 am

What is the World Health organization's recommentdded set back standard on Wind Turbines? Is it from homes or property lines?

Urban

Reply

tfleming () • February 8, 2012 at 11:48 pm

Urban, I have not seen where WHO recommends a fixed distance for turbine setbacks, though I could be wrong. As I understand it, WHO has noise-based guidelines (30 or 40 dbA nighttime level, depending on which version of the guidance). Ergo, that results in a de facto physical setback in the range of 2 km in order to meet the noise guidance.

Reply

News Blast from John Droz! « Save Our SeaShore (<http://saveourseashore.org/?p=1886>) • February 8, 2012 at 9:49 pm

[...] Superior article about the origins of turbine setbacks

<<<http://www.masterresource.org/2012/01/wind-ordinance-offset-debate/>>>

(<http://www.masterresource.org/2012/01/wind-ordinance-offset-debate/>>>); [...]

Reply

Recent Energy and Environmental News – February 2012 « PA Pundits – International (<http://papundits.wordpress.com/2012/02/10/recent-energy-and-environmental-news-february-2012/>) • February 10, 2012 at 6:03 am (<https://www.masterresource.org/nuclear-power/tuckers-terrestrialism-modernity/#comments>)

[...] Superior article about the origins of turbine setbacks

<http://www.masterresource.org/2012/01/wind-ordinance-offset-debate/>

(<http://www.masterresource.org/2012/01/wind-ordinance-offset-debate/>) [...]

Reply

GeorgeG () • February 17, 2012 at 12:12 pm

This whole article and several assumes that there is some magic number. That is an incompetent risk analysis. Mitigation must be proportional. Setback distances should be based on operating sound levels as well as hub height and blade length as well as base elevation and surface structure. All of these factors will vary from one turbine to another and from one site to another.

Try this one on: why is the typical residential speed limit 30 miles an hour? Given the number of fatalities each year it is surely not a safe number that any science could support – how slowly does a car need to be moving when it hits you not to do injury? The most ‘science’ one can find is that this is twice the 15 mph which was the original common limit based on the theory that going faster would be injurious to lady passengers. The scientific answer is that there is no practical speed which is intrinsically safe.

The water quality at my cottage has been degraded by smokestacks nearly 100 miles away. Scientifically, a setback of at least 2000 miles from any similar body of water should be observed. Prof Fleming: Indiana produces about 95% of its electricity from coal. Please stop — you are inside of my scientifically based setback distance.

Reply

Kathleen Miller () • October 29, 2017 at 12:39 pm

Exactly Sir, Keep your unsafe setbacks off my property completely. Thank you very much!

Reply

Tom Stacy () • May 17, 2012 at 7:50 am

///

In Ohio a recent blade shatter episode occurred in winds no higher than 35MPH – well within the standard operating range of the devices. Two blades apparently flexed too much as they passed the tower, causing collisions that moments later sent sharp pieces weighing hundreds of pounds sailing through the air. The vertical drop in such cases is between 150 and 400 feet. In this case, the debris field spread horizontally 1,150 ft. from the tower.

It seems reasonable that nearby property owners should be able to use their full property safely – not just the inside of their dwelling. In fact the dwelling offers a degree of protection from blade debris that being outdoors on one's own property does not. This is why setbacks from dwellings is only an applicable standard when it comes to nighttime noise and infrasound because people usually sleep in their dwellings. Ohio Senator William Seitz recently offered an amendment to Governor Kasich's energy bill based on the empirical evidence of this debris field. The amendment would have superceded language related to dwelling setbacks, and increased the property line setbacks from 1.1 times total device height to 1,250 ft. The amendment was rejected for reasons we do not yet understand. This circumstance looks (to this non-attorney) like it ripens civil action against the state for negligence. Class action must begin with plaintiffs, not counsel.

Vestas and Nordex both published "do not linger" radius recommendations for the maintenance personnel of their customers in safety and operator manuals. For Vestas the minimum was 1,300 feet; for Nordex, 1,620. Adjacent property owners would be well advised to "not linger" on their own land within the same distances from wind turbines on nearby properties. If that does not represent an illegal taking of property rights, John Kasich please explain to us why not. Ohio may have some of the safest regulations to protect people from hazards associated with natural gas development, but they cannot say their wind energy siting regulations are prudent.

Reply

Tom Stacy () • May 17, 2012 at 10:29 am

To be clear, setbacks in Ohio are 1.1 times the height of the turbine to non-participating property lines, and 750 ft' plus the length of one blade from the foundation of a home. These two standards are considered independently. A blade is typically about 150 ft. long, so the effective setback from a home is 900 ft. with today's technology.

"Remember, a bumper crop of grain can be stored in a silo. A bumper crop of wind energy must be consumed on the spot!"

Reply

Proposed Campbell County Temporary Zoning ORDINANCE #2019-1 - Attorney Blog | Natural Resources, Commercial Law - Attorney Blog | Natural Resources, Commercial Law (<https://www.lexenergy.net/proposed-campbell-county-temporary-zoning-ordinance-2019-1/>) • January 28, 2019 at 10:14 am

[...] [1] See Tony Fleming, Wind Ordinance Debate: The 1,000-foot Set-Back Standard (Are environmentalists underregulating themselves?), *Master Resource* (Jan. 23, 2012), <https://www.masterresource.org/wind-offset-distance/wind-ordinance-offset-debate/> (<https://www.masterresource.org/wind-offset-distance/wind-ordinance-offset-debate/>). [...]

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CHAPTER ONE

INTRODUCTION

Gail Moyer Opposition Testimony
Republican Wind LLC, OPRB# 17-2295-EL-BGM

6A1C MOYER
EX. 1

The Village of Gibsonburg is focusing upon a targeted industrial area on the southeast side of town, as well as on the northern edge (Creekwood Farms, with 220 acres annexed into the Village on the west side of S.R. 300, with rail access), and infrastructure improvements have been planned for the southeast industrial site. As with the other communities mentioned, a general pattern incorporates the continuation and possible expansion of enterprises that have located in industrial "pockets" closer to the city center since the early 20th century, now complemented by targeting of sites for a cluster of new businesses on industrial parcels of 50 acres or so. These sites typically have access to a state highway or U.S. 20, and many also have rail access. Their development by the public sector has been aided greatly by the efforts of an active team of developers who have had repeated success in developing and selling or leasing industrial properties.

Residential growth has also continued, albeit relatively slowly, over the last twenty years, while the County's population has decreased. The location of such new residential development continues to be split between population centers and rural areas of the county. This decentralized residential growth is most notable within Ballville Township, south of Fremont, and along road frontages of township and other county roads. Housing has been developed on Bellevue's west side as well.

II. Purpose of the Plan

EXHIBIT
Gail Moyer
1
9-12-2019
68861-153-008 (0/0) PENDING

The Sandusky County Comprehensive Plan is a long-range plan used to guide growth and development. Among the duties ascribed to County and Regional Planning Commissions under Ohio Revised Code 713.23 are preparing such plans, including studies, maps, recommendations, and reports. However, while a variety of consulting duties of the commission are listed, the plans are not binding and not required to be followed because of the phrase "may adopt such plan". This update to the 2003 plan thus presents current information on county demographics, development trends, and public facilities, and presents a set of recommendations for local decision-makers to consider.

A comprehensive plan establishes recommendations for determining what types and densities of development are most appropriate in what areas of the community, including where development may be best accommodated and where resources are readily available to revitalize already developed areas. The update also highlights the current condition of streets, water and sewer lines, and other public facilities needed to support future land uses and what important environmental and cultural resources should be protected.

The Comprehensive Plan is the statement of development policy for Sandusky County by the many public and private officials and residents who participated in the planning process. The Plan presents a series of goals and strategies to guide the preparation of future County regulations and the application of County programs. These goals and policies are organized in eight functional categories dealing with population and demographics, economic development, housing, quality of life (including historic preservation, parks, recreation, and open space; education; health and health care; and public safety), natural resources, land use, public utilities, and transportation. Each section contains a summary of important issues and trends, a statement of goals and a list of strategies, and recommendations that the County could use to address these goals. Also included is a chapter on current planning tools available to the County and its political subdivisions to promote and guide growth and development. That chapter is not intended to require or even suggest implementation of each strategy, but as a reference to inform the reader of options available within Ohio to help address locally-established goals.

Excerpts from the

CHAPTER ONE INTRODUCTION

The Plan works best with public support and understanding, as well as far-sighted leadership by public agencies, many of which were instrumental in the development of the Plan, to support its vision and goals. In addition to serving as a guide to the expenditure of public funds in the acquisition of land and the siting and construction of public facilities, the Plan provides useful information to help inform the separate development of locally-generated zoning and subdivision regulations, which are recommended for the health and safety of County residents, and to achieve orderly growth and a beneficial pattern of land use. Thus the Plan has no enforcement power to govern or enforce specific development decisions, but it offers a series of planning principles which, when consulted, can assist in preserving the positive vision for the County's future.

☆ All decisions should be made in light of the strong history of private property rights enjoyed by citizens of our country. Sandusky County residents have chosen to allow most land-use control to be exercised at the Township level in order to ensure that these controls are responsive to the needs and wishes of residents. The plan does not advocate the expansion of these controls at the expense of property rights or the reduction of local authority.

Sandusky County, local jurisdictions, and other entities, have prepared and will continue to prepare a variety of specific plans and ordinances. Among them are the County Comprehensive Water and Sewerage General Plan, Sandusky County Comprehensive Economic Development Strategy (CEDS), Sandusky County Comprehensive Housing Improvement Strategy (CHIS), Solid Waste Plan, various zoning resolutions, and subdivision regulations. In an effort to promote collaboration and continuity and effort has been made to dovetail the goals of those more specific plans with the recommendations and suggestions offered in this Comprehensive Plan.

III. How to Use the Plan

In simple terms, the Plan is a tool for dealing with change. More specifically, it can be used in at least the following six ways:

1. As a basis for the development of public programs and regulations, e.g., community services and facilities, thoroughfare, water and sewer services; zoning regulations; land use; etc.
2. As a basis for decision on specific land use changes as reviewed through zoning regulations.
3. As a basis for the measurement and evaluation of changes in the physical, social or economic makeup of the County. Out of this process may come modifications of the Plan.
4. As a means of intergovernmental coordination and understanding.
5. As a means of communication and education for the public.
6. As a basis for private decision-making regarding the nature and timing of land development and conservation activities.

This update has tried to describe a number of public works and capital improvements projects that are of high priority. Some will be undertaken in the short run, while others have a longer time frame for implementation. In most cases, implementation is dependent upon obtaining sufficient funding from outside and local resources. An overarching need is to constantly seek outside funding sources for the priority projects listed within

9. Continue support of organizations like the Sandusky County Regional Planning Commission, Sandusky County Economic Development Corporation and Chamber of Commerce of Sandusky County, as well as other county-wide and community based economic development practitioners and organizations.

Workforce Development Objectives:

1. Continue and expand the cooperation and coordination between local, state, and federal agencies and entities engaged in workforce development activities and decision-making.
2. Expand Sandusky County's available talent pool of skilled workers, and ensure that workers' skills are matched with current job opportunities
3. Improve the employability of the county's labor force through the design and implementation of training programs and needed support services such as transportation and childcare.
4. Help small businesses gain better access to the workforce training system
5. Facilitate regional coordination of workforce training and education
6. Implement monitoring programs that measure program outcomes and support accountability.
7. Take steps to overcome personal barriers related to substance abuse that prohibit employment.

B. Housing

Housing Goal To ensure an adequate supply of housing to meet the diverse needs of Sandusky County households, including housing size, amenities, location, accessibility and affordability

Objectives:

1. Provide housing alternatives to meet the needs of all segments of the population, particularly the elderly and LMI residents
2. Promote housing developments in a safe, quiet environment that is healthy, convenient, and attractive, ensures stable property values, and affords opportunities for all citizens.
3. Promote Energy Star new construction or retrofitting existing housing to increase efficiency and reduce utility costs to owners and renters.
4. Support the innovative re-use of vacant or under-utilized buildings for housing alternatives.
5. Utilize and periodically update the Sandusky County Community Housing Investment Strategy, or CHIS.

C. Quality of Life

Overall Quality of Life Goal Promote Sandusky County as a place to reside, work, shop, obtain necessary services, and pursue leisure activities.

Historic Preservation Goal: To preserve Sandusky County's rich history through renovation and restoration of its most vulnerable historic buildings and sites.

CHAPTER ONE INTRODUCTION

1. Incorporate planning and development elements that promote and facilitate healthy lifestyle choices, including walkable neighborhoods, pedestrian and bicycle safety, trails and green space, and other provisions for passive recreation.
2. Promote and publicize programming by local communities, agencies, and health care providers that offers education and information pertaining to healthy lifestyle choices.
3. Promote and publicize the availability of a wide array of both general and specialized health care providers throughout Sandusky County, and support their efforts to develop new facilities and capabilities in response to local needs.

D. Natural Resources



Natural Resources Goal: To protect and preserve Sandusky County's natural and significant resource areas

Objectives:

1. Identify areas of natural and significant resources within Sandusky County;
2. Establish conservation, restoration, and preservation methods to assist in the retention of natural amenities and scenic beauty;
3. ~~Encourage site design that protects the natural terrain and groundwater, preserves or restores significant vegetation and scenic views, and incorporates native vegetation into landscape plans;~~
4. Limit or mitigate development within flood hazard areas.



E. Land Use

Land Use Goal: *To promote the coexistence of all land uses, with sensitivity to the needs and impacts of each.*

Objectives:

1. Guide growth patterns to promote efficiency of travel and offer the best return on public investment, placing special emphasis on areas currently experiencing growth or designated for future growth by local officials:
 - ┌ Areas identified by municipal and township officials;
 - ┌ The Sandusky County Airport as a site for future industrial development;
 - ┌ The US 20 corridor from Fremont to Bellevue and west of Woodville;
 - ┌ SR 53 north from Fremont, SR 51 from the Turnpike at Elmore to the south; and
 - ┌ other growth areas identified in the "Growth Areas" map included within this Plan.
2. Encourage neighborhood commercial and mixed-use business areas, especially outside larger municipalities.
3. Encourage the creation of zoning in unzoned political subdivisions.
4. Encourage the use of planned unit developments to mix housing densities and offer incentives for open space.
5. Protect areas that are sensitive to change: wetlands, riparian corridors, other environmentally sensitive areas and habitats including the Sandusky River and other significant streams, historic artifacts and cultural facilities, and prime farmland.



6. Utilize methods that preserve prime farmland and special resource areas.
7. Encourage the development and use of innovative tools that promote community history and community revitalization, such as the Fremont downtown historic overlay district.
8. Encourage the use of tools that assist coordination between adjoining and nearby jurisdictions, with the emphasis on minimizing land use conflicts and promoting revenue sharing arrangements.
9. Continue to incorporate broad public involvement within land use planning processes.

F. Public Utilities and Infrastructure

Public Utilities Goal: To perpetuate the County's public utilities in a safe and efficient manner to accommodate existing and future growth needs, by addressing the following objectives:

Note: In current planning practice, the term infrastructure involves a broad array of physical investments in the provision of utilities, accessibility, and amenities that render a site or area suitable for development. In the context of this comprehensive plan, public utilities includes water storage, treatment, and distribution; sanitary sewerage and treatment; storm sewerage and provision for drainage of developed property; distribution of power sources (electricity, natural gas), and information and communication networking (telephone lines, fiber optics, wireless communication towers and equipment).

Water and Sewer Services Objectives

1. Promote industrial site planning in designated growing or growth areas with sufficient infrastructure.
2. Guide development of adequate infrastructure to targeted locations.
3. Pursue the feasibility of providing water of adequate quality and capacity to special areas with documented health and human safety issues.
4. Establish standards and criteria for consideration of cumulative impacts of on-site septic systems upon surface and groundwater quality.
5. Discourage "rural water" infrastructure sized for low-density residential use in areas where future industrial or other higher density development is anticipated. The source and capacity of water provided should match the needs of the users in any given area.
6. Develop cost effective methods to provide services to unincorporated areas of the county with documented groundwater and septic issues.
7. Recognize the importance of programming and budgeting for maintenance and operation of existing infrastructure to maximize its useful life.
8. Approach storm and surface drainage issues on an effective regional or comprehensive basis.

Telecommunications and Energy Infrastructure Objectives

- The City of Bellevue has accommodated new development in several locations radiating from the center of the city. These include property adjacent to SR 269 straddling the Sandusky-Huron County line on the south edge of the city, a 53-acre industrial park within Huron County in the city's northeastern quadrant which is served by infrastructure through a combination of federal and state grants, and (most important for purposes of this document) continued growth along the US 20 corridor extending west into Sandusky County, as described previously. Along this latter corridor, an industrial area was developed between SR 20 to the north and the Norfolk Southern railroad tracks to the south. A number of significant industrial investments have been made within this area, and the City invested in one such property at the time that a manufacturer left their Bellevue location, purchasing the property and converting it to a City Hall, police and recreation headquarters, and other municipal facilities. This has helped establish the western end of the city as a center of growth for industrial, office, and commercial growth. A number of investments in new commercial and office (primarily medical) space has followed along Route 20 West, and with the extension of utilities further west, continued westward development is likely.
 - An 81,000 square foot building and 40,000 square foot building are being marketed within this area, the Bellevue Hospital relocated to a new campus on the west side, and residential development has occurred within close proximity of the US 20 corridor. Utility suppliers in this area include First Energy (Ohio Edison) and Columbia Gas, and rail service is available to portions of this area by Norfolk Southern.60
- The Village of Gibsonburg continues to market certain sites for industrial development, including a potential industrial park on the eastern edge of town along SR 600, as well as the Creekwood Farms development, where 220 acres were annexed to the Village and zoned industrial. Some 60 acres are available in this vicinity, with electricity available from First Energy (Toledo Edison) and natural gas from Columbia Gas. However, a sanitary sewer extension of 1,600 feet is required to further develop the site as an industrial park. An additional five-acre site is available on S. Windsor Drive for commercial activity. An annexed area on the north side also offers potential for manufacturing activity, bolstered by the proximity of three quarries holding some five billion gallons of raw water.

- Economic development officials have worked to develop and market prime properties within close proximity of the Sandusky County Regional Airport south of US 20 in Green Creek Township. A new strategic plan and vision for the airport is currently being developed. A water line extending in the vicinity of the airport, delivering water to Green Springs from the City of Clyde has increased the potential for development of the area. The airport is viewed as a significant attractor for air-related or dependent business. It features a 5,500-foot concrete runway, 100 feet wide, with a Unicorn 123.05 and Sandusky VOR approach. An air ambulance and their staff are now based at the airport, servicing Northwest Ohio's emergency needs. Recent expansion of the airport included construction of an East parallel taxiway (1,822 x 35'), improving the safety and capacity of aircraft operations on the runway.

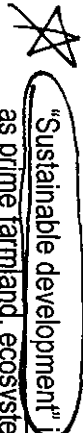


existing structures and rebuilding. In such as case, subject to zoning, a number of possibilities can be envisioned (hotel/resort/meeting facility; multifamily housing; new commercial requiring large lot size – such as automotive, truck, marine, or implement dealership; restaurant; light industrial).

The variety of resources available within the county, coupled with federal and state programs, should be targeted to the creation and growth of small business. These include the counseling services provided by the Small Business Development Center based at Terra State Community College, Small Business Management classes offered at Vanguard Sentinel Career Center, the variety of classes and trainings offered through the county's educational institutions, and capital financing resources offered through area business revolving loan funds. While emphasis is placed on the development of industrial parks and sites, suitable locations and resources for small business should be catalogued by local economic developers as well, including lower-cost sites in older and vacant existing buildings, with information available to interested entrepreneurs.

3.6 Consider and incorporate the concept of sustainable development

Meets Economic Development Objectives 3, 4, 5, 6.

 "Sustainable development" incorporates concepts of environmental stewardship, to ensure that development patterns protect natural resources such as prime farmland, ecosystems, and watersheds. Resource development should be undertaken using sound practices that ensure that resources are not depleted faster than the earth's ability to replenish itself. Conservation and restoration are thus considered as a normal cost of doing business. More recently, the concept of sustainable development has also come to incorporate the notion that the local economy should sustain the area's residents with jobs that can affordably sustain their households.

Much has been written considering this term. In 1991, the Local Government Commission brought together a group of architects to develop a set of community principles, including how the community should relate to its region. The resulting principles were presented in the fall of 1991 to about one hundred elected officials at a conference in the Ahwahnee Hotel in Yosemite. These "Ahwahnee Principles", which are cited to this day as a good framework for sustainable development, include the following:

- All planning should be in the form of complete and integrated communities containing housing, shops, work places, schools, parks and civic facilities essential to the daily life of the residents.
- Businesses within the community should provide a range of job types for community residents.
- The community should have a center focus that combines commercial, civic, cultural, and recreational uses.

3. Long-term maintenance. Has the Park District factored site and facility maintenance and operation into its overall budget from now on?
4. Is the site or facility accessible via safe and adequate roadways, and is safe parking of suitable capacity available to meet expected demands?
5. Is the use of the land as parkland or open space precluding a more beneficial or significantly more productive use of the land? Does the property contain special or distinctive natural features that present it as a unique opportunity for preservation as a park or open space?

GOALS AND OBJECTIVES

Parks and Recreation Goal: To promote the health and well-being of residents through the encouraged use of active and passive recreational outlets.

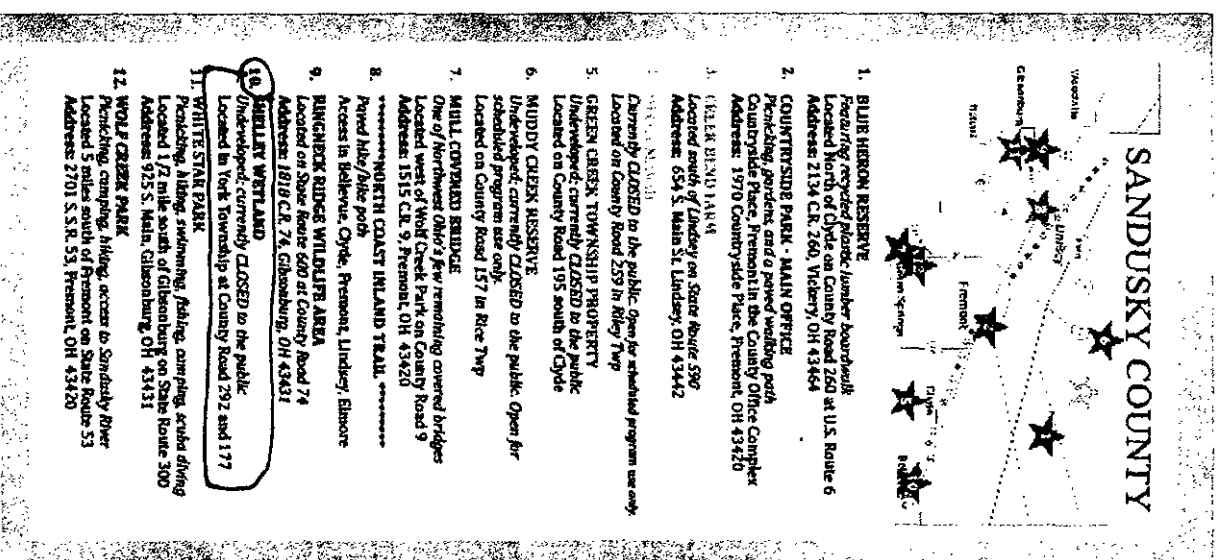
Objectives:

1. Provide a well-balanced array of recreational activities and outlets.
2. Pursue the feasibility of seeking additional revenues for the Sandusky County Park District and community park and recreation departments to expand operations and its recreational inventory.

EXISTING CONDITIONS AND TRENDS

Countywide parks and recreational facilities are promoted and supervised by the Sandusky County Park District. Governed by a Board of Park Commissioners, the Sandusky County Park District operates with an annual budget of approximately \$1,400,000. The largest revenue source is a ten-year, 1.0 mil levy that was passed in 2007. This levy provided \$1,000,000 in 2011. Other sources include user fees (such as fees for scuba diving and swimming in White Star Park) and grant funds. Major facilities owned and operated by the District include:

- White Star Park, 800 acres, located ½ mile south of downtown Gibsonburg on State



- Creek Bend Farm: located on 654 South Main Street in Lindsey. This property is listed as the Overmyer-Waggoner-Roush Farm on the National Register of Historic Places and is managed as a 1930's-1950's era family farm by the Sandusky County Park District. The property contains restored timber framed barns, an historic house, a certified tree farm, two miles of Muddy Creek, restored riparian areas, and trails. Modern and historic farming techniques are demonstrated on the property.
- Ringneck Ridge Wildlife Area is located at 1818 County Road 74 in Washington Township. The 360-acre wildlife area provides public hunting and nature trail access.
- ★ Shelley Wetland is a 17-acre wetland donated by the Paul and Kate Shelley Family and is located at the intersection of County Road 177 and York Twp. Road 292. Access to the wetland is located at the North Coast Inland Trail parking lot on Township Road 292.
- Muddy Creek Reserve is located at 1675 C.R. 157 in Riley Township. The 82-acre reserve contains forested wetlands, diked mashes and Muddy Creek access. The area is presently open for program use only.
- Decoy Marsh is a former private hunt club property located at 2700 C.R. 259 in Riley Township. The 67-acre marsh contains diked marshes and access to Green Creek for popular canoeing programs. The area is presently open for program use only.

In addition to these facilities, which are maintained by Park District staff, the District offers area residents and groups a variety of programs to better their understanding of the bounty of resources available within the county. Nature walks include night hikes, a river walk, and general nature walks. A variety of nature talks are available as well. Reference materials, including books, lesson plans, materials, compact discs, and slide shows, are also available for loan for educational purposes. The district provides some 300 such programs annually. A focus of these programs is to engage participants of all ages, especially children, to reconnect with the natural world around them.

The Park District is responding to new demands and new priorities. A major new thrust is in the area of wetland and stream restoration. An ultimate goal is to be able to control targeted corridors, limit development, and preserve their natural features.

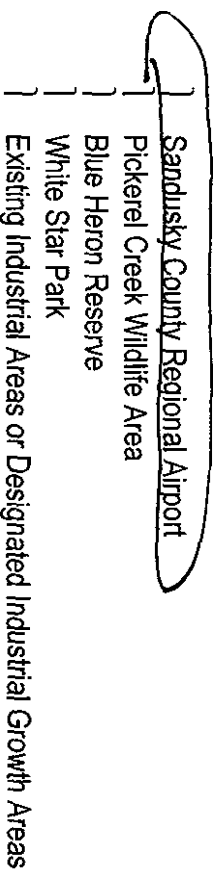
Three areas of focus include flood plain areas along Muddy Creek in Washington Township from the Shade Road area north through Lindsey and Rice Township to the Sandusky Bay, the Sandusky River flowing through Ballville Township, Fremont, and Sandusky, Rice, and Riley Townships to the Bay, and the Green Creek corridor, flowing from southern Green Creek Township, through Riley Township into the Sandusky Bay. A fourth corridor also receiving attention in Sandusky County, within the context of a larger planning area being considered by the Toledo Metropolitan Area Council of Governments, is the Portage River corridor, which extends through the township and village of Woodville at the county's western edge.

Strategies and Recommendations

7.1 Encourage compatible land uses contiguous to sensitive areas Meets Land Use Objectives: 1,4,8,9

Sensitive areas can range from those with environmental constraints to the Sandusky County Regional Airport, where compatible land uses around the airport are absolutely vital to health and human safety, but also to its overall economic viability. It is recommended that areas sensitive to incompatible land uses receive additional attention in land use or zoning documents prepared by or for the affected political subdivision.

Some areas around the county that may require buffering from incompatible land uses are:



7.2 Utilize tools that promote intergovernmental cooperation. Meets Land Use Objectives: 1,2,3,4,7,8,9

The use and promotion of these tools may allow participating political subdivisions to guide growth and development closest to established areas with suitable infrastructure. The common theme among these tools is that all participating parties, both public and private, benefit from growth. There are several methods that can be used, such as Joint Economic Development Districts¹ (JEDD), Cooperative Economic Development Agreements² (CEDA), Enterprise Zone Agreements³, and Community Reinvestment Areas⁴ (CRA). Since the initial plan was written, a dual-county JEDD has been under development in the vicinity of the SR 51 Turnpike interchange near Elmore in Ottawa County.

In 1999, the Ohio legislature passed legislation which allows political subdivisions to enter into cooperative economic development agreements with each other to address concerns associated with economic development, growth, and annexation.

¹ Ohio Revised Code (ORC) 715.69

² ORC Sections 701.07 and 709.192

³ ORC Sections 5709.61-69

⁴ ORC Section 3735.671

Gail Moyer Opposition Testimony

Republic Wind, LLC, OPSB# 17-2295-EL-BGN

Excerpts from the Seneca County Comprehensive Plan Update 2001

In order to promote positive economic growth countywide, there should be a cooperative understanding between all agencies, citizens, and public officials so all parties can be involved in new industry proposals.

Recognizing agriculture as integral to the economy and character of the County, prime farmland should be preserved. Methods of preservation included the use of restrictive wills, trusts, government programs, and keeping farms in the family.

Several problems related to the implementation of a farmland preservation plan were identified. Two of these were funding issues and the **buyout of development rights by private corporations** that may seek to prohibit farming. Other concerns were **lack of respect for private property rights** and lack of support for agriculture among the citizenry.

The group cited growth management as a means to plan ahead for growth and prevent the further environmental degradation of the land

However, given the citizenry's concern about loss of prime farmland and land conversion, growth management will be a valuable tool as the County faces development pressures in the future.

Goals, objectives, and policies for Seneca County were developed as a result of input from focus groups, interviews with local officials, and citizen surveys. **Three themes emerged as primary goals of the Plan: Quality of Life, Balanced Growth, and Efficient Services. A focus on these principles will permit Seneca County to accommodate growth while retaining the character and inherent attractiveness so important to the citizens of the County.**

The following major goal statements and objectives reflect these three themes. More specific policies and implementation strategies for each goal are detailed in Chapter 9.

1. Maintain and enhance the standard of living for all citizens of Seneca County.

- 1.1 Increase the economic development potential of the County.
- 1.2 Provide a range of housing choices for all residents.
- 1.3 **Ensure all residents have access to quality open space** and recreation opportunities.
- 1.4 Preserve and protect historic sites and structures in the context of their natural settings.
- 1.5 **Maintain the rural character of the County**

2. Encourage growth that focuses upon existing urban areas and respects the intrinsic values of the land.

- 2.1 Encourage growth that builds upon existing municipalities, and support new residential, commercial, and industrial growth only within identified urban growth boundaries where public infrastructure is available.**
- 2.2 Utilize growth management principles.**
- 2.3 Preserve prime farmland recognizing agriculture as a viable economic resource.**
- 2.4 Protect sensitive environmental areas such as woodlands, steep slopes, endangered species habitats, and native flora and fauna from the impacts of development.**
- 2.5 Encourage intergovernmental cooperation and collaboration among political jurisdictions and between governmental agencies.**

ECONOMIC DEVELOPMENT AND FUTURE LAND USE

Economic development must be considered within a land use framework in order to have maximum benefit on the regional and local economies while having minimum negative impacts on the environment, service capacity, and character of the area. Therefore, it is this Plan's recommendation that economic development activities should be focused in identified urban service areas where infrastructure and services can be provided most efficiently.

Furthermore, the use of economic development agreements through intergovernmental coordination should be promoted, as growth is beneficial to the entire County wherever jobs are retained or created.

Cities, townships, and counties across the nation provide valuable open space and recreational opportunities for their citizens. **Seneca County provides an example of the value of open space and natural resources to its residents. Throughout the County's past, the natural environment has played an important role in defining Seneca's identity. Seneca County prides itself on its rural character and agricultural resources.**

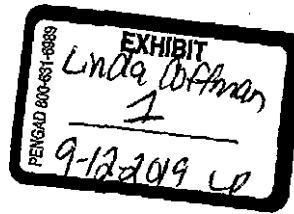
In the planning process, citizens were able to express their views on a number of issues, including open space. Citizens were concerned with preserving significant natural and historic features such as the Sandusky River corridor, County parks, and historic municipal downtowns. **Citizens also want to maintain the rural character of the County by preserving farmland and other natural features. To protect the County's rural character, citizens suggested implementing growth management techniques such as encouraging compact development in existing urban areas.**

2.3 Preserve prime farmland recognizing agriculture as a viable economic resource.

- a. Develop and implement an aggressive program to preserve agricultural uses in those areas identified for permanent agricultural preservation.**
- b. Preserve the top 70 percent of the County's prime farmland.**
- c. Develop an incentive based land management system, utilizing the LESA model, which provides cluster (hamlet/conservation) alternatives for areas suitable for development.

2.4 Protect sensitive environmental areas such as wetlands, woodlands, native species habitats, and flora and fauna from the impacts of development.

- a. Restrict development in karst terrain.
- b. Restrict development in critical resource areas such as in the 100-year flood plain and in perennial stream buffers.**
- c. Evaluate and improve the County's current environmental protection practices.
- d. Encourage developers to consider alternative land use designs that provide the best protection for existing natural features through density incentives.
- e. Maintain and preserve natural open space corridors that are important to wildlife and plant life habitats.**

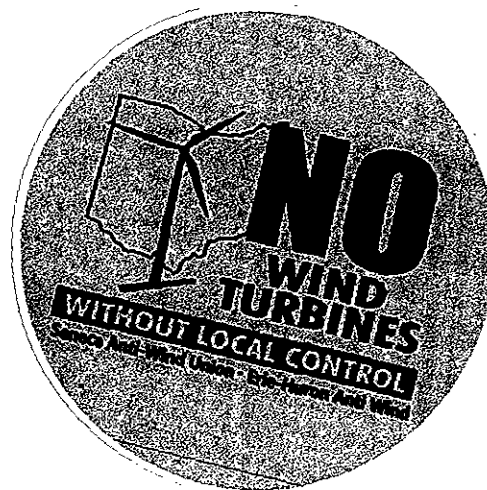


Linda
Hoffman
Coffman
Ex. 1 ✓

Verbal statement to the OPSB
Presented by:

Linda Coffman
6851 South State Route 231
Tiffin, OH 44883
Seneca County
September 12, 2019

OPSB Case No.17-2295-EL-BGN



My name is Linda Coffman. L I N D A C O F F M A N I live at 6851 South State Route 231, Tiffin, OH, which is in Eden Township.

I am opposed to the industrial wind turbine project proposed by Apex. I am especially concerned for the people who would live in the project footprint, some barely a quarter mile from 600 foot industrial wind turbines. These families would be the ones to bear the heaviest burden and pay the highest price. If a project like this were to be allowed, that project would transform their rural, farmland community into an industrialized area. I am also very concerned about the environmental impact from these turbines, especially on large bird species and on bats.

About a year ago, I received an email invitation to attend an open house at the Apex office in Bellevue. I went to learn, to hear what they had to say. Apex Clean Energy had produced various handouts, and I was encouraged to take one of each and read them. Today, I would like to comment on a few topics Apex covered in some of these handouts, and you might want to look for a pattern in the coverage.

Apex addresses the subject of PROPERTY VALUES and quotes a study which says, "...the core results of our analysis consistently show no sizable statistically significant impact of wind turbines on nearby property values." The size of the study they quoted was 51,000 homes, and all the homes were within 10 miles of wind facilities. Study details show that less than 3% of these homes were within one mile of the turbines. The vast majority of the homes were from nearby towns up to ten miles away. This study is meaningless for the people actually living "nearby" or inside the project footprint. In a Forbes article dated September 23, 2015, it states, "Why should somebody choose to buy a home with an industrial wind farm nearby?" In contrast to the Apex handout, the

conclusion in this article was that nearby residents would take about a 25-40% loss.

On the subject of WILDLIFE, Apex states they “conduct environmental impact studies,” and they “coordinate with federal and state wildlife agencies to make sure that (their) projects are sited in areas where impacts to birds and bats are minimized and appropriately mitigated if necessary.”

In November of 2018, I wrote a letter to the OPSB concerning a statement an Apex project manager made to a group of people at the open house. He was answering a question about wind quality and told the group the wind across Seneca County is very high quality. He said because of Lake Erie, there is a steady “river of wind”. I, then, asked him if migrating birds wouldn’t follow a route like that? He acknowledged that Seneca County is in a migratory route for birds, and Apex would be required to curtail their turbines during the migration period. My letter to the OPSB was to ask how long their turbines would be curtailed and who would enforce it. Putting industrial wind turbines in a known migratory flyway doesn’t sound like Apex was making sure their projects are sited in areas where impacts to birds and bats are minimized. This is just one of the reasons why Seneca County would not be an appropriate location to host these turbines.

A third topic in an Apex handout addresses HEALTH, and specifically infrasound.

The handout states, “...low level frequency noise or infrasound emitted by wind turbines is minimal and of no consequence. Further, numerous reports have concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines.” Apex goes on to say that health symptoms associated with turbines are likely due to a “nocebo”

response, which is a recognized psychosomatic condition. On pages 23-35 of the OPSB post of the public hearing held July 23, 2019, Captain Michael Curran delivered a comprehensive report on studies which show infrasound does adversely affect the heart and other organs in laboratory animals, and human tissue samples were also studied. Robert Berg, on pages 134-144 also spoke on infrasound and reported there is proven reduction in the strength of the tissue of the human heart when they're exposed to infrasound signals. That scientist's conclusion was that wind installations should be kept far enough from where people live and gather to ensure human health is not endangered. The two totally different and independent studies cited by Curran and Berg reached similar conclusions.

A fourth and final example concerns SAFETY

Apex wrote, "Fact: Ohio has some of the most restrictive setbacks in the country." Apex also wrote a paragraph attempting to make sure the "safe viewing setback" mentioned in the 2007 turbine manual written by turbine manufacturer, Vestas, was not confused with actual setback distances. In the last sentence of that paragraph, Apex says, "The implication that a 'safe viewing distance' from a catastrophically failing turbine should be applied as a standard setback is as unreasonable as the suggestion that the standard setback from building to building in downtown Bellevue should be based on a 'safe viewing distance' in the case of a gas explosion or fire in the neighborhood."

In June of this year, the OPSB asked for public comments on whether to require turbine operators to report turbine incidents. Apparently reporting has not been required which makes me wonder how Apex, without having data to support it, can know for sure that incidents are really "quite rare and highly unlikely." What we do know is that Apex would like our present setback distances to be reduced, even though our current setbacks are insufficient to

protect people and property, if an incident were to occur. On page 68 of the July 23rd public hearing post, Dennis Schreiner noted that one in twenty turbines will have a blade throw event in its lifetime. On page 86, Jim Feasel noted that in Ohio, blade fragments weighing several pounds have been thrown hundreds of feet farther than current setbacks. If public safety is a consideration, then IWTs should not be sited close enough to where people live to make them unsafe in their own homes.

The pattern I see leads me to conclude the Apex application to install their IWTs in Seneca County should be denied.

Daniel Coffman

From: "Daniel Coffman" <lindancoff@gmail.com>
Date: Friday, November 09, 2018 11:41 PM
To: <OPSB@puc.state.oh.us>
Subject: Case numbers 18-0488-EL-BGN and 17-2295-EL-BGN

6851 South State Route 231
Tiffin, OH 44883
November 9, 2018

The Ohio Power Siting Board
180 East Broad Street
Columbus, Ohio 43215

Case number 18-0488-EL-BGN
Case number 17-2295-EL-BGN

Dear Board Members,

At an open house meeting of Apex Clean Energy in Bellevue, Ohio, Dalton Carr, an Apex employee, explained to a group of people that the wind across Seneca County is very high quality wind. Because of Lake Erie, there is a steady "river of wind". The question was then asked, "Wouldn't migrating birds follow a route like that? Mr. Carr said Seneca County is in a migratory route for birds, and Apex would be required to curtail their turbines during the migration period.

Was Mr. Carr correct when he told the group the turbines would be curtailed during migration? Who would require and enforce Apex to curtail their turbines during migration? How long a period would be required to ensure the safe travel of the migrating birds? Will Seneca Wind, sPower, have the same requirements?

You are probably already aware there is strong opposition to these wind projects throughout Seneca County. Residents in rural areas are rightfully concerned about many environmental factors. One substantial worry is the harm that will be done to birds and bats due to these turbines. If appropriate restrictions are not mandated, bat and bird populations will significantly decline.

In addition to curtailing the turbines during migration, the Board needs to require the turbine cut-in speeds to be increased from the usual 3.5 meters per second. Since bats don't like to fly when it's windy, an increase in the cut-in speed could save thousands of bats and limit the impact of the turbines that would destroy them.

Sincerely,

Linda Coffman

WIND ENERGY AND PROPERTY VALUES

As the development of utility-scale wind energy projects has become more prevalent in this country, concerned communities have asked how these projects might affect their property values. Researchers have been working hard to answer this question scientifically by studying hard data. In 2013, Lawrence Berkeley National Laboratory (LBNL) published the most extensive study to date on property transactions near wind farms. Its conclusion?

"...the core results of our analysis consistently show no sizable statistically significant impact of wind turbines on nearby property values."

—2013 Study by Lawrence Berkley National Laboratory

About the Study

Researchers analyzed 51,276 home sales near 67 wind farms in 27 counties across nine U.S. states.

- All homes were within 10 miles of wind facilities
- 1,198 sales were within 1 mile of a turbine
- 331 sales were within 1/2 mile of a turbine
- Data was collected before, during, and after wind farm construction

or 2.3% of the study
0.6% of the study



© David Schweltzer

Good News for Wind Farmers

Regardless of the type or size of wind turbine studied, researchers have found no statistical evidence that home values near turbines are affected before, during, or after construction.



The study data shows that statistically, even homes within half a mile of a wind turbine are not affected by its presence.

According to rural appraisers, farm acreage upon which turbines are sited often increases in value to account for the new stream of steady, long-term income the property generates through the harvesting of the wind.

WIND ENERGY AND WILDLIFE

Wind energy is one of the most environmentally friendly forms of electrical generation on the planet. That is because wind energy emits no air or water pollution, requires no mining or drilling for fuel, uses virtually no water, and creates no hazardous or radioactive waste. Clean, renewable wind energy also displaces harmful emissions from fossil fuel power plants and offsets carbon emissions, making it a safer generation option for people, wildlife, and natural ecosystems.

National Wildlife Organizations Support Wind Energy

Properly sited wind energy projects protect birds and wildlife by producing no dangerous pollutants or carbon emissions. According to the Audubon Society's website:

"Audubon strongly supports properly sited wind power as a renewable energy source that helps reduce the threat posed to birds and people by climate change. However, we also advocate that wind power facilities should be planned, sited, and operated in ways that minimize harm to birds and other wildlife..."

To ensure that our projects are responsibly sited for wildlife, Apex conducts environmental impact studies for every project. We coordinate with federal and state wildlife agencies to make sure that our projects are sited in areas where impacts to birds or bats are minimized and appropriately mitigated if necessary.

In 2012, the National Wildlife Federation, ConservAmerica, and 116 other sportsmen, business, and conservation groups signed a letter asking Congress to support renewable energy projects around the country.

While birds do occasionally collide with turbine blades, modern wind farms are far less harmful to birds than buildings, communication towers, power lines, and vehicles. In fact, turbines account for only a small fraction, about 0.0003%, of all human-related bird deaths.

Wind Energy Has No Known Impact on Deer Population or Hunting

Just as deer adapt to the construction of new homes and buildings and other new sights and sounds near their habitats, the deer population also becomes accustomed to wind farms. It is not uncommon to find deer and other wildlife feeding or resting near the bases of turbines. Cattle, horses, goats, and other livestock are also 100% compatible with wind energy technology.

Wind Energy Reduces Air Pollution

In 2012, wind energy offset 87,000 metric tons of SO₂ and 61,000 metric tons of NO_x, dangerous particulate air pollutants that are associated with conventional electric generation.* In addition, wind turbines installed in the United States through 2012 will displace nearly 100 million metric tons of carbon dioxide annually.* That's the equivalent of removing over 17 million cars from the road. This carbon savings helps birds and wildlife by minimizing the worst impacts of climate change, which according to scientists could threaten between one-quarter and one-half of all bird species.

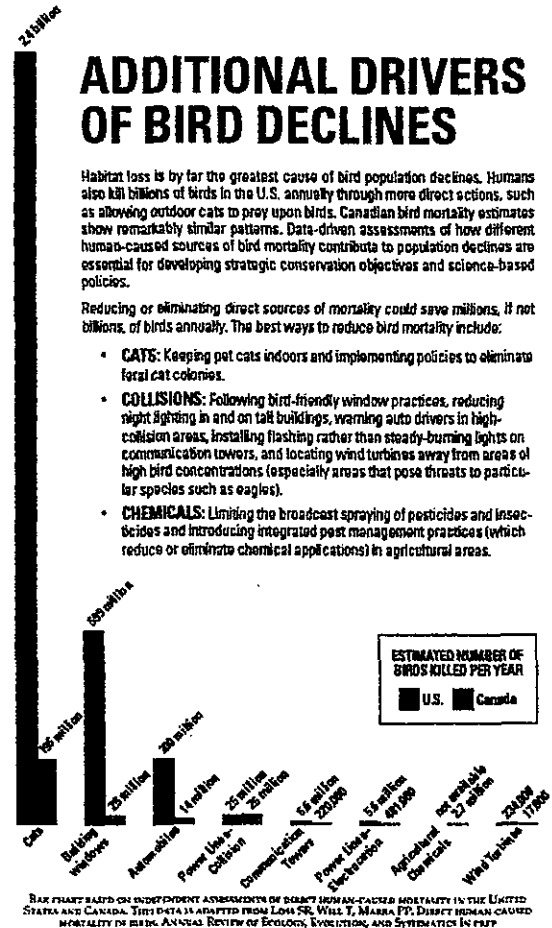
* American Wind Energy Association

ADDITIONAL DRIVERS OF BIRD DECLINES

Habitat loss is by far the greatest cause of bird population declines. Humans also kill billions of birds in the U.S. annually through more direct actions, such as allowing outdoor cats to prey upon birds. Canadian bird mortality estimates show remarkably similar patterns. Data-driven assessments of how different human-caused sources of bird mortality contribute to population declines are essential for developing strategic conservation objectives and science-based policies.

Reducing or eliminating direct sources of mortality could save millions, if not billions, of birds annually. The best ways to reduce bird mortality include:

- **CATS:** Keeping pet cats indoors and implementing policies to eliminate feral cat colonies.
- **COLLISIONS:** Following bird-friendly window practices, reducing night lighting in and on tall buildings, warning auto drivers in high-collision areas, installing flashing rather than steady-burning lights on communication towers, and locating wind turbines away from areas of high bird concentrations (especially areas that pose threats to particular species such as eagles).
- **CHEMICALS:** Limiting the broadcast spraying of pesticides and insecticides and introducing integrated pest management practices (which reduce or eliminate chemical applications) in agricultural areas.



Source: North American Bird Conservation Initiative U.S. Committee, *The State of the Birds 2014*, U.S. Department of the Interior, Washington, DC (2014), p. 11.

WIND ENERGY AND HEALTH

More than 48,000 wind turbines are in operation in the United States today, safely generating electricity for our nation. Wind energy is one of the healthiest forms of energy generation in the world because it releases no greenhouse gases, soot, or carbon into the atmosphere; it also does not consume valuable freshwater or produce water pollution. Apex wind projects are built in full compliance with local, state, and federal safety regulations to protect the health and welfare of landowners, maintenance teams, and others.

Key Findings from Major Health Impact Studies

Government- and university-sponsored studies around the world have repeatedly confirmed that modern wind turbines pose no threat to public health. Over 17 independent reviews of the existing science on wind energy and health have reached the same conclusion.

Wind Turbine Sound

The sound of wind turbine blades passing through the air is often described as a "whoosh." Measurements show that this sound is no louder than a kitchen refrigerator or air conditioning unit at a distance of 1,000 feet. Scientific evidence confirms that this sound is not dangerous and that any low-frequency waves produced are not harmful to those nearby.

"There is no evidence for a set of health effects from exposure to wind turbines that could be characterized as a 'Wind Turbine Syndrome.'"

—Massachusetts Department of Health*

"To date, no peer reviewed scientific journal articles demonstrate a causal link between people living in proximity to modern wind turbines, the noise (audible, low frequency noise, or infrasound) they emit and resulting physiological health effects."**

Infrasound from Emerson Creek Wind will be no different than waves on a beach and weaker than highway traffic, air conditioners and other daily exposures.

"...low level frequency noise or infrasound emitted by wind turbines is minimal and of no consequence...Further, numerous reports have concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines."***

Shadow Flicker

This term refers to the shadows cast by wind turbine blades as they rotate in front of the sun, similar to the shadow cast by a tree blowing in the wind. By positioning wind turbines at a carefully calculated angle and distance from dwellings, Apex ensures that most homes in a project experience no shadowing at all. For those that do, shadowing will occur for no more than a few minutes per day, on average. Shadowing does not occur on cloudy or foggy days.

Apex uses sophisticated software to place turbines so that shadow is minimized.

Furthermore, while some have claimed that shadow flicker can create risk of seizures in photosensitive individuals, "Scientific evidence suggests that shadow flicker [from the rotating blades of wind turbines] does not pose a risk for eliciting seizures as a result of photic stimulation."*

Ice Throw

In some wintry conditions, ice can accumulate on turbine blades. Sophisticated vibration sensors on the turbine blade automatically shut the turbine down when this occurs.

The risk of ice striking a home 984 feet from a turbine is extremely low—researchers estimate that if it happens at all, it is only likely to occur once every 625 years.

In almost all cases, ice drops straight to the ground, just like icicles or snow sliding off a roof. Apex maintains minimum setback requirements to ensure that ice is not a risk to neighboring structures.

* Source: Massachusetts Department of Public Health, "Wind Turbine Health Impact Study: Report of Independent Expert Panel," January 2012.

** Source: Knopper and Olsson, "Health Effects and Wind Turbines: A Review of the Literature," *Environmental Health* 10: no. 78 (2011).

*** Source: Australian Government, National Health and Medical Research Council, "Wind Turbines and Health," July 2010.

WIND ENERGY AND HEALTH CONTINUED

More on "Wind Turbine Syndrome"

"Wind turbine syndrome" is a term used by wind energy opponents to describe an unrelated set of conditions and symptoms that they claim emerge due to exposure to wind turbines. The World Health Organization, which classifies diseases, does not recognize wind turbine syndrome, nor does any other medical institution. Numerous comprehensive, scientific, peer-reviewed studies have concluded there is no evidence of wind turbine syndrome, and that to the extent we see health symptoms associated with turbines, they are likely due to a "nocebo" response, a recognized, psychosomatic condition "whereby adverse effects are generated by negative expectations."

Ice Shedding and Risk of Turbine Debris

In some wintry conditions, ice can accumulate on turbine blades and other components. Sophisticated vibration sensors on the turbine blade automatically shut the turbine down when this occurs. In almost all cases, ice drops straight to the ground, *just like icicles or snow sliding off a roof.*

It is very rare for ice shedding to impact homes, and the statistics suggest that many more houses have been hit by meteorites than would be expected to be hit by wind turbine debris or ice throw.* In fact, the risk of ice striking a home 984 feet from a turbine is extremely low—researchers estimate that if it happens at all, it is only likely to occur once every 625 years.

We are not aware of a single instance in which a member of the public was harmed by ice shed at any distance from a wind turbine. Nonetheless, wind farm operators have developed operational and siting criteria that protect the safety of host communities and neighbors from this possibility.

Life Flight Access

The Federal Aviation Administration (FAA) is heavily involved in the turbine siting process. Helicopters are often resourced during the construction, maintenance, and operations of wind farms, therefore projects are designed to ensure that they will be able to land near the project. In fact, wind farms often improve relationships between multi-agency emergency responders by providing additional training and information. There have been several cases involving non-wind related emergencies in which turbine coordinates and predesignated landing zones have helped *medical helicopters access and navigate the site, enhancing their knowledge of nearby communities by improving air traffic communication, and making rescue from Life Flight or a similar service more feasible.*

"Safe Viewing Distance"

A 2007 Vestas turbine manual includes a description of a "safe viewing setback", which is intended to provide guidance on how to respond to an emergency involving a severely malfunctioning turbine. Severe turbine malfunctions are quite rare, and this manual exists to prepare turbine operators for this highly unlikely contingency. Vestas has verified that this section in its manual was intended to apply only in cases of fire or emergency, and it is not meant to act as a guide for setbacks from properly functioning machines. Vestas does not recommend any particular setback from a turbine that is in standard operation. The implication that a "safe viewing distance" from a catastrophically failing turbine should be applied as a standard setback is as unreasonable as the suggestion that the standard setback from building to building in downtown Bellevue should be based on a "safe viewing distance" in the case of a gas explosion or fire in the neighborhood.

* Wahl, David and Philippe Giguere. "Ice Shedding and Ice Throw - Risk and Mitigation." GE Energy. 2006.

LeBlanc, M.P. "Recommendations for Risk Assessments of Ice Throw and Blade Failure in Ontario." Garrad Hassan. 2007.

WIND ENERGY FACTS

Fact: Wind farms do not affect property values of nearby homes.

A study by Lawrence Berkeley National Laboratory studied 50,000 U.S. home sales near 67 wind facilities in 27 counties and found that there was no evidence that home values were affected.¹

Fact: Ohio has some of the most restrictive setbacks in the country.

The new proposed setbacks would still be more restrictive than setbacks on safely operating wind farms in other states.

Fact: Current technology resolves risk of ice throw.

Sophisticated vibration sensors on the turbine blade automatically shut the turbine down when this occurs. In almost all cases, ice drops straight to the ground, just like icicles or snow sliding off a roof. The risk of ice striking a home 984 feet from a turbine is extremely low—researchers estimate that if it happens at all, it is only likely to occur once every 625 years. In fact, we are not aware of a single instance in which a member of the public was harmed by ice shed at any distance from a wind turbine. That's because wind farm operators have adopted operational and siting criteria that protect the safety of host communities and neighbors.

Fact: Noise from Wind Turbines does not pose health risks.

Infrasound can be an ominous word, but remember that it is not unique to wind energy ~ your heartbeat and breathing generate infrasound. Despite years of comprehensive study of the topic, no direct connection between wind energy and adverse human health effects has ever been found.²

Fact: Turbine blades cannot rotate anywhere near a speed that would impact even the most sensitive populations.

While some have claimed that shadow flicker can pose a health risk to those extremely sensitive to light, shadow flicker does not pose a risk of inducing seizures in people with photosensitive epilepsy. In fact, positioning wind turbines at a carefully calculated angle and distance from dwellings, Apex ensures that most homes in a project experience no shadowing at all. For those that do, shadowing should occur for no more than a few minutes per day, on average.³

Fact: Wind turbines do not negatively impact medical evacuation services.

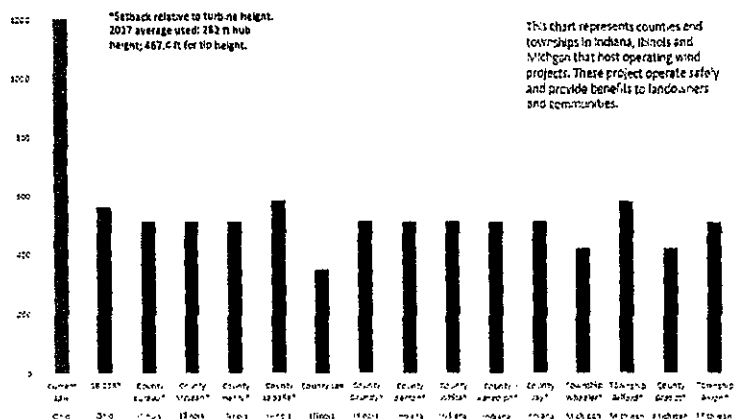
Helicopters have been resourced during the construction, maintenance, and operations of wind farms; therefore they must be able to land near a facility. In fact, a wind farm improves relationships with multi-agency emergency responders. Turbine coordinates and predesignated landing zones have been used by medical helicopter personnel in non - wind related emergencies. Projects have enhanced emergency responder knowledge in nearby communities by improving air traffic communication, making rescue from Life Flight or a similar service more feasible.

Fact: Wind turbine manuals do not discuss siting setbacks

A 2007 Vestas turbine manual includes a "safe viewing setback" which refers to the recommended distance from a malfunctioning turbine. Vestas claims that this was intended to apply only in cases of fire or emergency; it is not meant to act as a guide for setbacks. This is not the recommended distance from an operational turbine. The implication that a "safe viewing distance" from a catastrophically failing turbine should be a standard setback is synonymous with the suggestion that the standard setback from one building to another in downtown Bellevue should be based on a "safe viewing distance" in the case of a gas explosion or fire.

Setback Comparisons

Regional Setbacks From Non-Participating Property Lines



SOURCES

1. <http://emp.lbl.gov/sites/all/files/lbnl-6362e.pdf>
2. 'Australian Government, National Health and Medical Research Council, "Evidence on Wind Farms and Human Health," February 2015.

3. ¹Frontiers in Public Health, "Wind Turbines and Human Health," June 2014.

INTRODUCING APEX CLEAN ENERGY

We Harness the Power of the Wind and Sun

Our business is to responsibly develop clean, reliable energy from the abundant wind and solar resources found throughout the United States. We bring renewable energy to the market responsibly, by carefully siting projects in suitable locations around the nation.

Apex Clean Energy Is a Proven Industry Leader

Founded in 2009, Apex has become one of the fastest-growing companies in the clean energy industry. Apex is an independent, privately held renewable energy company based in Charlottesville, Virginia.

Apex Management Is Experienced

A growing company of over 200 people, Apex is led by a team of wind energy veterans with collective experience of over \$10 billion in the development, financing, construction, and operation of wind and solar energy facilities now operating in the United States. The Apex team offers in-house expertise in wind resource assessment, development, permitting, wildlife biology, engineering, information technology, construction, and finance.



Careful Site Selection Brought Us to Seneca and Sandusky Counties

Republic Wind is typical of our careful approach to project development. Apex chooses locations with supportive landowners, a proven wind resource, access to high-capacity transmission lines, low risk for wildlife impacts, and compatibility with existing land uses. We work to become community partners and establish long-term relationships in the areas where we work.

We Want to Meet You

John Arehart is the primary point of contact for Republic Wind. John has been a part of the Apex team since 2009. During this time, he has helped develop wind projects across Ohio, as well as other states in the Midwest and Virginia.

"As a wind farm developer, I always try to work closely with landowners, local officials, and the public to answer questions about a project. I see my role as a facilitator to ensure the perspectives of all stakeholders are considered in project planning."

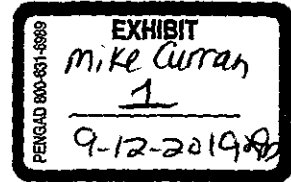


Contact Information

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Apex Clean Energy
310 4th St. NE, Ste. 200
Charlottesville, VA 22902

Michael Curran

EX.1



September 12, 2019

The Ohio Power Siting Board,

I would like to thank the Ohio Power Siting Board for allowing me to give my testimony this afternoon concerning some of the potential health effects which quite possibly could be produced by the large sized and numerous wind turbines being proposed for construction in Seneca County.

My name is Captain Michael Curran. I am retired from the United States Navy. While on active duty, I was stationed at the Bethesda Naval Hospital, directly across the street from the National Institutes for Health, that is NIH, which is home of the on-line medical literature service called Pub-Med.

The articles utilized by the Wind Power companies to minimize concern for the potential harmful effects of infrasound generated by wind turbines on humans, referenced articles they said were found in the Pub-Med database. The Wind Power companies basically claimed that there was no real research which clinically documented harmful health effects of infrasound on humans, or other living creatures.

To my knowledge, none of this research presented by these companies cited research performed in the Soviet Union in the 1970's and 1980's. The Soviet research publications are not available on-line through Pub-Med. To obtain access to the Soviet research articles, an individual must be personally on site at NIH's National Library of Medicine and must have an identity card issued for research at the library. I have a National Library of Medicine research card and have used it to investigate Soviet research findings on site, at the library.

In my research at the library, I discovered that there are, in fact, a very significant collection of Soviet investigations concerning the

damaging effects of infrasound on laboratory animals and also on healthy human male subjects. One particular area of concern was the adverse effects of infrasound on cardiac function. These effects included changes in cardiac rate and rhythm, including arrhythmias. Microscopic inspection of sacrificed laboratory animals' heart tissue showed multiple areas of pathological cell changes. The heart was only one of the many internal organs adversely affected by infrasound studied by the Soviets. Soviet research articles at the library are written in Russian using the Cyrillic alphabet. I have included three of those articles which I have had translated into English, with attached photographs of the Journal cover, which has the date stamp when NIH acquired the journal. I have also included photographs of the first page of each article.

Today, as I am speaking to you here in Tiffin, Ohio, ongoing clinical research is being performed by The Department of Cardio and Vascular Surgery at The University Hospital of Johannes Gutenberg University in Mainz, Germany. After watching a documentary concerning adverse effects of infrasound generated by wind turbines, produced by ZDF television in Germany, I wanted to meet the researchers at their hospital and ask them more specific questions concerning their testing techniques and their findings.

In January of this year, I flew direct to Frankfurt, Germany and then made the short drive across the Rhine River to Mainz. Arriving at the office of Professor Christian-Friedrich Vahl, I was introduced to his main researcher on this subject, Dr. Ryan Chaban, who is a Cardio-Thoracic Surgeon on the Staff at the hospital. Over two days he enlightened me as to his research materials and methods and the findings of his investigations. **One aspect of this ongoing research in Germany is extremely important and relevant in this meeting today. To the best of his knowledge, Dr. Chaban's research is the first to directly expose and measure the immediate adverse effects of infrasound on living, human cardiac tissue.**

The University Hospital team used two heart tissue samples harvested from human patients undergoing cardiac surgery. One of the samples was used as a control and the other sample was exposed to infrasound. Samples were exposed to infrasound of 16Hz frequency, at decibel levels of 100, 110 and 120 dB. No decibel weighting system—such as dB(A)—was used, since the dB(A) weighting system is used to measure only sound levels which are audible above 20 Hz frequency. The samples were stimulated electrically with a rate of 75 beats per minute for 120 minutes. The decrease in force of the infrasound exposed cardiac tissue was found to measure almost 7.5% for every 10dB increase over the 100dB baseline, resulting in an almost 15% decrease in heart tissue contraction force at 120dB.

Besides the adverse effect on heart function, I asked Dr. Chaban if there could be any cognitive complications that could affect an individual due to decreased heart performance over time. He told me that Cardiac Induced Dementia could very possibly result from the decrease in the heart's ability to circulate an adequate blood supply to the brain.

I questioned him that since a 7.5% decrease in contraction force was seen at 110 dB, would it be possible that contraction force could be decreasing a certain amount between 100dB and 110dB. He stated that result could potentially occur, but that he could only vouch for the changes demonstrated at his testing points of 110 and 120 dB.

I also asked Dr. Chaban if there could be effects on heart tissue contractile ability at levels of 100dB or less if the exposure to infrasound was extended over years and decades instead of only 120minutes. He replied that even though it was an interesting question, he could only confirm the results of his team's testing at the 110 and 120dB power level points.

Prior to his training in Medicine and specialization in Cardio and Thoracic Surgery, Dr. Chaban told me his undergraduate education was

heavily involved in Physics. He explained to me characteristics of infrasonic acoustic energy where, because of its long wavelength, infrasound can travel long distances without dissipating its energy level and also has the ability to penetrate into buildings. He also discussed the phenomenon known as Helmholtz Resonance, whereby infrasound energy can be condensed in a closed room, reaching energy levels 100 times greater than the energy level measured outdoors.

I would think that the potential health risks from infrasound, identified by Soviet research in the 20th Century and confirmed by the latest, ongoing German research in the 21st Century would dispel forever the notion of clean, safe, green energy produced by wind turbines. Even the research the Wind Companies use in their attempt to support their construction plans state that most of the sound energy produced by wind turbines is in the low and infrasonic range and that the larger the size of the wind turbine, the greater the amount of infrasonic energy produced. **The planned wind turbines, being over 600 feet tall, are going to produce a huge amount of infrasonic acoustic energy, externally unheard, but internally---working on internal human organs in a slow, ongoing, insidious manner.**

Therefore, I am stating in my official testimony that I most strongly recommend against the Industrial Wind Turbine project proposed by the entity known as Republic Wind, Case Number 17-2295-EL-BGN. The Ohio Power Siting Board should not, in good conscious, allow this to happen to the population of Seneca County.

Thank you for the courtesy of allowing me to testify to you publicly today on this issue.

Sincerely,

A handwritten signature in cursive script that reads "Michael T. Curran". The signature is fluid and written in dark ink.

Michael T. Curran, Captain, USN (Ret.)

High level infrasound exposure reduces the contractility of human cardiac tissues in in-vitro model

Chaban R, Ghazy A, Brendel L, Buschmann K, Vahl C-F

Background

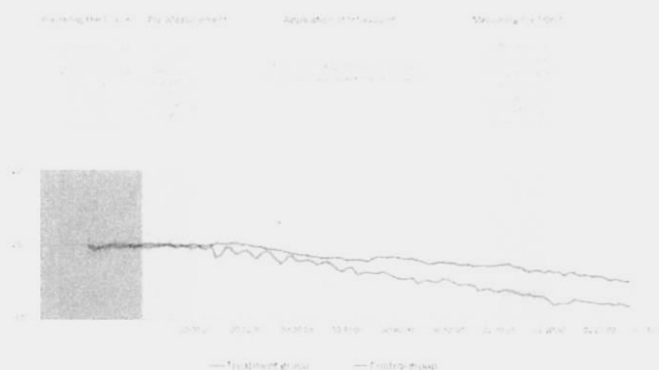
Human exposure to infrasound is increasing due to man-made factors, like industrial installations, wind farms and transportation. A growing concern among the public regarding the safety of this exposure can be noticed. The aim of this work is to evaluate whether exposure to infrasound interferes directly with human cardiac function and hence attributes to any kind of pathological process.

Methods

Human myocardial tissues, obtained from patients undergoing cardiac surgery, were prepared in small muscle samples and then stimulated electrically with a frequency of 75 bpm for a period of almost 120 minutes under sustained perfusion with an oxygenated physiological solution. Two samples were obtained from each patient: one was subjected to infrasound at 16 Hz and the other served as a control. The exhibited isometric contraction force (CF) and contraction duration (CD) were measured before and after the treatment. The changes in these values ($CF_{\%}$ and $CD_{\%}$, corresponding to the ratios between the values after the exposure and before) were evaluated and analyzed as dependent variables in a multiple linear regression model, considering the ratios in the corresponding control samples and infrasound levels of exposure as explanatory variables.

Three infrasound levels of exposure were used in this study: 100, 110 and 120 dBz. No weighting system was used.

Experiment design

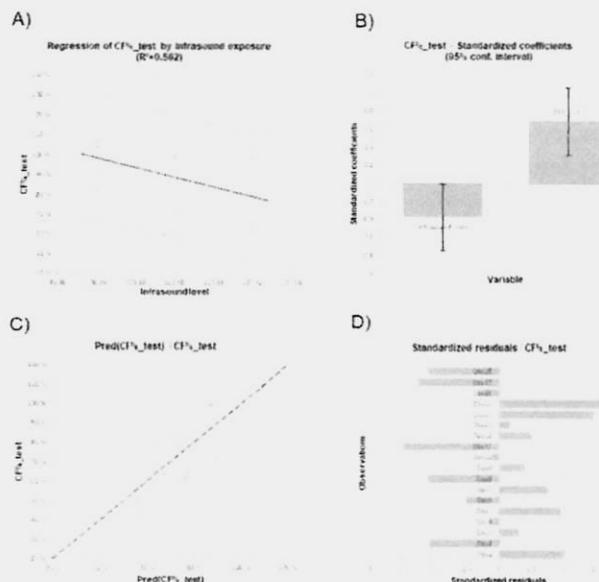


Experiment design: first the samples were stimulated for a period of 30 minutes until they reached a steady state. Then the CF and CD are measured (CF_1 & CD_1) over a period of 10 minutes. After that, infrasound was applied for a period of 60 minutes during continuous electrical stimulation. A second sample from every patient served as a control. At the end, the measurement was repeated (CF_2 & CD_2) again over a further period of 10 minutes. The Ratios between the values (CF_2 / CF_1 & CD_2 / CD_1) were calculated for each trial.

Results

The measured $CF_{\%}$ in the samples treated with infrasound were proportional to the measured $CF_{\%}$ in the corresponding control samples ($p = 0.001$) and corresponded negatively with the infrasound level of exposure measured in dBz ($r^2 = 0.56$; $p = 0.044$). The decrease in $CF_{\%}$ measured almost 7.5% for every 10 dBz above the 100 dBz limit, resulting in almost 15% decrease in contraction force at 120 dBz.

The $CD_{\%}$ remained unchanged after the treatment with infrasound.



Using multiple linear regression, we found the measured $CF_{\%}$ in the samples treated with infrasound to be proportional to the measured $CF_{\%}$ in the corresponding control samples ($p = 0.001$) and negatively corresponded with the infrasound level of exposure measured in dBz ($r^2 = 0.56$; $p = 0.044$). The decrease in $CF_{\%}$ measured almost 7.5% for every 10 dBz above the 100 dBz limit, resulting in almost 15% decrease in contraction force at 120 dBz.

Conclusion

Exposure to high levels of infrasound (more than 100 dBz) interferes harmfully with the cardiac contraction function, even as soon as after one hour of exposure. There are plenty of other works that support this conclusion. The effect of infrasound obviously goes beyond the direct mechanical effect in increasing the cross-bridge breakage and involve a wide range of process, like calcium metabolism and mitochondrial integrity.

These results should be considered when looking at environmental regulations. We recommend introducing a maximal tolerated infrasound level for long-term exposure as low as 80 dBz.

Dr. Ryan Chaban

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ГИГИЕНА ТРУДА

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Москва
МЕДИЦИНА



Myocardial Ischemia Effects

ИНТЕНСИВНАЯ ИШЕМИЯ МИОКАРДА, ВЫЗВАННАЯ ИНФРАЗВУКОМ

О-гигиенический медицинский институт, Ленинград

менный научно-технический с привел к созданию крупногабаритных машин и агрегатов, способных создавать инфразвуковые колебания, которые являются составной частью производственных шумов. При определенных параметрах инфразвук оказывает вредное влияние на организм [4]. В настоящее время интенсивное изучение воздействия инфразвука как на целостный организм, так и на различные органы [3].

В литературе имеются работы, связывающие влияние инфразвука на сердце [1, 2, 5, 6]. Эти исследования констатируют, что инфразвук вызывает прежде всего спазмы миокарда вместе с тем патогенез воздействия инфразвука на миокард во многих отношениях остается невыясненным, не изучены влияние инфразвука на структуру миоцитов, что и является целью настоящего исследования.

Для проведения экспериментов была создана специально сконструированная акустическая установка, позволяющая создавать инфразвуковое поле в зоне 0,5—50 Гц с интенсивностью давления 90—140 дБ.

Эксперименты были поставлены на белых морских свинках, которых облучали инфразвуком частотой 8 Гц, интенсивностью 120 дБ на протяжении 15, 20, 40 сут с ежедневной дозой 3 ч. Во всех группах опы-

тов использовали по 10 животных, которых служили контролем. Животных забивали декапитацией. Фиксацию проводили по Карнуа и в 20 % формалине. Препараты окрашивали гематоксилином-эозином, по Ван-Гизону, цинкином по Эйнарссону для выявления нуклеиновых кислот, метиловым фиолетом с пиронином по Браше (контраст с рибонуклеазой). Использовали реакцию с контролем амилазы следовали также активности сукцинатдегидрогеназы (СДГ), лактатдегидрогеназы (ЛДГ) и глюкозо-6-фосфатдегидрогеназы (Г-6-ФДГ). Для выявления активности окислительно-восстановительных ферментов охлажденный миокард резали в криостате при температуре -5°C . Срезы обрабатывали по прописям Э. Пирса. Оценка гистологических реакций и активности окислительно-восстановительных ферментов осуществляли полуколичественным методом, сравнивая полученные данные с контролем.

Для электронно-микроскопического исследования фиксацию проводили в 2,5 % глутаральдегидом на протяжении 2 ч с дофиксацией 1 % осмиевой кислотой последующим обезвоживанием. Ультратонкие срезы делали на ультратоме LKB-III, контрастировали ситратом свинца и изучали с помощью электронного микроскопа ЭМ-7.

В острых опытах после 3-часового однократного воздействия инф-

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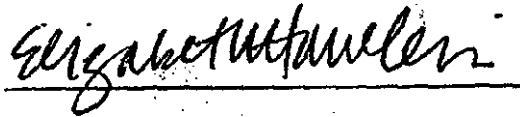
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A. S. GORDELADZE, V. V. GLINCHIKOV, V. R. USENKO
**EXPERIMENTAL MYOCARDIAL ISCHEMIA CAUSED BY
INFRASOUND**

Sanitary and Hygienic Medical Institute, Leningrad

Modern scientific and technological progress has led to the creation of large-sized machines and units capable to generate infrasonic vibrations, which are an integral part of production noise. At certain parameters, infrasound can have a harmful effect on the body [4]. Currently, an intensive study of the effect of infrasound over both the whole organism, and on various organs and tissues is being conducted [3].

There are works in the literature showing the effect of infrasound over the myocardium [1, 2, 5, 6]. These studies stated that infrasound damages firstly the vessels of the myocardium. At the same time, the pathogenesis of the effect of infrasound over the myocardium remains unclear in many details, the effect of infrasound over the structures of cardiomyocytes has not been studied, which is the goal of the present study.

For holding experiments, a specially constructed acoustic installation was used, allowing to create the infrasonic field in the range of 0.5–50 Hz with a pressure intensity of 90–140 dB.

The experiments were performed on white rats and guinea pigs, which were irradiated with infrasound at a frequency of 8 Hz, intensity of 120 dB during 1, 5, 10, 15, 25, 40 days with daily exposure of 3 hours. In all groups of experiments 10 animals were used, 3 of which served as a control. Animals were slaughtered by decapitation. Fixation was performed by Carnoy method and in 20% formalin.

The preparations were stained with hematoxylin-eosin, by Van Gieson method, halo-cyanin, by Einarson method, to detect nucleic acids, methyl green with pyronin, by Brache method (control with ribonuclease). The SCHIFF-reaction with amylase control was used, the activity of succinate dehydrogenase (LDH), lactate dehydrogenase (LDH), and glucose-6-phosphate dehydrogenase (G-6-FDG) were also investigated. To detect the activity of redox enzymes, cooled myocardium was cut in the cryostat at a temperature of -5°C . Cuttings were processed according to E. Pierce's prescriptions. Evaluation of histochemical reactions and the activity of redox enzymes was performed by a semi-quantitative method, comparing the obtained data with the control.

For electron microscopic examination, fixation was performed with 2.5% glutaraldehyde for 2 hours with additional fixation with 1% osmium and with

subsequent dehydration with alcohol. Ultrathin cuttings were made on the LKB-III ultratome, contrasted with lead citrate and examined with electron microscope JEM-7A.

In acute experiments after 3-hour single exposure to infrasound with a frequency of 7 Hz and an intensity of 120 dV, when examining the heart, barely perceptible pallor and swelling of the left and right ventricular walls and small-point hemorrhage in the pericardium structure were noted.

Histological examination showed mild edema and in some cardiomyocytes - moderate grit and even vacuolar dystrophy of myofibrils with the disappearance of transverse striation. SCHIFF -reaction was unevenly expressed, weakened after treatment of cuttings with amylase. Pironnophilia was of diffuse nature and decreased after exposure to nuclease. The activity of the LDH was increased, the precipitated grains of diformazan differed in polymorphism. Capillary lumens are filled with red blood cells, but endothelial cells look swollen.

During electron microscopic examination, reactively altered cardiomyocytes show mitochondrial swelling and destruction of outer membranes with loss of dual contour, enlightenment and homogenization of the matrix with fragmentation of the cristae. In myofibrils there are areas of re-coloring, and sometimes tears of myofilaments in the area of the disks. The canals of the T-system are dilated. An increase in the amount of chromatin is noted in the nuclei. Nuclear pores are enlarged.

With continued impact of infrasound, a day after the start of the experiment, the activity of redox enzymes falls in the ischemic zone, but at the same time there are areas in which myofibrils are painted over with aggregation of diformazan grains. Reactively modified cardiomyocytes give a weak SCHIFF -positive reaction, weakening when treating medicines with amylase. Pironnophilia has a diffuse character. The activity of SDH varies, at first decreasing sharply compared to the control one, then increasing. The activity of LDH in some myofibrils is increased. The activity of G-6-FDG and NAD-diaphorase is expressed weak. In the foci of ischemia, the capillaries are sharply narrowed as a result of the swelling of the endothelium cells. The sarcoplasm of cardiomyocytes is edematous, the sarcolemma is damaged in a number of areas, there are homogenization zones and a re-dyeing band in the myofibrils. The mitochondria are swollen, with a vague outer membrane, devoid of matrix, the cristae are fragmented to varying degrees. The contours of the nuclei are strengthened, the nucleoli disappear, the amount of chromatin is increased, the nuclear pores are enlarged. In the T-system there are vacuoles of various sizes, the sarcoplasmic reticulum canaliculi are enlarged.

In the intact zones, single modified cardiomyocytes appear with the presence of re-dyeing bands and even with damage of myofilaments.

At the 5th, 10th, and 15th day, in the zones of myocardial ischemia located mosaically in the region of the left ventricle, there are perivaacular hemorrhages around the small vessels, and there are separate leukocytes in the surrounding connective tissue. Damaged infrasound cardiomyomastics changed, they have all the signs of granular dystrophy. The SCHIFF reaction is poorly expressed, does not change after treatment with amylase, pyronnophilia is focal in nature and disappears after treatment with ribonuclease. The a/ctivity of redox enzymes is reduced, the myofibrils are diffusely stained, the diformazan grains form polymorphic clusters. Sarcoplasma of cardiomyocytes is edematous, in some places myofibrils are fragmented in the area of the discs, there are foci of homogenization of myofilaments (see figure); discs are mixed and expanded. Many mitochondria are swollen, with a spotty-coated matrix, the cristae are finely fragmented, the outer membrane in a number of structures is devoid of dual contour. The contours of the nuclei are deformed, nucleoplasm is cleared in some places, chromatin forms clusters of irregular shape. Sarco-plasma reticulum canaliculi dilated. The erythrocytes accumulate in the lumens of the dilated capillaries, and in the swollen endothelial cells there are destroyed mitochondria

After 25 and 40 days of infrasound impact in the area of myocardial ischemia, the SCHIC-reaction of cardiomyocytes is weak. Pironnophilia of cells has a focal character and decreases after treatment with ribonuclease. The activity of redox enzymes increases, there are areas with myofibrils stained in color, the diformazan grains form focal accumulations. The activity of G-6-FDG increases.

At the 25th day in reactively altered cardiomyocytes, sarcoplasm edema decreases. Sarcolemma is sharply contoured, the number of ribosomes increases, however, myofilaments are homogenized in some places. Mitochondria have an oval shape, in the matrix there are sometimes foci of enlightenment, the crista are in most cases parallel to each other, fragmentation is poorly noticeable. The nuclei of cells have rugged but clear contours, chromatin is located in the form of clumps of various sizes, the pores of the nuclear membrane are enlarged. The lamellar complex is little changed, the tubules of the sarco-plasma reticulum and the T-system are moderately dilated. There are single lipid inclusions, sometimes primary and secondary lysosomes are found. Capillary openings are enlarged, the amount of chromatin in the nuclei is increased, the mitochondria are homogenized, the number of glycogen granules is reduced.

Full restoration of damaged cardiac cells occurs as a result of intracellular regeneration and occurs after the termination of infrasound impact.

Conclusions. 1. Infrasound with a frequency of 8 Hz and an intensity of 120 dB has a damaging effect on the structure of the myocardium, which is associated primarily with damage to cardiomyocytes, as well as with damages related to microcirculation process. In this case, the size of the damage increases with increasing of duration of impact.

2. Having a damaging effect on the myocardium, infrasound in parallel causes the development of compensatory and supportive processes, which can mask the clinical symptoms and thus impede the correct and timely diagnosis.

3. The concealment of the action of infrasound on the myocardium requires the timely detection of this harmful factor in production and the control of it for the sake of preserving the health of those who are exposed to its constant effect.

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Liver Damage

Интенсивное развитие современной промышленности привело к созданию машин и механизмов большой мощности, которые являются источниками акустических колебаний различного спектрального диапазона. Особое внимание исследователи обращают на инфразвук как составную часть производственных шумов.

Научные исследования последних лет показали, что инфразвук в определенных параметрах оказывает вредное влияние на организм человека [1, 2, 3, 7]. При этом изучается воздействие инфразвука не только на целостный организм, но и на отдельные органы и ткани, а также клеточную структуру [2, 5]. Среди экспериментальных работ, в которых показано вредное воздействие инфразвука на клетки печени [4, 6]. Однако многие детали этого процесса остались неизученными и явились предметом настоящего исследования.

В эксперименте была использована инфразвуковая установка, описанная в предыдущей нашей работе [3]. Опыты поставлены на половозрелых белых крысах-самцах массой до 250 г, которые подвергались воздействию инфразвука частотой 2, 4, 8, 16 Гц и интенсивностью 90—140 дБ на протяжении 40 сут при ежедневной экспозиции 3 ч. Материал брали на 5, 10, 15, 25, 40 сут. Животных декапитировали. Материал фиксировали в 20 % формалине, срезы окрашивали гематоксилином-эозином, по Ван-Гизону, метиленовым пиронином по Бранше и галлоидом по Эмбарсону на нуклеиновые кислоты.

Для электронно-микроскопического исследования кусочки печени фиксировали 2,5 % глютаральдегидом с фиксацией 1 % осмия и заливали в аралдид. Ультратонкие срезы делали на ультрамикротоме LKB-III, контрастировали цитратом свинца и изучали в электронном микроскопе EM-10.

Установлено, что инфразвук оказывает повреждающее действие на гепатоциты печени при частоте 8 Гц и интенсивности 120 дБ. В железах паренхимы печени имеются диффузные изменения, которые носят характер реактивных процессов и встречаются в отдельных гепатоцитах или в целой группе клеток. Наблюдались изменения и со стороны клеток синусоидов печени.

Реакция гепатоцитов на воздействие инфразвука носила мозаичный характер и выражалась в том, что поврежденные клетки теряли друг с другом контакт и округлялись. Явления дистрофии развивались по мере действия инфразвука и характеризовались уменьшением со стороны ядер, цитоплазмы. Прежде всего уменьшалась интенсивность ядер с перераспределением хроматина и конденсацией его в виде плотных скоп под ядерной мембраной. В цитоплазме уменьшалось содержание РНК, она становилась базофильной. Более выраженными были изменения со стороны гепатоцитов при увеличении частоты инфразвука.

показали, что в реактивно-измененных гепатоцитах вначале происходило набухание митохондрий, резко увеличивалась плотность матрикса. Также наблюдалась деформация крист. Капсулы эндоплазматического ретикулаума расширялись, и в них формировались вакуоли неправильной формы и различных размеров.

При длительном воздействии инфразвука на 25-е и 40-е сутки в ряде гепатоцитов возникали миелиноподобные тельца и липидные гранулы. В гранулярной цитоплазматической сети количество рибосом резко уменьшалось и появлялись четкие зоны лизиса, особенно вокруг ядер (рис. 1). Количество гликогена резко уменьшалось по сравнению с нормой. Вокруг зон лизиса находились сравнительно мелкие митохондрии с плотным матриксом.

Рядом с резко поврежденными гепатоцитами располагались клетки, в ядрах которых хроматин был распределен неравномерно, умеренно выраженный ретикулаум имелась количество рибосом. В дальнейшем в подобных реактивно-измененных гепатоцитах хроматин преимущественно скапливался около ядерной оболочки, имея вид крупных, неправильной формы глыбок. В цитоплазме нарастала вакуолизация, а набухшие митохондрии содержали укороченные и фрагментированные кристы. Подобные гепатоциты остаются жизнеспособными и после прекращения действия инфразвука постепенно приобретают нормальное строение.

Дегенеративным изменениям подвергаются лишь те гепатоциты, в которых имеются участки лизиса с последующим образованием крупных вакуолей и наличием мелких митохондрий с плотным матриксом и разрушенными кристами (рис. 2). Вокруг дистрофически-измененных гепатоцитов скапливаются полибласты и постепенно формируются инфильтраты. Проллиферативные процессы сопровождаются появлением большого количества купферовских клеток, которые делятся митозом и скапливаются в участках поврежденной паренхимы. В ряде случаев можно наблюдать и митоз гепатоцитов, что, несомненно, свидетельствует о наличии процессов регенерации.

Исследование показало, что инфразвук оказывает повреждающее действие на клетки печени при частоте 8 Гц и интенсивности 120 дБ, вызывая изменения как ядер, так и цитоплазмы. Начальной формой реакции гепатоцитов на инфразвук является деформация ядер с перераспределением хроматина и конденсацией его в виде глыбок под ядерной оболочкой с расширением просвета и увеличением размеров перинуклеарного пространства. Как правило, подобные изменения в гепатоцитах наблюдаются на протяжении первых суток после окончания воздействия инфразвука. Одновременно в цитоплазме, где наблюдается изменение митохондрий с фрагментацией крист.

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S.V. ALEKSEYEV, V. V. GLINCHIKOV, V. R. USENKO

REACTION OF LIVER CELLS TO THE IMPACT OF INFRASOUND

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Intensive development of modern industry led to the creation of the machines and the mechanism of high power, which are the source of acoustic oscillations of various spectral range. The researchers pay special attention to infrasound as an integral part of production noises.

Scientific studies of recent years showed that infrasound in certain parameters has a harmful effect over the human body [1, 3, 7]. At the same time, the effect of infrasound is studied not only on the whole organism, but also on separate organs and tissues, as well as cellular structures [2,5]. Among the experimental works there are ones that show the harmful impact of infrasound over liver cells [4, 6]. However, many of the details of this process remained not researched and are the subject of this study.

The infrasound installation described in our previous work [3] was used at the experiment. The experiments were performed on sexually matured white rats-males weighing up to 250 g, which were exposed to infrasound frequency at 2, 4, 8, 16 Hz and with an intensity of 90–140 dB during 40 days with a daily exposure of 3 hours. The material was taken on the 5th, 10th, 15th, 20th, 40th day. The animals were decapitated. The material was fixed in 20% formalin, the cuttings were colored with hematoxylin-eosin, by Van-Gieson method, methyl green with pyronin, by Brache method and halo-cyanin, by Einarson method for nucleic acids

For electronic - microscopic research the pieces of liver were fixed by 2.5% glutaraldehyde with additional fixation by 1% osmium and poured into araldide. Ultrathin cuttings were made on the ultratome LKB-III, contrasted by citrate of lead and studied in the electronic microscope JEM-7A.

It was established that infrasound has a damaging impact over hepatocytes of the liver at the frequency of 8 Hz and the intensity of 120 dB. In the glandular parenchyma of the liver there are diffuse changes which have the nature of reactive

processes and are found in separate hepatocytes or in the whole group of cells. In addition, changes from the side of the sinusoid cells of the liver were observed.

The reaction of hepatocytes to the impact of infrasound was mosaic by nature and was expressed in the fact that the damaged cells lost contact with each other and were rounded. The phenomena of dissociation increased along with the effect of the infrasound and were characterized by changes from the side of both the nucleus and the cytoplasm. First of all, there was a deformation of the nuclei with the redistribution of chromatin and its concentration in the form of dense layer under the nucleus membrane. In the cytoplasm, the RNA content increased, it became sharply basophilic. Hepatocyte changes were more pronounced at the increase of the infrasound intensity up to 140 dB.

Electronic microscopic studies showed that mitochondrial swelling in reactively altered hepatocytes initially took place, the density of the matrix sharply increased, and deformation of the cristae was observed. The endoplasmic reticulum canaliculi expanded, and vacuoles of irregular shape and of various sizes were formed in them.

At long time exposure to infrasound, myelin-like bodies and lipid granules appeared in a number of hepatocytes on the 25th and 40th day.

In the granular cytoplasmic reticulum, the number of ribosomes sharply decreased and lysis areas appeared, especially around the nuclei (Fig. 1). The amount of glycogen decreased sharply compared with the norm. Around the lysis areas there were relatively small mitochondria with the dense matrix.

Next to sharply damaged hepatocytes there were cells in which nuclei chromatin was unevenly distributed, and in the endoplasmic reticulum there was a moderately pronounced vacuolization and the number of ribosomes decreased. Ultimately, in such reactively altered hepatocytes, the chromatin predominantly accumulates around the nuclear envelope, having the view of large clumps of irregular form. Vacuolization increased in the cytoplasm, but the swollen mitochondria contained shortened and fragmented cristae. Such hepatocytes remain viable after the termination of the infrasound action as well, gradually acquiring the normal structure.

The subject of degenerative changes are only those hepatocytes in which nuclear deformation takes place, but in the cytoplasm there are lysis areas with the ultimate formation of large vacuoles and the presence of small mitochondria with a dense matrix and destroyed cristae (Fig. 2). Polyblasts accumulate around dystrophic-

altered hepatocytes and infiltrates gradually form. Proliferative processes are accompanied with the appearance of a large number of Kupffer cells, which are divided by mitosis and are accumulated in areas of the damaged parenchyma. In some cases, hepatocyte mitosis can be observed, which undoubtedly indicates the presence of regeneration processes.

The study showed that infrasound has a damaging impact over liver cells at a frequency of 8 Hz and an intensity of 120 dB, causing changes of both the nucleus and the cytoplasm. The initial form of the reaction of hepatocytes to the infrasound is the deformation of the nucleus with the redistribution of chromatin and the concentration of its clumps under the nuclear envelope with the disintegration of the nucleoli and the increase of the perinuclear spaces size. As a rule, such changes in hepatocytes are observed during the first day after irradiation with infrasound and are observed in those cells that are the subject of dissociation. At the same time, changes in the cytoplasm also take place in such hepatocytes, where mitochondria swelling with cristae fragmentation is observed.

Along with infrasound action, the number of reactively modified hepatocytes increases as well, especially on the 10-15th day, with the appearance of degenerative forms among them.

The greatest damaging effect of infrasound is observed at a frequency of 8 and 16 Hz and an intensity of 140 dB. At the same time, the number of dissociated hepatocytes increased, they formed whole groups. The nuclei of such cells were sharply deformed, and in the cytoplasm there were lysis areas of the endoplasmic reticulum, with ultimate formation of large vacuoles. In the preserved areas of the granular cytoplasmic reticulum, the canaliculi were enlarged and formed vacuoles of various dimensions and sizes. At the same time, lipid granules containing osmiophil inclusions appeared in the cytoplasm, and the structure of mitochondria changed.

The mitochondria that were located closest to the lysis area and were reduced in size, with a dense matrix and mild cristae, were altered most of all. In those areas of the cytoplasm in which the canaliculi of the granule network were preserved, though expanded, the mitochondria were enlarged in size, the fragmentation of the cristae was observed. The changes described above indicate that infrasound damages not only intracellular membranes and mitochondria, but also the nuclear apparatus, that can lead to the death of cells, if these changes have pathological nature and are

accompanied by lysis of cytoplasmic areas with ultimate formation of large vacuoles.

Such hepatocytes ultimately die, and polyblasts and profiling Kupffer cells are accumulated around them.

Less damaged hepatocytes, in which lysis of the cytoplasmic membranes is not detected, are gradually restored, though the extended canaliculi of the endoplasmic reticulum and the increased density of mitochondria with moderate vacuolization remain in them for a long time.

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Organism reaction
both Animal + Human

ГИГИЕНА ТРУДА

и профессиональные
заболевания

10

1979

МЕДИЦИНА

Москва



Гиг. труда

РАННЯЯ РЕАКЦИЯ ОРГАНИЗМА
НА НИЗКОЧАСТОТНЫЕ АКУСТИЧЕСКИЕ КОЛЕБАНИЯ

Санитарно-гигиенический медицинский институт

(Поступила в редакцию 14/II 1978 г.)

Причиной возникновения искусственного инфразвука являются работающие механизмы с большими излучающими поверхностями, а также движущиеся потоки газов. Источниками инфразвука, по данным ряда авторов (В. И. Зинченко и Ф. Е. Григорян; Э. Н. Малышев; Tempest; Hood и Leventhall, и др.) и результатам наших исследований, могут являться дизельные двигатели, турбины, поршневые насосы, компрессоры, вентиляторы, большие воздухоудные машины. Инфразвук возникает в туннелях для автотранспорта, в дымоходах высоких печей и в горелках мартеновских печей. Инфразвуковые поля, создаваемые работой перечисленного оборудования, имеют на основных частотах 1, 5, 2, 4, 8, 12 Гц интенсивность от 110 до 132 дБ.

Интенсивность инфразвука часто имеет больший уровень, чем уровень слышимого звука. Распространение инфразвука, степень поглощения атмосферой, способность к дисперсии и др. несколько отличаются от соответствующих показателей слышимых звуков. Инфразвук способен вызывать резонанс крупных объектов в силу соизмеримости длины волны с этими объектами. Все это обуславливает некоторые особенности воздействия инфразвуковых колебаний на живой организм и создает определенные трудности в борьбе с ними.

На кафедре гигиены труда Ленинградского санитарно-гигиенического медицинского института проводятся определения производственных источников инфразвука, выяснение характера его действия на организм, определение механизма изменений, наблюдаемых в организме под влиянием инфразвуковых колебаний. Однако раскрытие этого механизма невозможно без установления самых ранних реакций организма на воздействие изучаемого фактора. Это и явилось целью настоящей работы.

Исследования проводили в условиях моделирования производственных параметров инфразвука в специально оборудованном на кафедре экспериментальном акустическом комплексе. В исследованиях принимали участие прошедшие предварительное медицинское освидетельствование и признанные здоровыми мужчины в возрасте от 19 до 29 лет. Кроме того, на крысах, кроликах, морских свинках изучали действие на организм инфразвуковых колебаний частотой 5 и 10 Гц, с уровнем звукового давления 100 и 135 дБ. Время действия фактора 15 мин. Уже в первые минуты воздействия инфразвук вызывает психическое напряжение, вегетативные реакции, неприятные слуховые ощущения. Наиболее общими жалобами, предъявляемыми при действии инфразвука исследуемых частот, являются ощущения общей усталости, вялости и давления в ушах. У небольшого количества лиц (в среднем у 15—20%) возникали такие симптомы, как головная боль, головокружение, которые отмечались непродолжительное время в конце и после окончания эксперимента. Более чем у половины исследуемых были зафиксированы жалобы на рассеянность, сонливость и ощущение депрессии. В течение всего периода воздействия инфразвука некоторые исследуемые отмечали вибрацию внутренних органов, которая сказывалась в основном в ощущении колебаний грудной клетки, брюшной стенки и желудка. Эти

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EARLY REACTION OF THE ORGANISM TO THE LOW-FREQUENCY ACOUSTIC OSCILLATIONS

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The causes of the appearance of the artificial infrasound are operating mechanisms with large radiating surfaces, as well as moving gas flows. According to a number of authors (V.I. Zinchenko and F.E. Grigoryan; E.N. Malyshev; Tempest; Hood and Leventhall, etc.) and the results of our researches, the sources of infrasound can be diesel engines, turbines, piston pumps, compressors, fans, large air blowing machines. Infrasound appears in tunnels for motor transport, in chimneys of high furnaces and in burners of open-hearth furnaces. The infrasound fields created by the work of the mentioned equipment have the intensity from 110 to 132 dB at the main frequencies 1,5, 2, 4, 8, 12 Hz.

Infrasound intensity often has a higher level than the level of audible sound. The distribution of infrasound, the degree of absorption by the atmosphere, the ability to disperse, etc. are somewhat different from the corresponding indicators of audible sounds. Infrasound can cause resonance of large objects due to the commensurability of the wavelength with these objects. All this causes some features of the impact of the infrasonic vibrations over the live organism and creates certain difficulties in combating them.

The Chair of Labor Hygiene of the Leningrad Sanitary and Hygienic Medical Institute performs the determination of the production sources of infrasound, clarifying the nature of its action over the organism, the determination of the changing mechanism observed in the organism under the influence of infrasonic vibrations. However, the disclosure of this mechanism is impossible without establishing the earliest reactions of the organism to the impact of the studying factor. This was the purpose of the present work.

The studies were conducted under the conditions of modeling the infrasound production parameters at the experimental acoustic complex specially equipped at the Chair. Recognized healthy men at the age from 19 to 29 years who passed preliminary medical examination took part at the research. In addition, the impact

over the organism of infrasonic oscillations with the frequency of 5 and 10 Hz, with a sound pressure level of 100 and 135 dB was studied at rats, rabbits and guinea pigs. The time of factor action is 15 minutes. Already in the first minutes of exposure, infrasound causes mental stress, vegetative reactions, unpleasant auditory sensations. The most common complaints caused by the infrasound action of the studied frequencies are feelings of general fatigue, lethargy and pressure in the ears. A small number of people (average 15–20%) had such symptoms as headache, dizziness, which were observed in a short time at the end and after the finalization of the experiment. More than half of the researched people complained for distraction, drowsiness, and feeling of depression. During the entire period of infrasound impact, some of the researched people noted the vibration of the internal organs, that mainly causes the sensation of vibrations at the chest, abdominal wall and stomach. These data allow to expect functional changes in the central nervous, cardiovascular systems, from the side of the hearing analyzer, respiratory system and vestibular apparatus under the influence of infrasound.

The functional state of the central nervous system was studied by electroencephalography method.

After a 15-minutes impact of infrasound, an increase in synchronization phenomena, most often in the left hemisphere, was observed at the electroencephalographic curves. In some cases, the hypersynchronized α -rhythm and the appearance of Θ -waves were observed in the left fronto-temporal region.

The obtained results allow us to make an assumption about the general reconstructions of the biopotentials, apparently caused by the impact of infrasound over the brain stem formations. These changes should be attributed to non-specific reactions associated with the weakening of the activating influences of the reticular formation of the trunk over the cerebral cortex (P. K. Anokhin; Moruzzi and Magoun, and others).

After the infrasound action with the frequency of 10 Hz, the intensity of 135 dB, the lengthening of the absolute values of the visual-motor reaction to the strong and weak stimuli and the decrease of the strength of the effector response were also observed.

At the action of infrasound with the frequency of 5 and 10 Hz and the intensity level of 135 dB, peculiar changes in the heart rhythm were noted. In the first minutes of exposure, the number of heartbeats tends to increase, expressed at the same level for both influencing frequencies. In 5–10 minutes, the heart rhythm slows down,

returning to the initial, but after turning off the generator, the number of heartbeats becomes even more rare compared to the background values. Some studied people had an arrhythmia. These phenomena are most pronounced in the first minutes of the action of low frequencies, gradually disappearing with increasing of the time spent in the camera by studied people. A decrease in peripheral vascular tone was found, manifesting in the increase of skin temperature and in the decrease of maximum arterial pressure.

The study of cerebral hemodynamics was performed by rheoencephalography method. Analysis of rheoencephalogram showed that the action of infrasound is accompanied with the signs of inhibition of cerebral hemodynamics, manifested in the difficulty of venous outflow from the cranial cavity. The infrasound with frequency of 10 Hz, the intensity of 135 dB, caused deeper and more stable changes in the cerebral blood circulation, which consisted in a greater increase of the amplitude of the rheographic wave, in an increase of the duration of its anacrotic phase and in a decrease of the tonic voltage indicator compared to the impact of infrasonic vibrations with frequency 5 Hz of the same intensity. Under the influence of infrasound, the most noticeable and authentic changes in cerebral hemodynamics appear from about 7-10th minute of being in the infrasound field.

For registration of mechanical movements of the heart during contraction, the method of seismic cardiography developed by V. M. Baevsky and M. A. Kazaryan was used. The obtained results allowed to conclude that the infrasonic oscillations with intensity of 135dB cause disturbances in the mechanical movements of the heart, reducing the force of contraction of the heart muscle. This is manifested in a decrease in both the amplitude of the 1st oscillatory cycle, reflecting the magnitude of the cardiac forces acting during the systole, and the amplitude of the 2nd (diastolic) oscillatory cycle. The most pronounced changes in the contractile activity of the heart take place under the influence of infrasound frequency of 10 Hz.

Analysis of pneumograms registered during the action of infrasonic oscillations with a frequency of 5 and 10 Hz, an intensity of 135 dB shows changes in the respiratory function, manifested in the stable decrease of respiration frequency, starting from the 1st minute of the infrasound impact.

The state of the auditory analyzer was investigated with the help of tone audiometer AP-02. Researches of the infrasound impact with the frequency of 10 Hz and the intensity of 135 dB showed in most cases a slight exacerbation of hearing sensitivity - within 10 dB at the frequencies of 125, 250, 500 and 300 Hz.

The applying of the electron-syntagmography method did not reveal any disturbances in the vestibular apparatus under the influence of low-frequency oscillations of the studied intensity.

At experimental studies over the laboratory animals exposed to infrasound of the same parameters, changes in the bioelectrical activity of some cortical and subcortical structures of the brain, disturbances of redox processes in skeletal muscles, changes in the volume of nuclei of receptor cells in the helical body of the guinea pig snail were revealed that is a morphological expression of excitation caused by the infrasound action. Changes in the content of nucleic acids were found in these cells.

The results of the conducted researches allow us to conclude that infrasonic oscillations are not indifferent for biological objects, have the adverse effect over the entire organism and make many important functional systems react. The central nervous, cardiovascular, and respiratory systems, as well as the auditory analyzer are the most interested, reacting already in the first minutes of the infrasound impact. Among all studied parameters of infrasound, the deeper changes in the indicated systems of the studied people were caused by the oscillations with the frequency of 10 Hz and the intensity of 135 dB. The infrasound with the frequency of 5 Hz at the same intensity caused much smaller effect. Studies conducted at a lower infrasound intensity of 100 dB practically did not lead to the changes in the studied systems.

The analysis of the received data witnesses about the fact that the impact of infrasonic oscillations is manifested, primarily, in the violation of the mechanisms of central regulation of the body vital systems, the manifestation of which are the detected changes in the functional state of the cardiovascular and respiratory systems, violation of proteins synthesis and metabolic processes in the organism.

Thus, the study of the early reactions of the organism to the impact of infrasonic oscillations allows to reveal certain aspects of the mechanism of its biological action and contributes to the scientific argumentation of the production infrasound levels acceptable to the humans.

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