STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Petition of BNE Energy Inc. for a Declaratory Ruling for the Location, Construction and Operation of a 3.2 MW Wind Renewable Generating Project on New Haven Road in Prospect, Connecticut	Docket/Petition No. 980 March 8, 2011

Supplemental Pre-filed Testimony of Michael S. McCann, CRA

The following pre-filed testimony supplements my pre-filed testimony filed on February 16, 2011, in connection with the above-captioned matter.

14. Did you review BNE's response to interrogatory number 34 of SPC's first set?

Yes. The response is dated February 16, 2011. The question presented was "[h]as any investigation, study or analysis been undertaken with respect to the effect of the project on property values in the area and the corresponding effect on property tax revenues for the Town of Prospect." Although BNE objected to the question as outside of the Siting Council's statutory decision-making criteria, it responded subject to and without waiving the objection: "[G]enerally studies have shown no impact on property values. *See* the extensive property value study attached hereto conducted by the Berkeley National Laboratory titled, 'The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis' at http://eetd.lbl.gov/ea/ems/reports/lbnl-2829e.pdf."

15. Are you familiar with the authors of this study?

Yes. I communicated directly with Messrs. Hoen and Wiser in late 2009 and provided them with a critique of their study. Correspondence dated September 12, 2009,

December 9, 2009, December 14, 2009 and December 15, 2009 are collectively attached to my testimony as Exhibit G. In particular, I attempted to stress that the report was not proportionately relevant to the footprint or "ground zero" value impacts, as the large number of data was not as near homes as is typically sought by wind energy developers. I also indicated that since he/they incorrectly cited the basis of my opinions at that point, I would likely need to go on the record to correct their mistakes. I also stressed that a Property Value Guarantee (PVG) should be recommended, as even their own report data showed lower home values at setback distances out to 1 mile for turbines.

In November 2010, I e-mailed Mr. Hoen to compliment him for updating his presentation at a webinar in May 2010. A copy of the e-mail is attached to my testimony as Exhibit H. I noted that slides 28 through 32 of the presentation make it harder for some people to misunderstand or misrepresent his study findings. A copy of the May 5, 2010 NEWEEP Webinar presentation titled "Impacts on Residential Property Values Near Wind Turbines: An Overview of Research Findings and Where to Go From Here" is attached as Exhibit I. On slide 29, Mr. Hoen states, "[s]o, given these results, are property values something stakeholders should be concerned about? **OF COURSE**!" (emphasis in original).

16. Are you aware of other critiques of the 2009 study cited in BNE's interrogatory response?

Yes. Albert R. Wilson, CRE, examined the study in his paper titled "Wind Farms, Residential Property Values, and Rubber Rulers." A copy is attached as Exhibit J. Wayne Gulden critiqued the study as well: "Critique of The Impact of Wind Power

Projects on Residential Property Values in the United States: A Multi-State Hedonic Analysis." A copy is attached at Exhibit K.

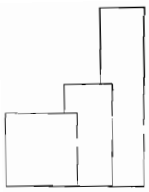
17. Is there anything further you would like to add about Mr. Hoen?

Yes. I read a story about a conversation between Mr. Hoen and Clif Schneider in April 2010. In it, Mr. Hoen explicitly states that "[wind] developers put our report forward and say look property values aren't affected, and that's not what we would say specifically." A copy of the story is attached as Exhibit L.

18. Isn't that precisely what BNE is doing in its response to interrogatory number 34?

Yes.

EXHIBIT G



September 12, 2009

Mr. Ben Hoen,
Mr. Ryan Wiser

Re: Review of DRAFT report titled "Hedonic Analysis of the Impact of Wind Power Projects on Residential Property Values in the United States"

Gentlemen;

As requested, I have read and reviewed the captioned (un-dated) draft report (Report) for the purpose of offering any appraisal review opinions as it relates to your study, analysis and draft conclusions. The date of my review is current, and the principal authors of the Report are identified as follows:

Ben Hoen, Ryan Wiser and Peter Cappers
Ernest Orlando Lawrence Berkeley National Laboratory

Mark Thayer
San Diego State University

Gautam Sethi
Bard College

The work described in the Report was reportedly funded under contract with the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy (Wind & Hydropower Technologies Program).

McCann Appraisal, LLC, and Michael S. McCann (McCann) has been invited to review the draft Report, and is providing the enclosed review comments on a pro-bono basis. Due to the experience and specialized knowledge possessed by McCann, as it relates to both wind farm issues and property values, McCann believes that the authors can benefit from such a review. Said experience has been developed over 29 years as a professional real estate appraiser and over 5 years of experience and involvement with wind farm projects, mainly in Illinois.

The intended users of this review are the authors of the captioned draft Report prior to finalizing said Report, for consideration by the authors in weighing the validity or reliability of their conclusions, as well as potential considerations for the authors to refine their work. Review comments by McCann are provided against the background of facts or issues that are contained in the draft Report, as well as some knowledge of data and market facts that may have been outside the scope of the Report or the methodology employed by the authors.

As it relates to the reliability of the draft conclusions, McCann notes the disclaimer contained in the report, and finds that said disclaimer is appropriate given the likely future dissemination and

reliance by zoning boards, etc., upon the conclusions of the authors. The Report disclaimer therefore merits full understanding from a review perspective, which is quoted as follows:

"This document was prepared as an account of work sponsored by the United States Government (1). While this document is believed to contain correct information (2), neither the United States Government nor any agency thereof, nor The Regents of the University of California, nor any of their employees, makes any warranty (3), express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights (4). Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or The Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, or The Regents of the University of California."

McCann review comments to the Report disclaimer

Note (1) The U.S. government, as well as many states and counties, are not "officially" neutral on the subject of wind energy development projects. In fact, many policy goals very much rely on the expedited development of the wind energy industry projects, and various acts of legislation, tax incentives, etc., have been instrumental to the demand for development of wind turbine projects.

McCann does not suggest that any agency or governmental entity has unduly influenced the authors or their draft conclusions. However, it can potentially be relevant to a user seeking to rely upon the Report, whether or not a report was paid for by a proponent or opponent of the issue purported to be studied. This factor typically is considered by any finder of fact, zoning board or governmental authority when "weighing" the reliability of the opinion(s) expressed in a report or testimony based on such a report.

Note (1) of the disclaimer should not be glossed over by any potential user of the Report, or misunderstood as an entirely academic work product. It is in fact funded by a proponent of the wind energy industry.

Note (2) The Report cites the sources of data analyzed by the authors. However, the raw data is not contained in the report in such a manner to enable a full peer review, or test the results via analysis of the same data.

It has been explained to McCann that confidentiality agreements, etc., prohibit the sharing of the base data, which is accepted at face value by McCann. However, Assessor offices and the data provided by such agencies are not subject to cross examination and discovery of any errors in the base data. McCann has personally found that mass-appraisal (Assessor) offices often have incorrect factual information in their records, which is part of the reason that every state has an appeal process; not only to appeal the value opinions of such agencies, but to correct factual errors.

The Report disclaimer is appropriate as it puts potential users on notice that the authors have not verified the factual accuracy of the data upon which their conclusions are based. This is

relevant in the review process, given the likely reliance on the Report by zoning boards and wind industry developers and proponents.

Based upon experience at the zoning board and litigation levels of the applications for large-scale wind energy projects, McCann is aware that the inabilities to cross examine the author of an expert opinion can result in the opinion being inadmissible and, similarly, unverified bases for said opinions raises the potential question of reliability of the conclusion(s).

Note (3) of the disclaimer also discloses that the parties and governmental authorities involved in preparing or funding the Report provide any warranty or accept legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process. Again, the reliance of any party on the Report is limited, and even the regression methodology (process) is not claimed to be fully reliable.

Note (4) Perhaps most important in the disclaimer, note 4 recognizes an implicit risk to private property rights via use of the Report by other parties. It is exactly these rights and the value attendant to those rights that zoning laws are intended to protect, (*as well as the public safety, health and welfare)* It is in the context of this review with McCann's acknowledgement of the probable users of the Report that the disclaimer and emphasized notes should be understood.

Review opinion

McCann has read the Report disclaimer and considers it to be an important element of the Report. The authors have clearly disclosed the limitations of factors potentially affecting reliability and, taken at face value, there is nothing misleading to any user of party reading the Report. However, in practice, the reviewer notes that such disclaimers are often ignored or misunderstood to be "canned" anti-liability language.

Given the tendency and/or potential for zoning boards to skip ahead to the conclusions of any report without careful consideration or full understanding of the limitations on its reliable use, McCann recommends that the Report authors consider including reference to the prudent consideration by any zoning authority to require a Property Value Guarantee (PVG), as part of the conditioned approval of any large-scale wind energy zoning project application. There is no standardized PVG available, but important elements would include homeowner option to sell their property to the developer at an appraised value that assumes no turbines are present, in the event traditional marketing efforts are unsuccesful; payment for diminution of value in zones nearest the perimeter of any project; and use of current home prices as comparables, at the time any claim for compensation was made (to eliminate the effect of "normal" fluctuations of the market). This type of PVG can be fairly, objectively and successfully implemented by a well run energy company and/or the political jurisdiction of the project locations. A PVG would alleviate concern over the very issue acknowledged and studied by the authors of the report and observed first hand by McCann.

Finally, in the event that the author's conclusions prove out to be not universally reliable, correct or generally applicable to every residential property location near wind energy projects, the intent of local zoning laws would not be defeated as it relates to compatibility and property values being protected, when a new dominant land use is introduced to an established residential locale.

As McCann has testified numerous times, home ownership is the single largest investment for most Americans throughout their lifetime, and it is deserving of protection under circumstances where legitimate risk from such a profit-driven use exists. A PVG would not place the burden on homeowners of sacrificing long-built equity to accomplish energy policy goals for the "public good", and if there is no impact on home prices or marketability resulting from development of wind energy projects, then the only burden on the developers/owners of such projects would be a comparatively nominal administrative expense of funding the PVG process.

Review Opinions regarding Report content and Methodology

McCann has not "checked the math", or otherwise verified that the statistical indications of the Report for accuracy. Further, the base data for residential property sales was not available in the Report, as stated previously, and thus no alternate methodology could be employed by McCann to cross-check the conclusions of the authors. The review is therefore limited by these restrictions, and the reviewer can not state with authority that the conclusions are accurate with respect to the supporting data. On balance, McCann can not state that the conclusions reached by the authors are inaccurate for the majority of the sales studied in the zones up to 10-miles from the project locations.

McCann acknowledges that regression analysis has been largely accepted as an "objective" methodology for isolating the value (or devaluation) of property by consideration of the differences or, in this case, perceived disamenity of wind farm proximity to residential property. McCann is also aware that if any of the multiple input data or assumptions in a regression model are even slightly faulty or defective, the statistical indications that result can be significantly impacted. In fact, the authors fairly disclose that ***the primary goal of subsequent research should be to concentrate on those homes located closest to wind facilities, where the least data are available***.

McCann has read the draft Report as well as the prior study prepared by Mr. Ben Hoen. Notwithstanding an assumed objective methodology as well as analyst, what seems most apparent is the lack of transactions of residential property in the areas most heavily dominated by the turbine projects. When graphic representation of sale locations is provided, however, it becomes possible to see the "hole in the doughnut".

In other words, the absence of data in the most proximate locations is evidence, in and of itself, that the wind turbine projects are thwarting the successful marketing of residential properties in numerous locations. The regression analysis employed in the Report is not capable of discerning this observation, and is not considered to be reliable by McCann for those properties nearest the project locations.

Although the Report acknowledges that it would be useful to study marketing times of homes in the project locations, it does not cite the lengthy and on-going marketing attempts of the most severely affected homes. This is a shortcoming in the Report, as it now is reviewed in draft form.

Similarly, accepted and standard real estate appraisal forms and methodology would allow the authors to reasonably project the impact on market prices and values as the inventory of unsold homes expands with every new project constructed. A marketing time addendum required for

virtually all residential appraisals now provides the format and analytical framework for adjusting the price to allow for a typical marketing time, which may well vary from location to location even without any impact from wind energy projects. This methodology has been used for many years in relocation appraisals, where the guarantor (Relocation Company) limits their holding time to a typical marketing time, with a discounting process employed when marketing times exceed that base assumption.

As thoroughly acknowledged by the authors of the Report, proximity to an amenity or a nuisance can and does have significant effect on the value of residential property. Sale prices for property in zones up to 10 miles distant from a wind farm project are not considered to be a reliable basis for concluding a lack of impact on the most proximate properties, particularly those located in the "footprint" of a project. As those homes can be effectively surrounded by a large-scale industrial "overlay" with in some cases hundreds of 400-foot tall wind turbines becoming the dominant land use, it is exactly those (sales of) homes which would best reveal the greatest measurable impact of the projects.

The Report also concludes that "*Although this work builds on the existing literature in a number of respects, there remain a number of areas for further research. The primary goal of subsequent research should be to concentrate on those homes located closest to wind facilities, where the least data are available. Moreover, much of the data collection for this report was concluded in 2006, leaving the possibility of another round of analysis in the same study areas using more current data, and expanding the number of study areas, both of which would increase the overall sample size, and specifically the number of sales transactions for homes that are particularly close to wind facilities. A more detailed analysis of sales volume impacts would also be possible, as would be an assessment of the potential impact of wind facilities on the amount of time homes are on the market in advance of final sale. Finally, it would be useful to conduct a survey of those homeowners living close to existing wind facilities, especially those residents who have bought homes in proximity to wind facilities after facility construction.*"

McCann suggests that any further study would be well served by looking at the raw data for simple, market-accepted statistical indications. For methodology to be appropriate from an appraisal review perspective, it should "mirror" the market for the property type appraised (or studied) For example, data utilized by both McCann & Poletti derived from the Mendota Hills project, located in Lee County Illinois, included over 40 sales. The sale price per square foot of residential living area was discernibly different for those homes nearest the wind farm, with an average price about 20% lower than the unit price of the more distant homes. Square footage of homes is a widely accepted basis to measure the value of homes. And with all due respect, this important element is lost in the regression analysis as just another category to isolate, and the Mendota impact is similarly obscured.

Although the sample size is smaller for the Mendota Hills locale than the multiple locations cited in the Report, McCann believes that quality of data is more meaningful to the question at hand than quantity. The REPP report cites many thousands of sales and yet the report is meaningless to the question of property value impacts, yet it is often misunderstood as a reliable authority on this topic. McCann recognizes, in contrast, that the authors of the reviewed Hoen (et al) Report made a thorough an apparently time intensive attempt to carefully acknowledge and measure differences in views, distance, quality of homes, etc. In that regard, McCann believes that the author's integrity is beyond question.

McCann recommends that the authors emphasize the limitations of reliability, as contained in the Report disclaimer, as well as the absence of data in the most heavily impacted project locations. Perhaps coupling the regression methodology with more traditional, market-based methods of analysis will result in a Report that is generally applicable to virtually any proposed project.

Given the likely dissemination, use and reliance on the Report by governmental authorities, and with the impact on the "public" being best isolated to those living nearest such projects, a clearly emphasized focus on the nearest homes must be included for the Report to be considered reliable, from an appraisal review perspective.

Thank you for the opportunity to provide my input and comments on your draft Report, prior to its publication. I trust my comments are meaningful to you, and I remain available to discuss your Report and my review, if you decide it will be helpful to do so.

Respectfully submitted,

McCANN APPRAISAL, LLC

Michael S. McCann, CRA
State Certified General Real Estate Appraiser
License No. 553.001252 (Expires 9/30/2009)

McCann Appraisal, LLC

Real Estate Appraisers & Consultants

December 9, 2009

Mr. Ben Hoen
Ernest Orlando Lawrence
Berkeley National Laboratory

Re: The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis

Dear Mr. Hoen:

I am submitting a follow up review letter after reading your group's published study (Report). Perhaps your study group will be doing supplemental or ongoing work that will incorporate corrections, additions and shift the focus to reflect proportionate relevance, and these comments and concerns can be given due consideration.

First, and on a personal note, my compliments on a professional looking Report. However, with all due respect, it still falls short of being a truly objective and reliable REAL ESTATE VALUE study of the issue at hand, in my professional opinion, the reasons for which I will begin to describe in this follow up review.

As I predicted in a note to you earlier, your final Report would get a lot of exposure and probably be cited as justification for zoning and land use approval of wind energy projects on a far reaching scale.....which is well understood to be the agenda and policy of the federal government. For that reason, I think an abundance of caution should have been utilized to include any reasonable interpretation of your study data, even when that is contrary to, or significantly differs from, the thrust of the general conclusion.

In this day and age of questionable "science" being applied regarding predictions of global warming, any appearance of hiding data or painting "targets around bullet holes" does little to solve controversies or facilitate sound, well informed planning and decision making.

With that said, my comments are, as follows:

First, I direct your attention to Report *Table 2*, which cites study locations and the "hub" height of turbines. This is misleading to a typical reader, as zoning standards usually include the height as fully extended by the turbine blades. The height of the structures does not peak at the "hub" and there is obviously a greater height, often approaching

mikesmccann@comcast.net
500 North Michigan Avenue, Suite 300 Chicago, Illinois 60611
PHONE: (312) 644-0621 FAX: (312) 644-9244

400 feet; by any objective measure more significant than the lower hub height. My apology for not catching this in my truncated review of the draft Report.

Notwithstanding your polite acknowledgement of issues described in some of my initial review comments, I think you must have glossed over the fact that I cited to you in particular as my opinion basis for value impact 40 sales that demonstrate on their face a 25% lower value of homes in close proximity to the Mendota Hills turbines. The two (2) "sales" you DO attribute to me *(Report Table 1, page 9)* as my opinion basis are, in reality, examples I provided of inordinately long and on-going marketing times, at otherwise market-based asking prices.

The deterrent to sale of the homes directly attributable to the wind farm project is well understood by the local Realtor who had the listings and who, at the time of my communication with you, had reported to me the rejection rationale of over 100 otherwise interested would-be buyers and their agents. Interest that evaporated once they visited the properties and saw the nearby and surrounding turbines.

The Report also misstated an important fact: The two (2) homes never actually sold,....although the text of the Report implies it was just a long marketing time BEFORE they sold. (*See report page 7, 2nd paragraph*)

Such a stigma deterrent, while not perhaps statistically significant or measurable via the methodology employed and select data utilized in your study, is entirely significant to an owner unable to reasonably convert their home equity to cash. That real-world experience is virtually mute and mischaracterized in the Report, and apparently unimportant to the main conclusion of your group's study.

And while marketing experience for the two (2) homes is PART of the basis for opinions I have developed thus far, I think the report is misleading since I disclosed the sale basis to you (*see McCann review letter*) and that is not mentioned in your report on *Table 1*, where other such outside input is shown.

My contribution to anyone understanding the basis of Report conclusions is minimized, due to that inaccuracy. I suspect I will need to go on the record at some point to clarify that oversight. Unfortunately, that may in turn appear to be something other than a mere oversight, given the opposite direction of the indication of the Mendota data to the Report findings and coupled with the fact that it is contrary to the policy goals of the funding sponsor of the study.

On balance, I must fairly acknowledge that the Report gave some limited comment to the "possibility" that some properties "may" have had negative effects from proximity to turbines. But based on the size of the < 1 mile data sample, I am surprised that the report does not unequivocally state that nearby properties "have" shown a "discernibly and measurably lower" sale price than the base line data.

While those qualifying words may have been intended by the Report authors to reflect the somewhat lower mathematical certainty of drawing the indicated adverse conclusion, the framing of the comments appears to favor the cause of the funding sponsor, rather than being impartially framed and truly objective or "neutral".

Beyond my disclosures and comments, and contrary to the claimed general applicability of study conclusions to other areas in the country, the Report charts and data are in fact supportive of a distinctly MEASUREABLE reduction in value, on the order of 5.3% to 5.5%, for homes up to 1 mile away from the nearest turbine(s) (*Report Figure ES-1)*.

Although this difference is dismissed as "statistically insignificant", again, I think that is misleading to the typical user of your study and the public in general.

That distance included 125 sales within 1 mile out of 870 baseline sales that were greater than 5 miles in distance, and appeared to include no sales in the actual project footprint(s). As I understand basic statistical analysis, data in excess of 50 measuring points is generally accepted and deemed statistically "significant".

Similarly, your report *(Figure ES-2)* reveals that 310 sales with a vista rated as poor out of 2,857 sales with an average vista, sold for 21% lower than the average view properties. A below average vista yielded prices 8% below the average vista baseline.

While the rating of any vista has some subjective elements to it, it is well settled that the subjective rating of turbine views is disproportionately negative by residents of immediate project areas who have no turbine lease agreement or financial interest in the project(s). Again, the Report conclusions are contrary to data contained within.

The poor vista measurement in your study, however, is perfectly consistent with the Mendota data and the 25% value loss opinions I have expressed in the post-turbine *(poor vista)* scenarios I have studied, especially under circumstance whereby the property in question posses an above average vista and attendant higher than average value, and will end up with a below average or poor vista post-turbine development. A value loss of 25% may understate the damages in those instances.

And while the vista from a given property is a well recognized value influencing factor, your report fails to take into consideration any sound measurements at various projects or from the nearby homes, except as maybe implied by distances. Sound and vibration is indeed one of the predominant "nuisances" reported and documented by neighbors of wind farm projects, when they are indoors with windows closed, etc. View is part of the issue, but the sleep disorders, etc., that are becoming more understood with time will likely exacerbate the negative market perception of such homes.

The "quiet as a refrigerator" claim I have heard from wind farm developers is not consistent with the actual experience of many people who have been forced to abandon their homes or learn to live with the disturbances, if they can.

As a side note, if any grant is forthcoming beyond the $500,000 cost of the study to date, I would recommend that an acoustic engineer be retained on the team, to provide meaningful sound data for incorporation into statistical measurements.

A true peer reviewed article (*supporting data available for review*) written by Dr. Sandy Bond, (*also acknowledged in you report*), found an even lower impact on residential property value from cell towers in Florida than the 5% indicated in the Report, and the Appraisal Journal indeed published those findings as being significant.

As you are no doubt gleaning by now, I take exception with the repeated use of the word "insignificant", as it relates to measured value loss. For example, If you buy 1,000 shares of IBM stock to fund your retirement, and instead of the value going up or tracking in line with the market overall, you instead lose 5% of the value, while this is not statistically significant to the Dow average or to most people in the "market", if it is your asset and your retirement at risk, much less an immediate impact on your quality of life, the term "insignificant" or not "measurable" become inappropriate terms to describe the reality of your loss.

Or, like the two (2) homes cited, if you were unable to sell your IBM stock at any price, despite reducing the ask price by 10%, 20% or more from your going in basis and/or current market rates, and if the reason for the loss of reasonable liquidity is isolated as a single factor or influence, then that impact is many things,... but "insignificant" is not the phrase that comes to mind.

If you also applied the measured proximate study area loss of *(rounded)* 5% into a generic (Illinois) project area, covering thousands of acres of land, and did some simple projections, your conclusions may not stand a reasonable test of what is or isn't significant, in the context of a zoning standard being met or failing to satisfy the legal requirement of *no substantial impact on "neighboring" property value.* Please note that neighboring values are the relevant baseline....not the value of homes 5 or 10 miles distant from a proposed project.

Applying a conservative 5% reduction of value to a typical/approximate residential market value of $175,000, and carrying that on the basis of 1 house per 40 acres and a 6,000 acre footprint, (150 homes) a minimal **value loss of $1.3 million** is indicated for a typical Illinois project.

The MOST impacted properties are simply not reflected in your report, the importance of which is contrary to the report claim that the number is again, "statistically insignificant". It also appears that NONE of your study sale data lies within the footprint of the projects. The "hole in the doughnut" of your database is, in my opinion, the most important indication of your study and is disproportionately minimized or even misleading, by the framing of the comment in mathematical jargon.

Simply put, the homes located in the footprints of these projects is the real "ground zero" on this issue, and what is mathematically measured at distances beyond 3,000 feet, etc, is inapplicable as a basis for ground zero impacts.

However, if the actual measured loss of 5% is extrapolated to the typical ground zero (footprint) residence, the direction of impact must be logically concluded as greater than 5%. Thus, if the Mendota data indication of 25% value loss is applied to the preceding example, the impact is now $6.5 million in destroyed home equity. A 12,000 acre footprint then will carry a $13 million value impact. If this is repeated for 10 new projects, $130 million in losses, and so on.

I suggest that no one in the world could reasonably conclude the collapse of a $130 million office tower and complete destruction of its value would be "insignificant", even with no loss of life. I also suggest the value loss of rural residential property is no less deserving of fair characterization.

This magnitude of loss is significant on so many levels that the words "statistically insignificant" are misleading because they ignore the harsh, localized reality, when the projects are developed surrounding and interspersed with homes in rural residential areas, and are not just on the distant horizon as with the greatest majority of Report data locations and proximity to turbines.

Any reduction of equity (value) beyond normal negotiation of price and sale commissions must be considered significant, from a land use and zoning standard perspective. And since your report will be utilized for ***exactly that purpose***, rather than as an academic exercise in statistical analysis techniques, I do firmly believe more care should have been given to understanding the audience you know the Report would be advising, influencing and affecting.

In that regard, I must wonder as to why the Report did not even mention the prudence of property value guarantees? They are used sometimes in high profile and controversial zoning matters, *(See DeKalb, Illinois record)* and with all the other policy and non-mathematical commentary and background cited in your report, I think the "statistically insignificant" cost of implementing a property value guarantee, as measured against the huge cost of these projects, would have been a balanced and objective recommendation. Industry may not embrace that idea nor the funding sponsor, but what is the down-side to either of them if your general conclusions prove out to be applicable at ground zero properties?

Finally, and with some limited acknowledgement of further study needed, the Report is completely irrelevant to the issue of marketing times. This "variable" is well understood in all real estate professions as a value-related and value-influencing issue. The clear, obvious and documented loss of marketability is only mentioned in passing as a "possibility" rather than a historic fact or trend ...with future potential research of this issue suggested as an apparent afterthought. The report data is not accepted by me as "rich" since it is incomplete on such an important point.

In closing, and if you will forgive my analogy, if one wishes to learn the "price of tea in China", then that is where one must look. To expand the analogy a bit, it follows that one is not likely to find the truth to the question sought, if the price of tea at a thousand stores outside of China is researched.

I suggest that the Report reflects that misdirected focus, yet applies the findings pretty generically to all properties, whether or not in China. That is not a view restricted by the blinders of mathematical logic. It is just plain common sense.

I trust that you will take my review comments in the intended spirit; that of seeking the truth, regardless of the position or agenda of concerned parties on either side of this issue.

As you know, I conducted this and my initial review for no compensation, but out of concern on this issue, and being one of few professional appraisers experienced and qualified in the evaluation of wind farm impacts on residential values and the studies thereof.

Respectfully submitted,

McCANN APPRAISAL, LLC

Michael S. McCann, CRA
State Certified General Real Estate Appraiser
License No. 553.001252 (Expires 9/30/2011)

REVIEW CERTIFICATION

PROPERTY LOCATION: Wind Farm projects in general

EFFECTIVE DATE OF REVIEW: December 9, 2009

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

FIRST: The statements of fact contained in this review 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: I 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: I have no bias with respect to the property that is the subject of this report or to the parties involved with this assignment.

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

SIXTH: My 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 review report.

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

EIGHTH: The following person has made an exterior inspection of the public areas of the Mendota Hills project that is part of the basis for the opinions expressed in this report:

Michael S. McCann on various dates

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

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

Michael S. McCann, CRA
State Certified General Real Estate Appraiser
License No.553.001252 (Expires 9/30/2011)

-----Original Message-----
From: Benhoen2 [mailto:benhoen2@earthlink.net]
Sent: Monday, December 14, 2009 8:34 PM
To: 'Mike McCann'
Cc: benhoen2@earthlink.net
Subject: RE:

Mike,

(It seems I just sent you an email I had intended to send to Ryan which might have sounded too brief. This is what I had intended for you.)

Thank you for taking the time to take a closer look at our report a second time. Your comments, I suspect, are nuanced and thoughtful. I look forward to reading them in detail tomorrow.

Best,

Ben

Ben Hoen
Office: 845-758-1896
Cell: 718-812-7589
benhoen2@earthlink.net

From: Mike McCann [mailto:mikesmccann@comcast.net]
Sent: Monday, December 14, 2009 5:17 PM
To: Ben Hoen
Cc: RHWiser@lbl.gov
Subject:

Dear Mssrs. Hoen & Wiser,

Attached is my follow up review of the LBNL Report.

This is an extremely important issue to numerous areas that are considering proposed wind energy projects, and the thousands of people affected. For that reason, I have undertaken this follow up review on my own time.

Also, I think you should become familiar with USPAP in preparing any opinions that relate to value of real property, since an opinion of value (including impact thereon), by definition, is an 'appraisal", and that work is subject to the Uniform Standards of Professional Appraisal Practice (USPAP), and there are legal requirements that must be met. I have refrained from citing USPAP in my review, however, because I understand

that your Report does not claim on its face to be an "appraisal" opinion or to have opinions prepared by any Appraiser.

Please feel free to contact me should you have any questions, comments or if you wish to update your study with the benefit of experienced professional appraisal advice.

Best wishes.

Sincerely,

Michael S. McCann
McCann Appraisal, LLC
500 North Michigan Avenue, Suite # 300
Chicago, Illinois 60611

Real Estate Appraisal & Consulting

Phone: (312) 644-0621
Fax: (312) 644-9244
Cell: (312) 961-1601

mikesmccann@comcast.net

-----Original Message-----
From: Mike McCann [mailto:mikesmccann@comcast.net]
Sent: Tuesday, December 15, 2009 10:17 PM
To: 'Ryan Wiser'
Cc: Ben Hoen
Subject: RE:

Hi Ryan,

It is clear that you & Ben put a lot of time and effort into that study I know reasonable people can disagree on some things reasonably, and yes, Ben has followed up with me. I hope to clear up any disagreement that are possible to clear up, so I will expand on my thinking a little bit for your consideration.

First, the only home I know that has been built 800 feet from any turbines is the 965 Bingham Rd home. I explained to Ben how that site was purchased, and then the wind farm developed, and then the builder starting the construction and marketing of that house during the best sellers market in modern history. Yet, it still sat on the market for over 800 days, before selling to a gentleman (Dale Schmidt) who had a job compelling him to live in Lee County. He and his wife had sold their existing home, and had to find a replacement in Lee County specifically. Mr. Schmidt also has a job that requires him to, shall we say, be far more tolerant of negative visual stimulus than your typical person in the market (IL health & Ag, Hog slaughtering inspector). Clearly, these are unique circumstances that all came together, albeit very slowly, and allowed the builder to get out of his spec development (965 Bingham) at a break even, at best. It did sell for about 20% below market, however, and the impact was still measurable.

Other than how the referenced mistakes can be read or misunderstood to any reader/user/advisee of your report, I must still disagree that your report includes the complete, balanced and proportionately relevant presentation of the issues. I think even though you do disclose that more study is needed in the immediate project areas, the conclusions of the Report are not clearly or thoroughly defined in that separate manner. It is mentioned fairly minimally and definitely secondary to the more distant study zones.

Your report conclusions that are being quoted most often seem to end with sentences 1 & 2, as broken down by me below, without the 3 thru 8 complete quote.

…..neither the view of the wind facilities **1**-(nor the distance of the home to those facilities) is found to have any **2**-(consistent,) **3**-(measurable, and statistically significant effect) on home sales prices.
Although the analysis **4**-(cannot dismiss the possibility that individual homes or small numbers of homes have been or could be negatively impacted), it finds that **5**-(if) these impacts do exist, they are
6-(either too small and/or too infrequent) to result in any **7**-(widespread), **8**-statistically observable impact.

You merely need to read how your report is already being quoted to understand how various decision making bodies are likely to be influenced. The greatest area of impact, in my opinion, deserves the greatest focus. Thus, the "tea in China" analogy in my written review. Yet, these are the precise areas that impacts are dismissed with those qualifying adjectives

My additional remarks and review thoughts are now isolated to the Report conclusions, as enumerated and highlighted above:

1- The report data reveals that distance to homes does impact values, at the average rate of a bit over 5%. The report conclusions do not state that clearly.
2- The impacts at a given project locale, even within a footprint, are not expected to be "consistent". Some homes were worth $100,000 and others $400,000 or more, in locations I have studied. The dollar amount of impact is not consistent, and in many instances, I believe the percentage impact is variable, depending on the unique situations of each impacted sale. This qualifying word implies many homes in the nearest impact zones were not impacted in sale price at all, but I see no evidence to support that potential position.
3- It is a fact that 5% is "measured". It does not say measured OR statitistically significant. It says AND statistically significant. Forgive me if this sound nit-picky, but when conclusions are tested under cross examination, for example, the devil is in the details. That filters down the actual impact by minimizing it with the "opinion" that it is not statistically significant, and tends to lead the reader to the conclusion that there is no impact found in the most proximate residential data.
4- "cannot dismiss the possibility" does not mean the same thing as "evidence exists that such impacts have occurred" The balance of (3) says "have been or could be", which again, tends to lead the reader to incorrectly believe that no ground-zero evidence exist as far as negative impacts.
5- Saying "if" these impacts do exist, again, tends to indicate there is no factual basis in your study data to indicate the actual impacts.
6- The frequency as found in your study appears to be 128 sales located within 1 mile. This pales in comparison to the frequency of homeowners finding themselves' being in the middle (footprint in particular) of proposed projects. "Too infrequent" qualifies actual results in such a manner as to, again, lead the reader away from the fact of 5% measured loss in the 1 mile zone.
7- The term "widespread" seems to be left to interpretation of the reader. The study covered multiple (i.e. widespread) locales, and the report does not state that "negative sale price data was only found a t 1 of multiple project locations studied. Further, the wind energy projects in the pipeline are very widespread. I would concur that the impacts are not shown widespread in relation the 5 mile and beyond study zones, but in order to avoid being misleading; I think that should be clarified.
8- Your study stops at what is statistically observable in the larger background your study selected. It does not fairly disclose, however, that there are other relevant forms of observation and analysis. As I told Ben, ANY appraisal (opinion of value) should reflect the market. That is Appraisal 101. To ignore the method, depth and type of analysis the "typical" home buyers & sellers utilize is not consistent with this basic principle of valuation. If the market looks at homes on the basis of square footage, then the price per square foot is most relevant for analytical purposes. It is also true that if farmers look at land on the basis of price per acre and soil productivity, then the value opinion should not focus on how much frontage the farm has, nor the number of bedrooms in the farm residence. Those parameters become secondary.

Sometimes, what is NOT said or how something is said is more accurate and relevant to the issue at hand. Based on the proportional relevance of home values at varied distances, and the data in the report, I think the conclusion should read, more or less, thusly:

"There was a very limited amount of sale data (disclose number) of homes in the immediate impact zone, which is defined as the wind farm project footprint or "ground zero" The data that does fit within the definition of being located in the midst of any turbine project showed an average sale price of $X per square foot. This indicates property values are X% lower/higher/no

different than the data examples from very comparable settings but 5 miles or more from the edge of the wind farm projects studied.

Secondly, the zones of under 3,000 feet and up to 1 mile distant from the perimeter of the wind farm projects studied revealed value levels were approximately 5% lower than the similar properties more than 5 miles removed. The 5 mile and greater distances revealed no statistically significant difference or obvious impact on values, strictly from a statistical analysis perspective.

No evidence has been analyzed regarding marketing times, cancelled listings, price reductions of listings or ratio of showings to contracts for the footprint locations. However, given the widespread and consistent personal accounts reported by homeowners and agents hired to sell wind farm impacted residences, we recommend that provisions be made to insure against the financial loss of the most impacted residents. The owners of the most impacted residences represent a significant and growing number of citizens, and the study reveals that there are impacts in the most proximate areas, which warrants the requirement of Property Value Guarantees in any land use approval process for wind farms."

Ben advised me that the homes in the "Doughnut Hole" at the Fenner wind farm study area are owned by participating land owners. I must admit I am skeptical as to 100% of the homes being occupied by participating land owner (turbine pad site lessors.). In my experience, many homes in the rural residential areas are separated in ownership from the land, and in all instances I have studied, the majority of homeowners within project footprints were non-participating. It is at least as common for the participating land owners to be 'absentee" land owners, when mailing addresses of such land owners are researched on county tax records. The smaller parcels with a home located on it can not meet the setback requirements of any jurisdiction, and the wind energy developers seem to pretty much ignore anyone that does not own a potential turbine pad site.

I would very much be interested in seeing the support for the claim that all Fenner "doughnut hole" home owners are participating with the wind farm development. My review of Google satellite maps found numerous homes within in the Fenner project. I am also curious if the developer bought out any of the Fenner home owners, if you know, or if you have a contact at Fenner who would be willing to speak candidly with me.

Wind farm developments are an evolving trend in the US, as you know, and the process of evolution is far from completed. Beyond the evidence of value impacts to date, it is critical that the stage is not set for another real estate meltdown or catastrophe requiring any bailout The projects should be self-sufficient in that regard, and not provide financial gain to the new developments at the expense of the neighboring property owners

If your report is ever modified to reflect the proportional relevance of which I speak, I think the public officials who follow the guidance of your report will be better advised, and be in a better position to effectively use their administrative powers to protect private property rights, value, and other zoning standards (Health and welfare of neighbors, compatibility of land uses, etc)

As with Ben, I hope to keep our dialogue going.

Take care,

Mike McCann

-----Original Message-----
From: Ryan Wiser [mailto:RHWiser@lbl.gov]
Sent: Tuesday, December 15, 2009 2:39 PM
To: Mike McCann
Subject: Re:

Thanks Mike. Hope Ben is following up with you on our citation and reference to your work. If we messed that up, we will rectify. I must say that I disagree with many of your comments, but I also appreciate the time you have spent with the document. I certainly acknowledge that our work does not say anything about homes within 800 ft. It is, in our view, a solid study, but there is always more to be done. Best regards,

Ryan W.

Mike McCann wrote:
Dear Mssrs. Hoen & Wiser,

Attached is my follow up review of the LBNL Report.

This is an extremely important issue to numerous areas that are considering proposed wind energy projects, and the thousands of people affected. For that reason, I have undertaken this follow up review on my own time.

Also, I think you should become familiar with USPAP in preparing any opinions that relate to value of real property, since an opinion of value (including impact thereon), by definition, is an 'appraisal", and that work is subject to the Uniform Standards of Professional Appraisal Practice (USPAP), and there are legal requirements that must be met. I have refrained from citing USPAP in my review, however, because I understand that your Report does not claim on its face to be an "appraisal" opinion or to have opinions prepared by any Appraiser.

Please feel free to contact me should you have any questions, comments or if you wish to update your study with the benefit of experienced professional appraisal advice.

Best wishes.

Sincerely,

Michael S. McCann
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Phone: (312) 644-0621
Fax: (312) 644-9244
Cell: (312) 961-1601

mikesmccann@comcast.net

EXHIBIT H

From: benhoen2@earthlink.net
Sent: Saturday, November 27, 2010 8:00 PM
To: Michael S. McCann
Subject: Re: your May 2010 webinar presentation
Thanks Mike. Best to you too
Ben

Sent from my Verizon Wireless BlackBerry

From: "Mike McCann" <mikesmccann@comcast.net>
Date: Sat, 27 Nov 2010 16:47:35 -0500
To: 'Ben Hoen'<benhoen2@earthlink.net>
Subject: your May 2010 webinar presentation

Ben,

I just wanted to compliment you for your updated presentation, from the May 2010 webinar. Slides 28 thru 32 make it harder for some people to misunderstand or misrepresent your study findings, for the record. I also believe it cuts much closer to the "proportional relevance" I previously critiqued or commented about.

I hope all is well, that you had a nice Thanksgiving and you are staying warm!

Sincerely,

Michael S. McCann
McCann Appraisal, LLC
500 North Michigan Avenue, Suite # 300
Chicago, Illinois 60611

Real Estate Appraisal & Consulting

Phone: (312) 644-0621
Fax: (312) 644-9244
Cell: (312) 961-1601

mikesmccann@comcast.net

EXHIBIT I

Impacts on Residential Property Values Near Wind Turbines:

An Overview of Research Findings and Where to Go From Here

Ben Hoen
Lawrence Berkeley National Laboratory

NEWEEP Webinar
May 5, 2010

This presentation was made possible in part by funding by the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Wind & Hydropower Technologies Program

Impacts on Residential Property Values Near Wind Turbines

- Wind Energy and Property Values
  - Overview of Subject

Proximity to and Views of Environmental (Dis)Amenities Can Impact Property Values

Highway	Transmission Lines	Average Home	Green Space	Ocean Front
↓ $	↓ $		↑ $	↑ $

- This linkage is well studied generally, but not for wind facilities
- The home/land is often the largest asset in resident's portfolio
- Prior to wind facility construction, impacts (e.g., visual and auditory) to individual properties are difficult to quantify

Aesthetics and Property Values Rank as Key Concerns for Wind Stakeholders

"Aesthetic perceptions, both positive and negative, are the strongest single influence on individuals' attitudes towards wind power projects." (Warren, 2005, p. 853)

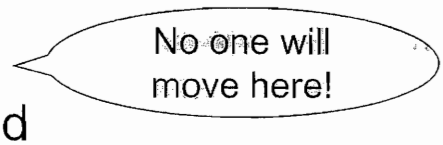
US developers rank aesthetics & property values as the #1 and #3 concerns of those in opposition to wind development (Paul, 2006)

100% and 85% of those opposed to offshore wind development believe aesthetics and property values, respectively, will be adversely impacted (Firestone et. al., 2007)

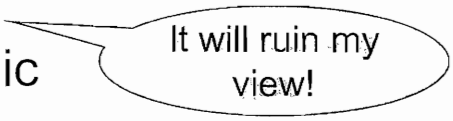
Having structures on the Vermont hilltops was considered a "big disadvantage" by the majority of those surveyed before the Searsburg, VT wind facility was erected (Palmer, 1997)

Property Value Concerns for Wind Energy Fall Into Three Potential Categories

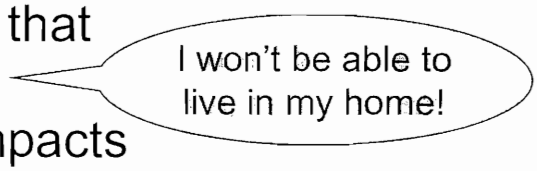
1. **Area Stigma:** Concern that rural areas will appear more developed



2. **Scenic Vista Stigma:** Concern over decrease in quality of scenic vistas from homes



3. **Nuisance Stigma:** Concern that factors that occur in close proximity will have unique impacts



Each of these effects could impact property values; none are mutually exclusive

Impacts on Residential Property Values Near Wind Turbines

- Wind Energy and Property Values
  - Previous Literature

Relatively Few Existing Wind and Property Studies

- **Variety of methods used**, from surveys to sales analyses, with varying levels of sophistication
- **Results are diverse**, and in many instances unpersuasive due to limitations in data and methodology
- Variety of methods and sample type makes **comparisons between results difficult**

Document Type / Author(s)	Year	Number of Transactions or Respondents	Before or After Wind Facility Construction Commenced	Area Stigma	Scenic Vista Stigma	Nuisance Stigma
Homeowner Survey						
Haughton et al.	2004	501	Before	- *	- *	
Goldman	2006	50	After	none		
Firestone et al.	2007	504	Before	- *	- *	
Bond	2008	~300	After		- ?	- ?
Expert Survey						
Grover	2002	13	After	none		none
Haughton et al	2004	45	Before	- *	- *	
Khatri	2004	405	Before‡	- ?		- ?
Goldman	2006	50	After	none		none
Crowley	2007	42	After	none	none	none
Kielisch	2009	57	Before‡			- ?
Transaction Analysis - Simple Statistics						
Jerabek	2001	25	After			none
Jerabek	2002	7	After			none
Sterzinger et al	2003	24,000	After	none		
Beck	2004	2	After			none
Poletti	2005	187	After	none		none
DeLacy	2005	21	Before†	none		
Goldman	2006	4	After	none		
Poletti	2007	256	After	none		none
McCann	2008	2	After			- ?
Kielisch	2009	103	After			- ?
Schneider	2010	2,330	Before	- */ none		
Transaction Analysis - Hedonic Model						
Jordal-Jorgensen	1996	?	After			- ?
Hoen	2006	280	After		none	
Sims & Dent	2007	919	After			- *
Sims et al	2008	199	After		-/+ *	
Hoen, Wiser et al.	2009	7,459	After	none	none	none

"none" indicates the majority of the respondents do not believe properties have been affected (for surveys) or that no effect was detected at 10% significance level (for transaction analysis)

"- ?" indicates a negative effect without statistical significance provided

*"- *" indicates statistically significant negative effect at 10% significance level*

*"-/+ *" indicates positive and negative statistically significant effects at 10% significance level*

† *Sales were collected after facility announcement but before construction*

Conclusions Drawn From Previous Literature on Wind Energy and Property Values

- Wind facilities have been **predicted to negatively impact property values** by some (e.g., Haughton; Firestone et al.), sometimes by as much as 24-43% (Kielisch)
- **Many experts** (e.g., appraisers, assessors, realtors) **have not experienced notable reductions** in value after construction (Grover; Goldman; Crowley)
- **Large impacts (e.g., >10%) have failed to materialize** when actual sales are investigated after construction (Poletti; Hoen; Sims & Dent; Sims et al.) **except for one study of land sales** (Kielisch)
- **Impacts**, to the degree that they exist, **are most likely very near turbines** (e.g., within ½ mile where they can be heard and seen) (McCann) and occur **after announcement but prior to construction** (Schnieder)

Limitations of Existing Research

- **Many studies have relied on surveys** of homeowners or real estate professionals, rather than quantifying real impacts based on market data
- **Most studies have relied on simple statistical techniques** that have limitations and that can be dramatically influenced by small numbers of sales transactions or survey respondents
- **Most studies have used small datasets** that are concentrated in only one wind project study area, making it difficult to extrapolate findings
- **Many studies have not reported the statistical significance** of their results, making it difficult to determine if those results are meaningful
- **Many studies have concentrated on Area Stigma**, and have ignored Scenic Vista and/or Nuisance Stigma
- **Only a few studies have included field visits** to homes to determine wind turbine visibility and collect other important information
- **Only two studies have been published** in peer-reviewed journals

Impacts on Residential Property Values Near Wind Turbines

- Wind Energy and Property Values

  - Berkeley Lab Research

    - Overview

Berkeley Lab Research Approach Responds to Limitations of Previous Work

- **Conduct literature review** of previous wind / property value studies and wind facility public acceptance surveys, as well as potentially analogous studies on other disamenities (e.g. roads, power lines, power plants)
- **Collect large amount of data** on residential sales transactions occurring both pre- and post-construction surrounding a **representative sample** of wind facilities at **multiple locations** in the U.S.
- **Visit each home** to determine wind turbine visibility and to collect other important information about the home (e.g., the quality of the scenic vista)
- **Use multiple statistical models** to explore magnitude and statistical significance of potential effects, relying primarily on **hedonic model**
- **Test for the presence of all three stigmas** – Area Stigma, Scenic Vista Stigma, and Nuisance Stigma
- **Rigorously analyze** the data, culminating in an LBNL report and at least one journal paper

Berkeley Lab Project Involves Most Data-Rich and Comprehensive Analysis To Date

Research Questions

1) Is there evidence that views of turbines measurably affect sales prices?
2) Is there evidence that proximity to turbines measurably affect sales prices?
3) Do the results change over time, and are there other observable impacts?

Relevance

Provides stakeholders in siting/permitting processes greater confidence in the likely effects of proposed wind energy facilities, allowing greater consensus on often-contentious setback requirements, viewshed valuations and non-participating landowner arrangements.

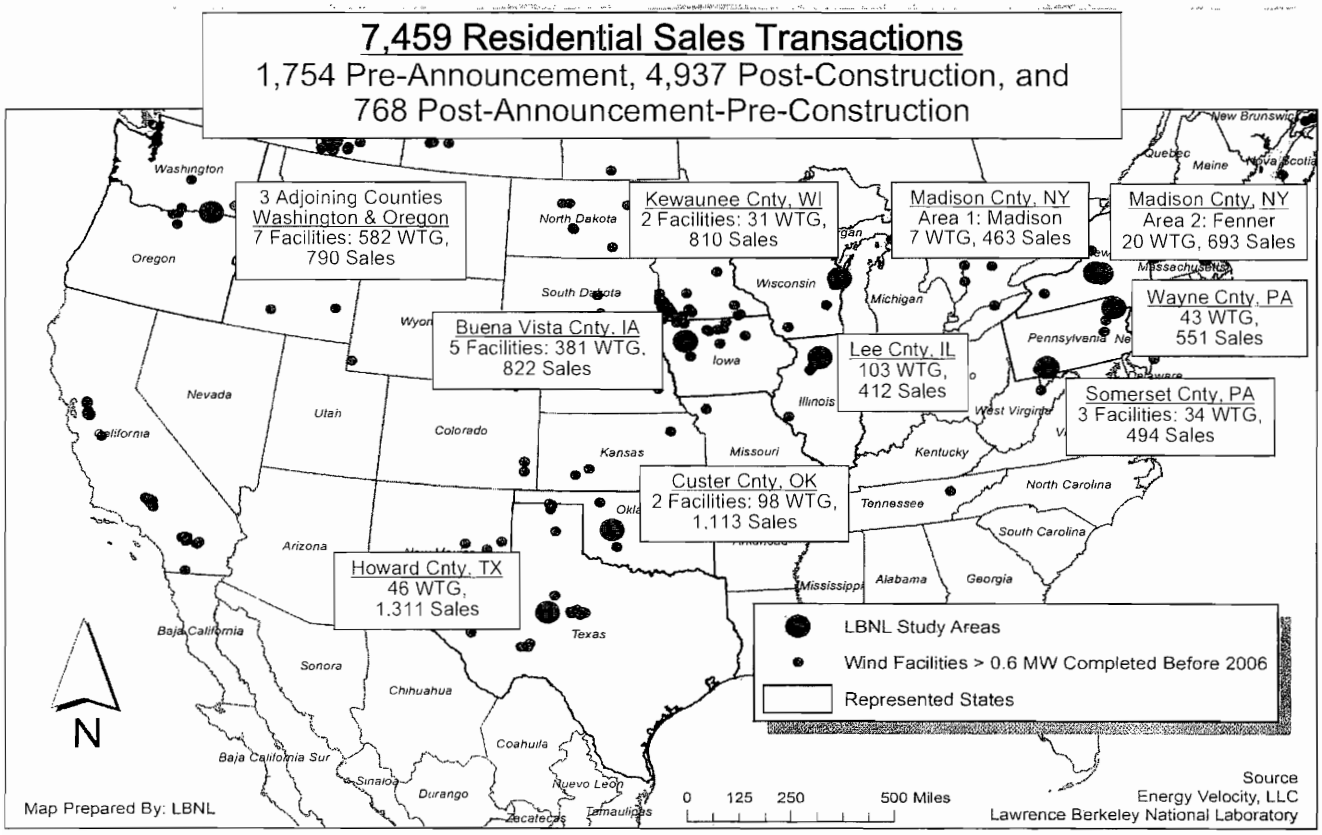
Team

B. Hoen (Subcontractor to LBNL), R: Wiser (LBNL), P. Cappers (LBNL), M. Thayer (San Diego State University), G. Sethi (Bard College)

Funder

U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Wind & Hydropower Technologies Program

Collected Sales Data from 10 Study Areas Surrounding 24 Wind Facilities in 9 States



Research Relies on Hedonic Pricing Model in Addition to Other Models

	Coef.	SE	p Value	n
Intercept	7.62	0.18	0.00	
Nbr_LN_SalePrice96_bat	0.29	0.02	0.00	4,937
AgentSale	-0.006	0.0004	0.00	4,937
AgentSale_Sqrd	0.00002	0.000003	0.00	4,937
Sqft_1000	0.28	0.01	0.00	4,937
Acres	0.02	0.00	0.00	4,937
Baths	0.09	0.01	0.00	4,937
ExtWalls_Stone	0.21	0.02	0.00	1,486
CentralAC	0.09	0.01	0.00	2,575
Fireplace	0.11	0.01	0.00	1,834
FinBsmt	0.08	0.02	0.00	673
Cul_De_Sac	0.10	0.01	0.00	992
Water_Front	0.33	0.04	0.00	87
Cnd_Low	-0.45	0.05	0.00	69
Cnd_BAvg	-0.24	0.02	0.00	350
Cnd_Avg	Omitted	Omitted	Omitted	2,727
Cnd_AAvg	0.14	0.01	0.00	1,345
Cnd_High	0.23	0.02	0.00	337
Vista_Poor	-0.21	0.02	0.00	310
Vista_BAvg	-0.08	0.01	0.00	2,857
Vista_Avg	Omitted	Omitted	Omitted	1,247
Vista_AAvg	0.10	0.02	0.00	448
Vista_Prem	0.13	0.04	0.00	75
WAOR	Omitted	Omitted	Omitted	519
TXHC	-0.75	0.03	0.00	1,071
OKCC	-0.44	0.02	0.00	476
IABV	-0.24	0.02	0.00	605
ILLC	-0.09	0.03	0.00	213
WIKCDC	-0.14	0.02	0.00	725
PASC	-0.31	0.03	0.00	291
PAWC	-0.07	0.03	0.01	222
NYMCOC	-0.20	0.03	0.00	346
NYMC	-0.15	0.02	0.00	469
Post_Con_NoView	Omitted	Omitted	Omitted	4,207
View_Minor	-0.01	0.01	0.40	561
View_Mod	0.02	0.03	0.58	106
View_Sub	-0.01	0.07	0.94	35
View_Extrm	0.02	0.09	0.80	28
Mile_Less_0_57	-0.05	0.06	0.40	67
Mile_0_57to1	-0.05	0.05	0.30	58
Mile_1to3	0.00	0.02	0.80	2,019
Mile_3to5	0.02	0.01	0.23	1,923
Mile_Gtr5	Omitted	Omitted	Omitted	870

"Omitted" reference category for fixed effects variables
"n" indicates number of cases in category when category "1"

Model Information

Model Equation Number	1
Dependent Variable	LN_SalePrice96
Number of Cases	4937
Number of Predictors (k)	37
F Statistic	442.8
Adjusted R Squared	0.77

What Is a Hedonic Pricing Model?

- **Well respected model** used by economists and real estate practitioners for over 40 years
- **Heterogeneous** residential sales data are used
- **Measures marginal price differences** between homes that vary by the variables of interest, after controlling for other characteristics
- **Controlling characteristics** include square feet, acres, bathrooms, fireplaces, age, condition and scenic vista of the home, location, etc.
- **Variables of interest** include view of turbines, distance from turbines, and development period (e.g. before or after construction began)
- **Estimates and significance levels** are important

Other Models Used in Analysis

Repeat Sales and Sales Volume Models

To Test for Scenic Vista Stigma, Scenic Vista Itself Is Controlled For

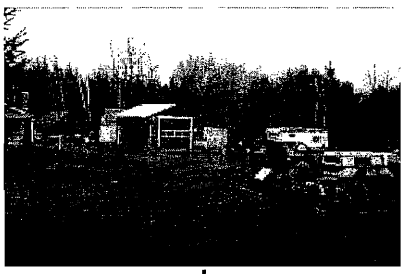
They might pull in two directions…

↑ $

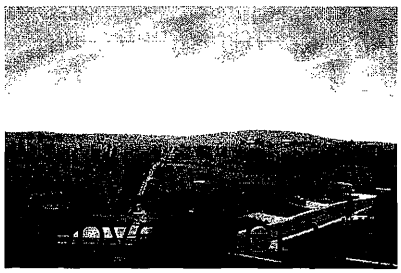
By separating out scenic vista, a potential bias is removed from measurements of the effects of the view of wind turbines

↓ $

Five Qualitative Ratings Are Used for Quality of Scenic Vista

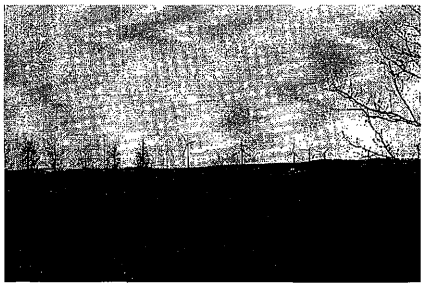


Each home is given a scenic vista rating, based on field visits



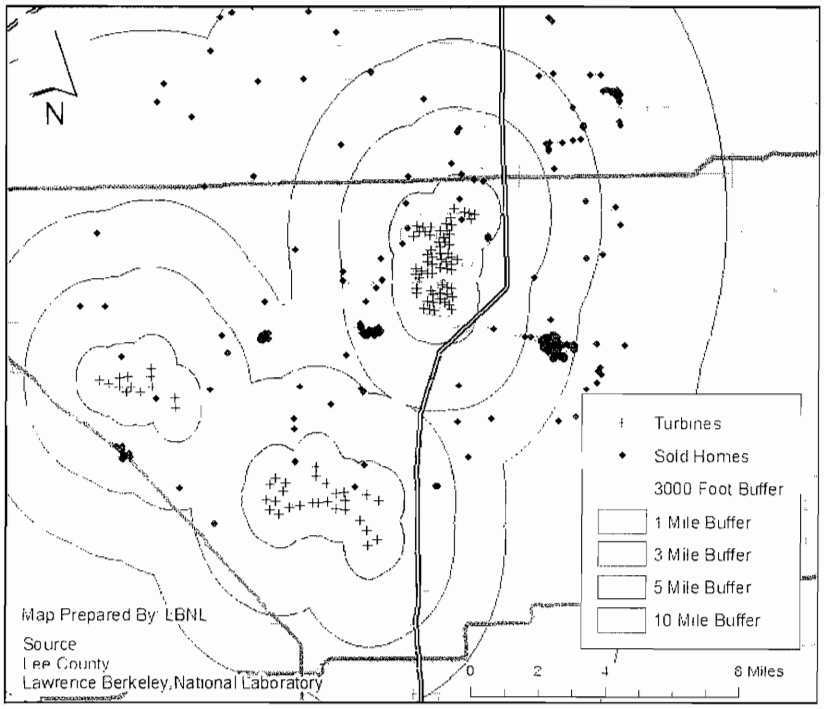
Four Qualitative Ratings Are Used for Dominance of View of Wind Turbines

Each home is given a view of turbines dominance rating, based on field visits



To Test for Area and Nuisance Stigmas,

Distance to Nearest Turbine at Time of Sale Is Determined



"Sold Homes" include all homes sold both before and after construction of the wind facility

Five Distance Bands Are Created

Nuisance Stigma

- Inside of 3000 Feet
- Between 3000 Feet and 1 Mile

Area Stigma

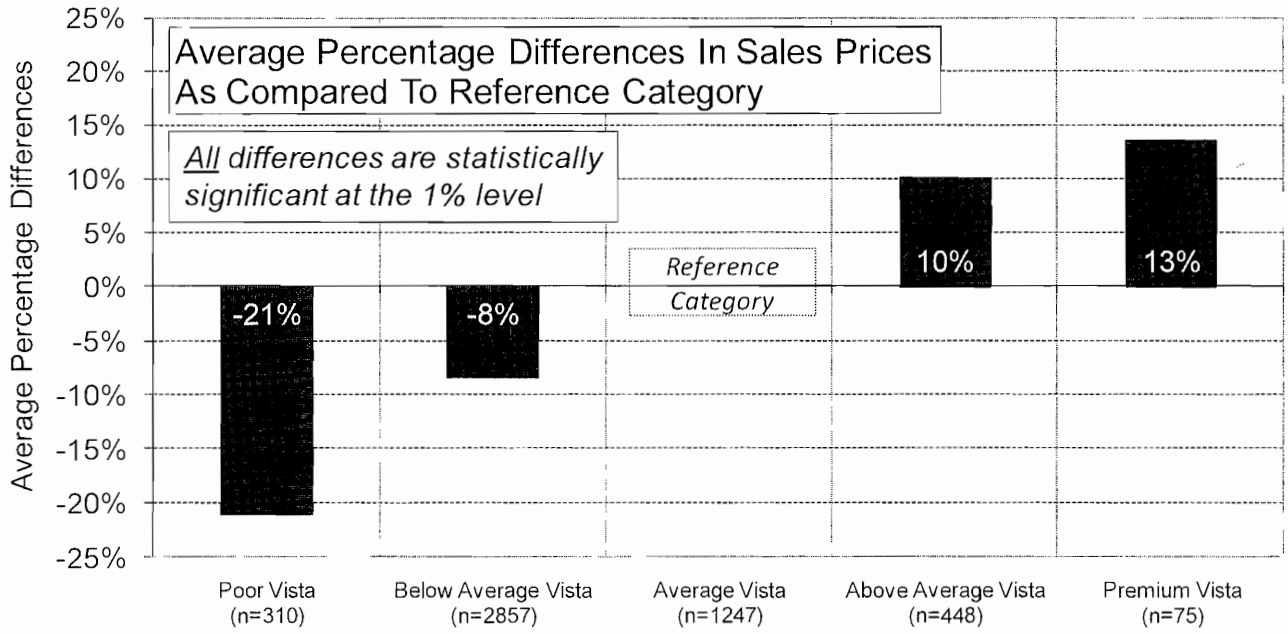
- Between 1 and 3 Miles
- Between 3 and 5 Miles
- Outside of 5 Miles

Impacts on Residential Property Values Near Wind Turbines

- Wind Energy and Property Values
  - Berkeley Lab Research
    - Results and Conclusions

Base Hedonic Model Results:

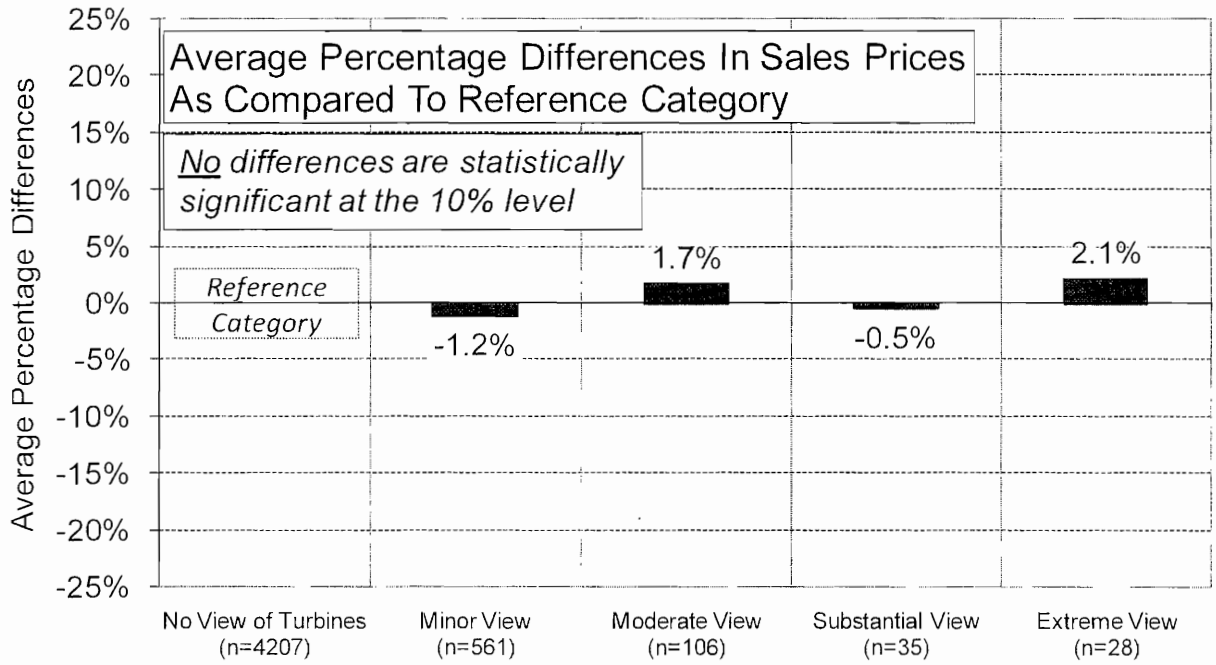
There Is Strong Statistical Evidence that the Quality of the Scenic Vista Affects Sales Prices



The reference category consists of transactions for homes with an Average Vista, and that occured after construction began on the wind facility

Base Hedonic Model Results:

There Is a Lack of Statistical Evidence that the Dominance of the Views of Turbines Affects Sales Prices



The reference category consists of transactions for homes without a view of the turbines and that occured after construction began on the wind facility

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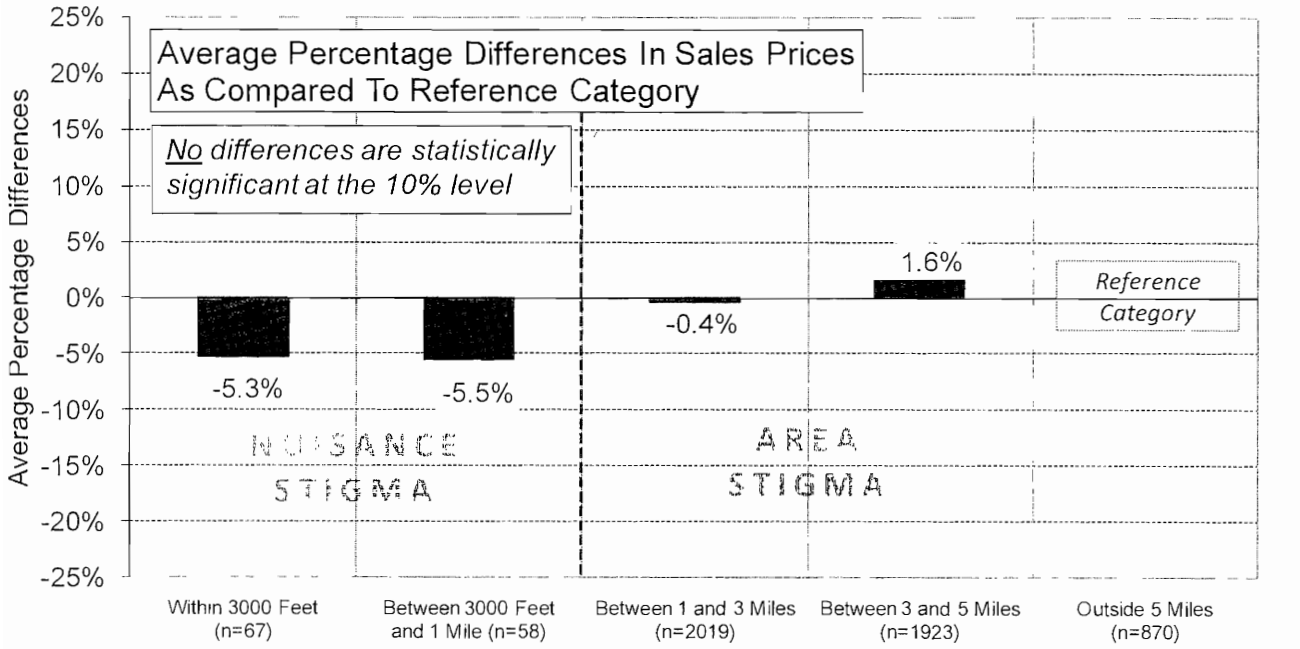
Base Hedonic Model Results:

There Is a Lack of Statistical Evidence that the Distance to the Nearest Turbine Affects Sales Prices



The reference category consists of transactions for homes situated more than five miles from the nearest turbine and that occured after construction began on the wind facility

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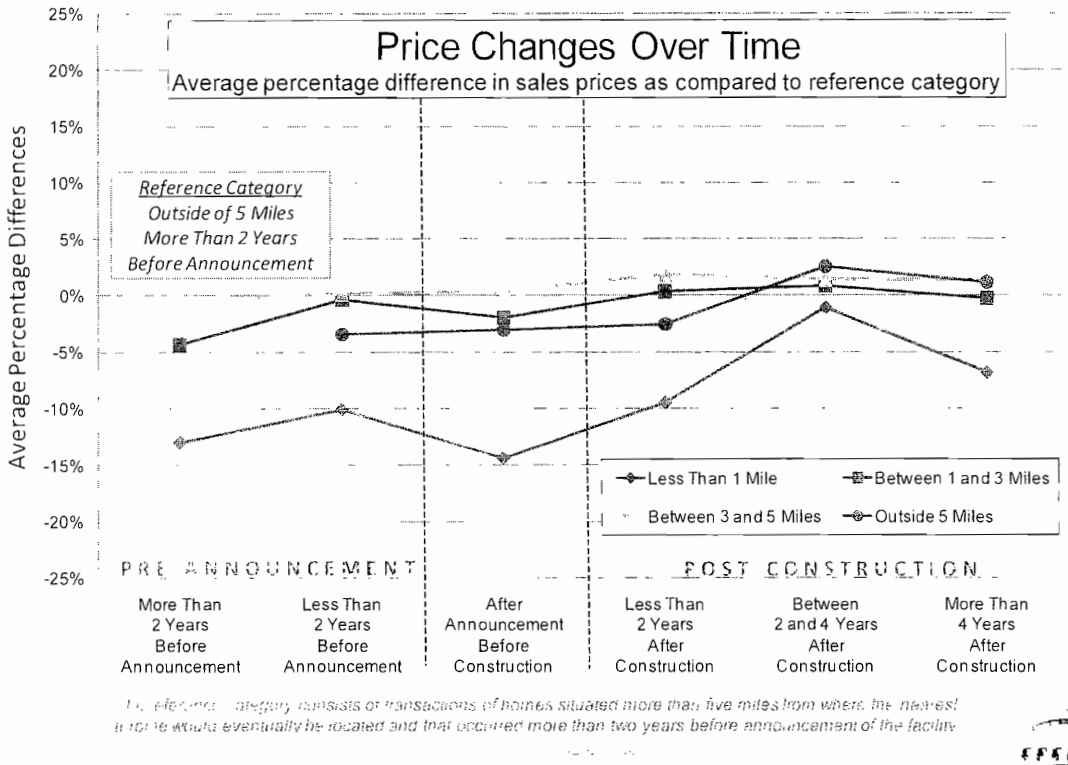
Temporal Aspects Model Results:

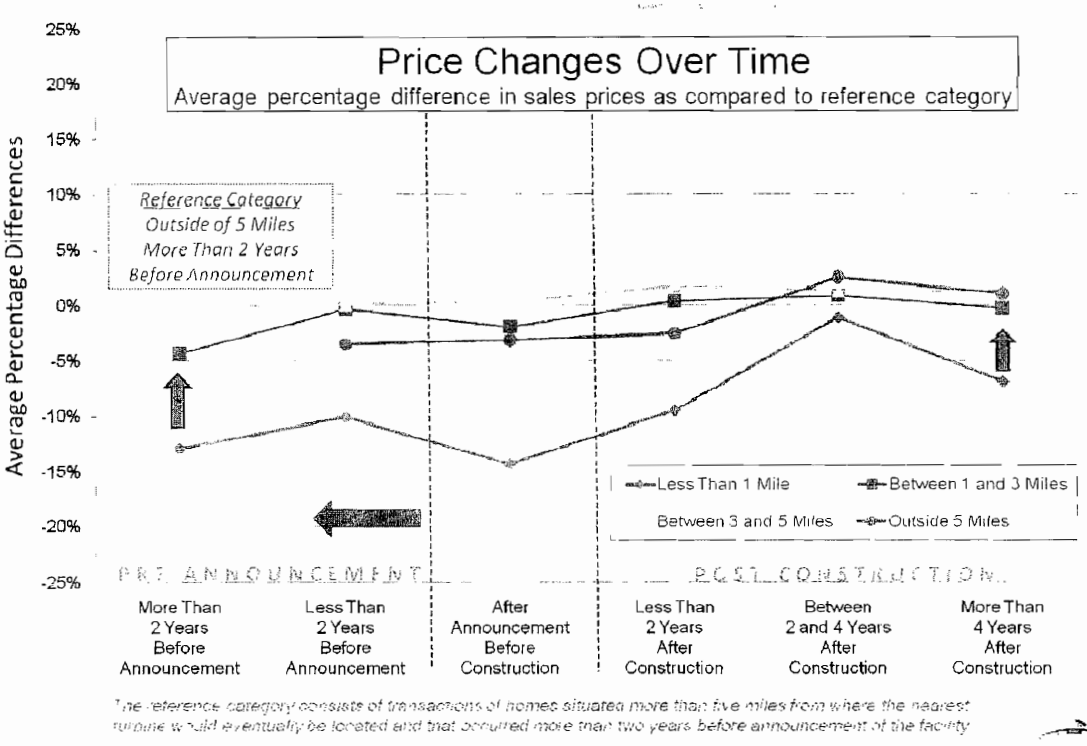
Homes Nearest the Turbines Were Depressed in Value Before Construction and Appreciated the Most After Construction While Homes Further Away Were Largely Unchanged Over Time



The reference category consists of transactions of homes situated more than five miles from where the nearest turbine would eventually be located and that occurred more than two years before announcement of the facility

Temporal Aspects Model Additional Sensitivity Results:

Potentially Sales Prices Are Affected in the Post Announcement Pre Construction Period and then Return to More Normal Levels Following Construction



The reference category consists of transactions of homes situated more than five miles from where the nearest turbine would eventually be located and that occurred more than two years before announcement of the facility

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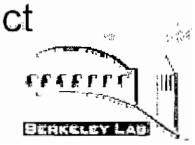
Conclusions Based on This Sample

- **Area Stigma:** There is an **absence of evidence** that sales prices of homes without views of turbines and further than one mile from the nearest turbine are stigmatized by the arrival of facility
- **Scenic Vista Stigma:** There is an **absence of evidence** that sales prices of homes with a view of the turbines are uniquely stigmatized even if that view is "dramatic"
- **Nuisance Stigma:** There is an **absence of evidence** that prices of sales occurring **after construction** of the facility for homes within a mile of the nearest wind turbine in this sample are affected and **some evidence** that sales occurring **prior to construction** are affected

"Absence of Evidence" does not equate to "Evidence of Absence"

But if effects do exist in this sample, they are either too small and/or too infrequent to result in any statistically observable effect



Impacts on Residential Property Values Near Wind Turbines

- Wind Energy and Property Values

  - Other Disamenity Research

Other Disamenity Research Have Conforming Results

Disamenity	Study	Location	Percentage Change	Difference	Effect Limit
Crematory	Agee and Crocker (2008)	Rawlings, WY	-2% to -16%*	within a mile	
Superfund	Gayer et al. (2000)	Grand Rapids, MI	-4% to -6%*	within a mile	
Superfund	Kiel & Zabel (2001)	Woburn, MA	-15%	within a mile	
Groundwater Contamination Pre Remediation	Case et al. (2006)	Scottsdale & Tempe, AZ	-7%	in currently contaminated area	
Groundwater Contamination Post Remediation	Case et al. (2006)	Scottsdale & Tempe, AZ	no difference	in previously contaminated area	
Waste Transfer Station	Eshet et al. (2007)	Israel	-12%	within a mile	
Industrial - Superfund	Carroll et al. (1996)	Henderson, NV	-7%	within a mile	2.5 miles
Lead Smelter	Dale et al. (1999)	Dallas, TX	-0.8% to -4%	within a mile	2 miles
Power Plant	Davis (2008)	assorted	-3% to -5%	within 2 miles	
Landfill - High Volume	Ready (2005)	assorted	-13%	adjacent to landfill	2 miles
Landfill - Low Volume	Ready (2005)	assorted	0% to -3%	adjacent to landfill	2 miles
Landfill	Reichert et al. (1992)	Cleveland, OH	-5% to -7%	within a few blocks	
Landfill	Thayer et al. (1992)	?	-2% to -5%	within a mile	4 miles
Transmission Line	Hamilton & Schwann (1995)	Vancouver, Canada	-6%	adjacent to tower	330 feet
Transmission Line	Des Rosiers (2002)	Montreal, Canada	-10%	adjacent to tower	150 feet
Road Noise	Batemen et al. (2001)	Glasgow, Scotland	-0.2% to -2%	increase of 5 dBA**	
Road Noise - 29 Study Review	Batemen et al. (2001)	assorted	0% to -11% (2% median)	increase of 5 dBA**	

** based on 2008 median house price (source: city-data.com)*

*** 10 dBA roughly represents the difference in noise between a busy road and a quiet street*

Impacts on Residential Property Values Near Wind Turbines

- Where To Go From Here

Where To Go From Here?

Do these results imply that property values effects near turbines do not exist? **NO!**

But rather, if effects do exist after construction, given current research, effects are likely to be relatively small and/or infrequent.

Further, where effects do exist in greater magnitude/frequency they are most likely to occur after announcement of the facility and prior to construction and in close proximity.

So, given these results, are property values something stakeholders should be concerned about?

OF COURSE!

Property Value Risks Will Persist Unless They Are Measured, Mitigated and Managed

Measure

Continue to Measure to Better Understand Effects,
to test the robustness of previous findings,
and explore nuances in effects (e.g., changes over time)

- Use other techniques (e.g., paired sales, surveys, appraisals)
- Use similar techniques with other data (e.g., new facilities)
- Test for other analogous effects (e.g., time on the market, sales volume)
- Publish results in journals

Modulate as knowledge and methods evolve!

Property Value Risks Will Persist Unless They Are Measured, Mitigated and Managed

Mitigate

Increase efforts to quantify risks for those living closest so as to reduce risk adverse actions, and **improve models** and resulting regulations

- Organize visits to other facilities; having discussions with nearby residents (both participating and non-participating);
- Model visual and audio aspects; Use video to better describe aesthetic impacts
- Improve models to better predict visual (e.g., via LIDAR) and audio impacts (e.g., take into account wind sheer).
- Adjust regulations and maximum sound limits to take into account meteorological conditions and sound output under all operating conditions

Modulate as knowledge and methods evolve!

Property Value Risks Will Persist Unless They Are Measured, Mitigated and Managed

Manage

Manage risks in the short term for homeowners through tenable/workable measures

- Offer some combination of neighbor agreements/incentives and/or property value guarantees (e.g., Dekalb County, IL) to nearby homeowners as are economically tenable and legally workable
- Conduct follow up studies (e.g., surveys, appraisals)
- Realize that cumulative impacts may exist
- Realize that real or perceived risks may increase/decrease as more/better information become available

For More Information...

See full report LBNL report

- **http://eetd.lbl.gov/ea/ems/re-pubs.html**

To contact the primary authors of report and me

- **Ben Hoen**, consultant to Lawrence Berkeley National Laboratory, 845-758-1896, benhoen2@earthlink.net
- **Ryan Wiser**, Lawrence Berkeley National Laboratory, 510-486-5474, RHWiser@lbl.gov

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EXHIBIT J

WIND FARMS, RESIDENTIAL PROPERTY VALUES, AND RUBBER RULERS©

by

Albert R. Wilson

I recently examined a document published by the Department of Energy's Lawrence Berkeley National Laboratory titled "The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi- Site Hedonic Analysis" (hereafter "Report")' I express no opinion concerning the impact of wind power projects on residential property values and instead focus on the underlying methods used in the development of the Report, and the resulting serious questions concerning the credibility of the results.

As stated in the title the primary bases for the conclusions drawn in the Report are hedonic analyses of residential real estate sales data. A hedonic analysis in turn is based on the assumption that the coefficients of certain explanatory variables in a regression represent accurately the marginal contribution of those variables to the sale price of a property.

Regression

A regression is a statistical process that attempts to quantify a hypothetical relationship between certain factors (explanatory variables) and the value of an outcome (dependent variable). The explanatory variables are related to the dependent variable through a mathematical formula generally referred to as a regression model. In real estate the explanatory variables are usually such things as size (square feet), number of bedrooms and bathrooms, garage space, presence of basement, location, and the like. The dependent variable is sales price. In the Report the authors are basing their analysis primarily on a set of regression models with the inclusion of variables that attempt to estimate the possible impact of distance from and view of turbines.

The mathematics of regression are executed through a computer program that assigns numeric values to the multipliers (coefficients) of the explanatory variables in such a way that when the estimates of the sales prices computed by the regression model are compared to the actual sales prices of the properties upon which the regression is based, the difference is at a mathematical minimum based on some measure (e.g. R^2 or R-squared, the coefficient of determination). This process is accomplish through the computer program by continually changing the coefficients of the explanatory variables, recalculating all of the estimated sales prices using the new coefficients, comparing the estimated to the actual sales prices and repeating the process until the minimum difference given the data and the regression model is achieved.

Using the hedonic analysts' favorite measure of R^2, the usual hedonic interpretation is that if $R^2 = 1$ then the regression model explains all of the differences between the estimated and actual sales prices. If $R^2 = 0$ then none of the differences are explained and the regression model is a failure. If the underlying regression is not explanatory of the actual data then the dependent hedonic analysis cannot be explanatory.

There are literally thousands of possible real estate regression models. The literature in the hedonic field generally exhibits little agreement on a model's mathematical form or the explanatory variables that should be included.[1] Absent published and recognized standards on the validation of data, model development and testing, and calibration of the model against the real world market, a regression may be nothing more than a rubber ruler that can be stretched to provide a desired result.[2]

Standards

However, a well-developed and tested set of standards do exist. Those standards are published and maintained by the International Association of Assessing Officers (IAAO) and are explicitly for the accurate and reliable estimation of sales prices using regressions, not simply for appraisal purposes as some allege.[3] These standards are employed many hundreds of times a day and are continually tested against the market.

For comparison purposes it should be noted that the usual hedonic regression model has an R^2 from 10% to more than 60% less than an acceptable regression under IAAO standards (IAAO R^2 better than 0.90[4] versus the best R^2 cited in the Report of 0.78–13% less–for example). No satisfactory scientific explanation of why a regression with a smaller R^2 will provide more accurate and reliable hedonic results has been provided.

There is no evidence whatever that the Report employed any standards. While the authors refer to the literature as support for their method this is little comfort as there is no evidence that any recognized standards were applied to the work reported in that literature. Further, the literature contains a significant number of papers illustrating some of the problems associated with hedonic studies ranging from an absence of proper validation of the underlying data, to models deliberately manipulated to magnify the desired impact, to improper use of indicator variables, to a failure to check the results of the models against the market to determine if the proclaimed results actually represent market behavior.[5]

A common problem with the lack of adherence to standards is that the apparent magnitude and statistical significance of the coefficients of interest may be increased by simply not including important explanatory variables in the regression, generally known as the "omitted

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[1] Atkinson, Scott E.; Thomas D Crocker, "A Bayesain Approach to Assessing the Robustness of Hedonic Property Value Studies," Journal of Applied Econometrics, Vol 2, 27-45 (1987).

[2] Wilson, Albert; "Real Property Damages and Rubber Rulers," Real Estate Issues, Summer, 2006

[3] Standards on Valuation Models, IAAO.ORG

[4] Gloudemans, Robert J., "Mass Appraisal of Real Property", International Association of Assessing Officers, 1999–One of the basic IAAO training manuals.

[5] SEE FOR EXAMPLE Rogers, Warren, "Errors in Hedonic Modeling Regressions Compound Indicator Variables and Omitted Variables," The Appraisal Journal, April, 2000

variable" problem.[6] This omission may be the result of a lack of understanding of residential sales price behavior or from other considerations but the result is the same, skewed coefficient values. There is strong evidence of an omitted variable issue in the Report.

Another method of increasing the apparent importance of a coefficient is to aggregate data into increasingly more expansive variable definitions. This procedure was used in the Report and is acknowledged by its authors. "The Base Model described by equation (1) has variables that are pooled, and the coefficients for these variables therefore represent the average across all study areas (after accounting for area fixed effects). An alternative (and arguably superior) approach would be to estimate coefficients at the level of each study area, thereby allowing coefficient values to vary among study areas."[7]

The consequence of this aggregation is to distort the quantitative meaning of the coefficients. Possible situations in the Report include sales prices in areas of declining population and therefore decreasing demand–a majority of the areas examined–are not directly comparable to sales prices in areas of increasing population and therefore increasing demand, but these markets were combined in the Report. Also in the Report is the aggregation of markets such as those in Washington–used as the base for comparison to all other areas by the Report–where the urban market of Kennewick was aggregated with the rural market of Milton-Freewater 42 miles distant. The failure to recognize and account for the need for homogeneity of markets is a common failing of hedonics.

One of the major issues concerning the hedonic approach on a nationwide basis in ignoring local market homogeneity is addressed by the 2009 Coldwell Banker Home Price Comparison Index.[8] It makes the point that local markets are critical. For example a house in Grayling, Michigan sells for $122,675 while in La Jolla, California the same house sells for $2,125,000. Creating an average sales price representing houses from nine states and at least 20 different markets–as the Report did–is a gross oversimplification that cannot provide for the specificity required to answer a micro-question such as an influence on sales price from a highly localized condition–distance to or view of a wind energy project.

This problem becomes critical when it is recognized that less than 10% of the sales transactions in the Report had any view of turbines, and that only 2.1% had a view rated greater than minor. The study is dominated by transactions where no influence is reasonably likely. The argument that the report is "data rich" may in fact be an overstatement of the situation because of this issue.

It is worth noting that IAAO standards discourage the use of regression for the analysis of

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[6] Rogers *ibid.*

[7] Report page 134

[8] "2009 Coldwell Banker Home Price Comparison Index," as cited in CNNMoney.com "Same 4-bedroom house - Wildly different prices", September 23, 2009

the impact of a proximate condition on value precisely because of the small number of potentially influenced sales available for analysis by regression. Instead the use of the classic three approaches to value (sales comparison, income and cost) is encouraged as more reliable under these circumstances.[9]

A major issue pointed to in the literature is the influence of errors in the data. A recent article reported that, using an IAAO certified regression, as few as 15 erroneous sales skewed the estimated sales prices by at least $500 for all but 43 of the 20,000 sales estimated.[10] In another instance a single error in the age of a property out of some 18,000 data elements skewed the results of the regression from a finding of an influence on sales price to no influence on sales price. Absent access to the Report data these and similar issues cannot be evaluated. There is no evidence in the Report that any sales confirmation work that might have revealed these issues was undertaken.

Peer Review

The authors of the Report claim it has been peer reviewed and the method and results are supported by the peer reviewed literature. Unfortunately this claim means far less than it seems. Peer review in the context of this Report and the referenced literature consists of the reading of the report by several presumably knowledgeable individuals and the provision of comments to the authors based on that reading, nothing more.[11, 12, 13] The authors may or may not have addressed all of the issues raised by the comments.

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[9] "Standard on the Valuation of Properties Affected by Environmental Contamination", IAAO.ORG

[10] Cholvin, Brooke, Danielle Simpson, "Assessing Mortgage Fraud," Fair & Equitable, IAAO, August, 2009

[11] Chan, Effie J., "The 'Brave New World' of Daubert: True Peer Review, Editorial Peer Review and Scientific Validity," New York University Law Review, April, 1995, 70, N.Y.U.L. Rev 100 ALSO, Haack, Susan, "Peer Review and Publication: Lessons for Lawyers," Stetson Law Review, Vol. 36, 2007.

[12] "The Editor reads each submitted manuscript to decide if its topic and content of the paper fits the objectives of JRER. Manuscripts that are appropriate are assigned anonymously by the Editor to one member of the Editorial Board and at least one other reviewer. ... The referee presents a critique to the Editor who forwards it to the author. Each author should be encouraged to resubmit the manuscript for publication consideration The Editor makes the final decision regarding re-submissions .." Editorial Policy and Submission Guidelines, Journal of Real Estate Research, American Real Estate Society, Volume 31, Number 2, 2009

[13] "The mistake, of course, is to have thought that peer review was any more than a crude means of discovering the acceptability–not the validity–of a new finding. Editors and scientists alike insist on the pivotal importance of peer review. We portray peer review to the public as a quasi-sacred process that helps to make science our most objective truth teller But we all know that the system of peer review is biased, unjust, unaccountable, incomplete, easily fixed, often insulting, usually ignorant, occasionally foolish, and frequently wrong." "Genetically modified foods. "absurd" concern or welcome dialog?" Richard Horton, editor of Lancet, 1999; 354: 1314-1315

What is missing from this process is any semblance of testing for the scientific validity of the results, a testing rendered impossible by the refusal of the Report's authors to provide the underlying data. Absent the data it is not possible to independently validate the accuracy or reliability of the data, replicate the analyses, test alternative regression models (say models that meet IAAO standards), or calibrate the results against the real world market. Absent such scientific testing we have nothing more than opinion upon which to base an estimate of the credibility and applicability of the results.

At best a peer review–as that phrase is commonly used in this field–with respect to both the Report and the literature addresses only the acceptability of the paper for publication but does not in any meaningful way address the validity of the underlying work.

Hedonic Analysis

Hedonic analysis depends entirely on the accuracy and reliability of the underlying regression. If the regression does not conform to recognized standards then we have no independent assurance of that accuracy or reliability, as in this case.

Hedonic analysis also adds a new requirement, specifically that the coefficients of the explanatory variables of interest are quantitatively accurate and represent only the marginal contribution of that explanatory variable to the sales price. This is not a requirement of regression. In this case there is some doubt that the hedonic requirement has been met.

First, computer regression programs are mindless, they simply follow a set of instructions until they are fulfilled and then print the results. It is a simple matter to demonstrate that omitting or adding an explanatory variable will frequently influence both the magnitude and statistical significance of the other explanatory variable coefficients. It is also possible to include a totally meaningless explanatory variable and achieve statistical significance for its coefficient, making it appear meaningful. Absent the application of standards regressions may easily meet the needs of junk science.

Second the accuracy and validity of the coefficients of hedonic interest (in the Report the coefficients associated with View and Distance) must be separately tested to determine if they comply with the hedonic requirement of accurately and only representing the explanatory variables.

In the literature–as in the Report–the usual test employed is that of the statistical significance of the coefficient. Unfortunately all this test may tell us is that the coefficient

is statistically unlikely to be zero.[14, 15] Knowing that a number is not likely equal to zero does not tell us anything about what it does represent or its importance to an analysis.

To determine if the coefficient has any hedonic value the test must be for the economic significance of the coefficient. Specifically a proof that the coefficient accurately and only represents the marginal contribution to sales price for that explanatory variable, and that it is of sufficient magnitude to provide a significant impact on sales price. There is no evidence of such testing in the Report, or indeed in the referenced supporting literature.

In Conculsion

While I have other issues with the Report and again reiterate that I have no opinion on the influence of wind farms on residential sales prices, the concerns I have addressed here lead to the conclusion that the Report should not be given serious consideration for any policy purpose. The underlying analytical methods cannot be shown to be reliable or accurate.

The reasons for the conclusion may be summarized as:

1) Lack of access to the underlying data prevents the independent validation of the data, replication of the analysis, testing of alternative analyses, or testing of the conclusions against the real market.
2) The peer review process used for both the literature and the Report can only determine the acceptability of the papers for publication. It cannot reveal the validity, accuracy or reliability of the work behind the papers.
3) Given the peer review actually conducted the fact that no published and recognized standards for the development of an accurate and reliable regression on sales price were used render the Report of highly uncertain value for any purpose.
4) The exclusive use of a test of statistical significance only indicates that the coefficients for Distance and View variables are not conclusive. What we do not know is what those coefficients actually represent. Only tests of economic significance would provide an answer, and none has been conducted.
5) Low explanatory power, 13% less than an acceptable minimum for an accurate regression on sales price.

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[14] Although difficult to read the following covers both statistical and economic (scientific) significance in some detail, Ziliak, Stephen T., Deirdre N. McCloskey, "The Cult of Statistical Significance", The University of Michigan Press, Series Economics, Cognition, and Society, Ann Arbor, MI and particularly the reference materials cited

[15] NOTE that the null and alternative hypotheses in a test of significance are required to be mutually exclusive and collectively exhaustive The test of significance for a coefficient uses the null hypothesis of equality to zero but the alternative hypothesis is rarely stated It appears that the hedonic analyst uses the idea that if the null can be rejected, then the coefficient must represent the marginal contribution of that variable to the sales price The correct alternative hypothesis is that the coefficient is simply not equal to zero and nothing more can be said

EXHIBIT K

Critique of
The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis

Authors: Hoen et al

By Wayne Gulden
wayne@amherstislandwindinfo.com
February 16, 2010

Introduction

The issue of wind turbines and their effect upon nearby property values has long been a contentious one, and for good reason. We generally accept the "wisdom of the market", and if wind turbines are as disruptive as opponents claim, surely this would show up in market prices of nearby properties. Opponents, politicians and wind developers can make all sorts of statements about noise, flicker, birds and so on, but talk is cheap. House prices, on the other hand, can be quite dear, and there's no easy or cheap way to hide the effect of wind turbines on house prices if in fact there is an effect. Plus house prices can serve as a single and quantitative proxy for all the effects that wind turbines may have on the neighbors.

Given the long history of the real estate industry figuring out house prices (commonly called "comps") you'd think this issue would be easily settled Unfortunately, it is possible to arrange the data in these studies to suit the sponsor – as Mark Twain famously observed, "figures don't lie, but liars figure". But couldn't one just take the prices of houses sold "in the area" before and after a project went in? But how big should "the area" be? And if there's only a small number of sales – these are, after all, generally remote areas – what conclusions can you draw?

For the wind industry and its allies in government and academic circles, persuasive studies showing no effect would go a long way to quiet the protests of the neighbors and make wind projects easier, quicker and cheaper to install. Almost needless to say, they have been working on such studies for a number of years. A major one was the REPP study (aka Sterzinger et al), and which is available at http://amherstislandwindinfo.com/reppreport.pdf. It was not persuasive (except among wind proponents), having used a large and undefined area in which most homes were so far from the project that any effect would be minimal. In fact Hoen was one of the REPP study's most severe critics. But the REPP study did reveal the underlying argument the wind industry could use to try to convince the willing and the gullible. They justified the large study area by asserting the main problem with turbines was *how they looked*. So if you could just see them (and you can see them for miles) they ought to affect the prices and since there was no measureable effect on prices there must be

no problems whatever with the turbines. Nice logic, if you can convince someone to accept it, and many politicians and reporters have done so.

This theme of the people objecting to wind projects mainly because of how they look is mentioned prominently in wind industry literature as the main reason people object to them. Never mind the noise, flicker, sleep problems and so on that are much more important for the actual close-in neighbors. The only place where serious visual objections are raised is where the scenery has a special value, like shorelines. Unfortunately, no property value study has ever been done specifically on projects in high-scenic-value locations. There's just not enough data yet – for example in this study only 117 properties, or 2%, had "premium vistas".

Regardless of what the wind industry asserts, the serious concerns for property values come from people who think they might be able to *hear* or *feel* the turbines enough so they cannot escape the noise and vibration even when they are just trying to enjoy their property, and especially when they are trying to go to sleep. For a home affected by this sort of problem the reduction in value might be very large indeed, certainly into double digits and in the worst cases approaching 100%. This is what home owners really fear.

To simplify it, there are three main ways to analyze house prices, in decreasing accuracy.

> First, you could study houses within audible distance (i.e. one mile) that sold (or perhaps independently appraised) fairly recently before the project was known about and then sold after the project went in. As long as the sales are "arms-length" and the proper adjustments made for area house price trends, this is the best indication of property value changes.
>
> Second, you could study just the house prices within audible distance of a turbine and compare them with similar houses (aka "comps") further away, like 10 miles. This technique is commonly used in the Real Estate industry to estimate property values.
>
> Third, you could use regression analysis. You start by taking all the sales within a certain distance of a wind project (5 miles is typical) and assign a series of descriptors to each house within that group – things like size of the house, number of bathrooms, distance from the wind project and so on. You then look for correlations between the different descriptors and the price, trying to assign the contribution of each. With enough computer processing you can assign the effect of each of these on the final price.

The Hoen study, published in December 2009, is the latest effort to analyze this issue and uses the third and weakest of these techniques, regression analysis. I go into more details later, of course, but in summary he found no "statistically significant" effect of turbines on house prices Unfortunately this study has a number of significant, and in

my opinion fatal problems. If you get to the bottom I've included some critiques from others that come to the same conclusions, certainly more authoritatively than I.

The Author

The primary author of the study was Ben Hoen, and his career warrants a brief but skippable section. This is not Mr. Hoen's first study in property values around wind projects. In 2006 he completed a master's thesis that looked at the impact of the Fenner, NY wind turbines on surrounding property values. His thesis can be found at: http://amherstislandwindinfo.com/hoen-fenner-2006.pdf. A condensed version, along with a critique, is at: http://www.windaction.org/documents/3236 . That study concentrated on the relation of the visual aspects of the turbines with house prices and found no evidence of any connection. However, a close reading of that study reveals some problems. First is the acceptance of the "how they look" theme put out by the wind industry lobbyists. Second is the small number of sales inside of one mile – out of 280 sales, only about 8 were inside of that distance (the closest was 0.75 miles), and the average distance was 3.5 miles. There's a picture of the data points at http://amherstislandwindinfo.com/hoen-fenner-map.jpg. Third, while he didn't find any statistically significant evidence of an effect (and with such a small sample of the important sales, how could he?) within Fenner Township, he did find that the Township as a whole had lost some 8% of its house values relative to neighboring townships. He went into overtime to explain away this elephant in the room. I doubt he was very convincing to any disinterested party, but certainly he established whose interests he wanted to serve early on.

From windaction.org,

> "Within months of obtaining his masters, Hoen and Wiser teamed up, and since June 2007 Hoen has been broadcasting the results of this latest study even though no data or information on the study was available for others to read and challenge. In the two years leading up to the December 2 [2009, this study] release, Hoen distributed his findings to largely friendly crowds and those more interested in the outcome of his study than the legitimacy of his methodology."

It seems at least unprofessional to discuss your findings in front of those with a financial stake in the outcome before publishing the findings, but it is consistent with his own personal business plan he previously revealed at Fenner. The slides from an early presentation can be found at: http://amherstislandwindinfo.com/hoen-presentation.pdf.

Overview of the Study

This study was funded by the U.S. DOE under a government contract at the Berkeley National Laboratory. Berkeley is a leading world center of scientific achievement, and gets its money from the Department of Energy. It would be sensible to keep in mind

that the Department of Energy has a wind program that "is working to improve wind technology and increase the use of wind energy in the U.S." The study is 164 pages long and can be found at http://amherstislandwindinfo.com/hoen-property-values.pdf, with the body of the report consisting of 75 fairly densely-written pages. Upon a casual reading the study is quite impressive, full of charts and formulae, and Hoen seems to be careful in his analysis. The devil's in the details.

This study uses the third technique I listed from above - regression analysis. While it is principally concerned with Scenic and Area "stigmas" it does include a "Nuisance" stigma which hopefully promises to answer the issue of the effects on the property values of those neighbors within a mile of the projects, and who have the most to lose. I don't much value the Scenic and Area metrics as explained above, so my comments will concentrate on the Nuisance metrics.

Before I go into my comments I ought to provide some background on what is meant by the "Multi-Site Hedonic Analysis". Initially I thought the "Hedonic" had to do with some special techniques being used, but later found out that hedonic is merely an offshoot from the word "hedonism" and simply refers to analyzing intangibles – like scenic values or wind turbine nuisance. The techniques used are "simply" standard regression analyses as would be performed in any number of other fields of study.

So, what is regression analysis? From Wikipedia:

> "In statistics, regression analysis includes any techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables."

In this case the one or more independent variables are things like square footage, number of bathrooms and distance from a wind turbine, while the dependent variable is the sales price of the house.

The general process is to decide which physical areas you want to study and the questions you want to answer. Hoen ended up choosing 10 areas as shown in Figure 1 on Abode's page 30, his page 12. You then gather all the relevant information about the properties and he provides a good summary of how he did this in section 3. Once you've obtained the data – and you always end up obtaining more than you actually use – you start running the analyses, looking to show statistically that there is a relationship between, for example, distance and price. Note that statistical practitioners do not pose their quest as trying to show there is *not* a relationship between i.e. distance and price. You may recall the *null hypothesis* from your student days, where "no relationship" is the starting assumption.

One potential problem might have occurred to the alert (still awake?) reader is that house prices vary a great deal depending on a large number of often times intangible factors. This type of analysis takes a snapshot of all the sales in the study area, regardless of how big or little, nice or nasty, good shape or not. How likely is it we can

accurately ferret out the factor (i.e. distance from a turbine) we are interested in? The solution is to have a large number of data points. In Hoen's case, he had 7,459 sales, making this the largest and presumably most accurate analysis to date.

Hoen worked with about 15 major independent variables, some of which were continuously variable (like square footage) while others were sorted into categories. Using these 15 independent variables in varying combinations, he then created 10 different reports that studied different relationships between them and the dependent variable – the house selling price. The reports are listed in table ES-1, Adobe's page 12 and the study's page xi. Given my interest in close-in neighbors, I will focus my comments on these most relevant 4 out of the 10 reports: Base, All Sales, Temporal, and Repeat Sales. His overall conclusions are in table ES-2, immediately following ES-1, and generally he is not able to find any statistically significant (at the 90% level) relationship between the distance from or view of the wind turbines.

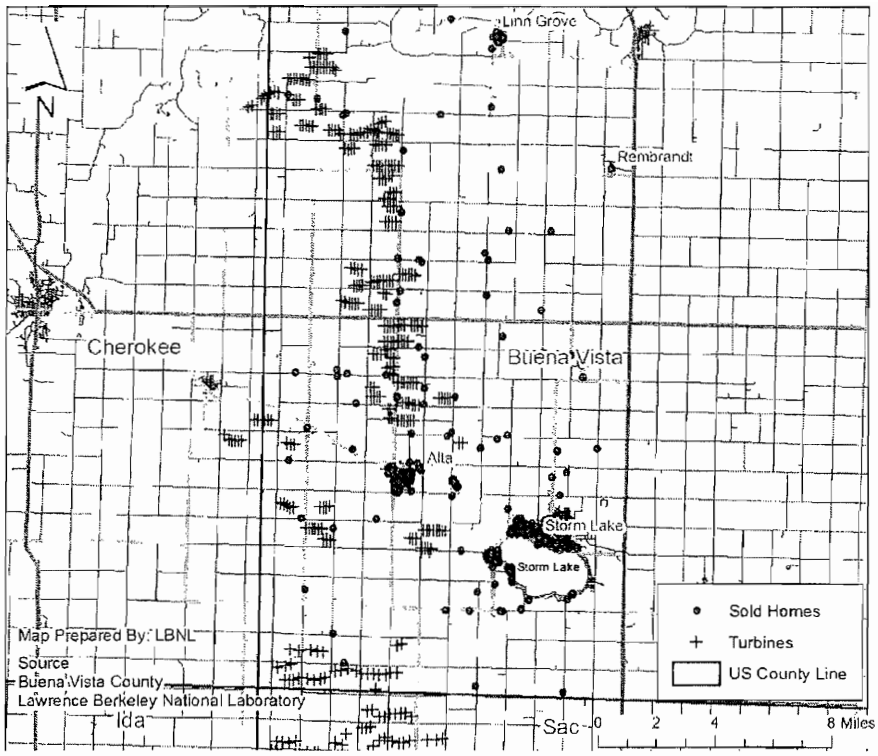
Discussion

As mentioned earlier, my interest is in the close-in neighbors who can hear the turbines, labeled the "Nuisance Stigma". Fortunately, Hoen has this summary of these properties, from Abobe page 17, his page xv:

> "Taken together, these models present a consistent set of results: homes in this sample that are within a mile of the nearest wind facility, where various nuisance effects have been posited, have not been broadly and measurably affected by the presence of those wind facilities. These results imply that Nuisance Stigma effects are either not present in this sample, or are too small and/or infrequent to be statistically distinguished."

Note carefully the last sentence. He has two potential explanations for this observed lack of effect. The first one, the effects are in reality not present, is what the wind industry dwells upon, and what Mr. Hoen himself mentions most prominently. But the second explanation, too small and/or infrequent to be called statistically significant, is equally possible. Of the 7,459 sales only 80 were within 3000 feet and another 65 inside one mile, for a total of 145, or 2%. Their prices did go down relative to everything else by varying amounts depending on the study, but that wasn't enough to trigger statistical significance most of the time. However, statistical significance has two basic requirements: that (1) the numbers are different and (2) they don't vary too much among themselves (the standard deviations are relatively small). Hoen won't release his raw data so others can sift through it, but among 140 properties from across the country I'd bet the differences would be very large. As an example, for the 7,459 sales the average price was 102,968 with the standard deviation of 64,293.

To give you a sense of how the properties are spaced relative to a project, here is a picture of the sales in the area with the most post-construction sales within one mile (Buena Vista County, Iowa, with 30 out of 125).



This chart is typical of the other 9; if anything, it is less extreme. Note the large number of sales in the towns of Alta and Storm Lake, both of which are pretty far from any turbines. To somehow use all these remote sales to draw conclusions about the relatively few close-in sales strikes me as quite a stretch. The obvious question to ask would be what sort of prices existed before the projects versus the prices after the projects for just the close-in properties, and one study in particular – the Repeat Sales Model – promises to provide that answer. Unfortunately, that model produced conflicting results as discussed below. Just as a snarky aside, there are actually 5 projects in this area; 3 of them were by Enron.

One oddly categorized variable was 5 different distances from a turbine – why wouldn't this be continuous? Hoen goes into overtime providing the reason in footnote 52 on his page 25. I can see his point about "imposing structure" but it does give him an excellent opportunity to game the data.

I don't know if Hoen used the distance categories to game the data or not. Without the raw data it is impossible to tell. But there's other ways to warp the data to get a result you can profit from. Buried in the footnotes on page 14:

> "Finally, it should be noted that the authors are aware of four instances in the study areas when homes were sold to wind developers. In two cases the developer did not resell the home; in the other two, the developer resold the

> home at a lower price than which it was purchased. But, because the sales were to a related party, these transactions were not considered "valid' and are therefore not included here. One might, however, reasonably expect that the property values of these homes were impacted by the presence of the wind turbines."

Those 2 resold properties were at the Somerset, PA project – the one you can see from the PA Turnpike. From stopillwind.org:

> "...Somerset Wind...bought these properties for fair market value—one in May, 2002 for $101,049, reselling it in August to a lessor who had initially leased land to the wind company for $20,000--20% percent of the previous sale price! In May, 2002, Somerset Wind purchased the other property for $104,447, selling it in August for $65,000--62 percent of the purchase price!"

I'll concede the sales from the original owner to the developer are invalid. But the following sales are not "to a related party". The developers are presumably rational and would want to sell these 4 properties for as much as they could, and in two cases that may well have been zero. The lower prices could well reflect what the properties are now worth. Given that the close-in property sample is so small, these 4 transactions make quite a difference – by my calculations (using average values), raising the Base model's inside-a-mile decrease in property values from 5.4% to 9.2%. One wonders what the headlines would have said if those values were published. I have little doubt that difference would have been statistically significant. Hoen avoided the problem by simply discarding this inconvenient data.

Earlier I promised to discuss the 4 models that seemed to be the most germane for my close-in worries. Here they are, but Hoen has managed to eviscerate the models enough that no honest result is apparent.

Base (Section 4, his page 23)

This model is the centerpiece of the study, even getting its own section. It just considers the sales of properties after construction of the project begins. Hoen justifies this because of his emphasis on the visual aspects of wind turbines - after all you can't measure them until the project is built. However, it also allows Hoen to avoid discussing the large price drop experienced by the close-in properties that occurs before the project in even constructed. Even then, he found that close-in properties decrease an average of 5.4%. As mentioned above, this is not statistically significant, perhaps because the sample is small and the variability is great.

Hoen comments,

> "That notwithstanding, the -5% coefficients for homes that sold within one mile of the nearest wind turbine require further scrutiny. Even though the differences are not found to be statistically significant, they might point to effects that exist but are too small for the model to deem statistically significant due to the relatively small number of homes in the sample within 1 mile of the nearest turbine. Alternatively, these homes may simply have been devalued even before the wind facility was erected, and that devaluation may have carried over into the post construction period (the period investigated by the Base Model)."

How does Hoen explain this away? By referring us to the All Sales model, discussed below.

All Sales (Section 5.3, his page 37)

While the Base model uses just properties that have sold after construction has started, the All Sales model includes all the sales both before and after the announcement and construction. Because the prices of the close-in properties declined even before the project was announced, the 5% decrease noted by the Base model now becomes larger, averaging 7%. This decrease becomes big enough to now be statistically significant. How does Hoen explain this away? By referring us to the Temporal Aspects model, discussed below.

Temporal Aspects (section 5.4, page 42)

This model focused on the price changes over different periods both before and after the construction of a project. My interest, as always, is in the properties within one mile. As for other sections, the number of sales that are useful for my purposes is quite small, a total of 225 over the entire roughly 10-year period. How he got to 225 escapes me as I can identify only the previously-mentioned 145 properties within 1 mile, and this is too large a delta to be a rounding error. He divided the 225 sales into 6 periods and compared their prices with an average. The earlier periods show quite large drops that are statistically significant. But as the project is built and put into operation the drops lesson, never going away completely, but becoming insignificant. This allows Hoen to put "no" in the Nuisance Stigma column for Temporal Aspects in table ES-2. The most interesting result to me is that even 2 years before the formal announcement of a project the prices within a mile decrease by 13%.

Repeat Sales Model (Section 6, his page 55)

This study took matched pairs of sales when there was one sale before announcement of a project and another sale after construction of the project. As such it does not use regression analysis. Unfortunately, the sample I'm interested

in, sales within one mile of the project, is quite small, a total of 14 properties. Curiously, it showed that these houses increased their value by 3% per year over the average. This is encouraging, but the sample size is small and there are other inconsistencies in the results in this section, so I'm not sure what to make of the results. Nor is Hoen:

> "These results are counterintuitive and are likely driven by the small number of sales pairs that are located within one mile of the wind turbines and experience a dramatic view of those turbines."

Maybe the solution to this odd result is contained in the Temporal Aspects Study. From that study, it seems that prices of houses within one mile drop a great deal beginning before the project is even announced, and then recover somewhat as time goes on. The repeat sales pairs could be reflecting this recovery from a depressed beginning.

Other Critiques

I've bored you enough. I've even bored me enough. Here are some critiques from others, all of whom have more insight into real estate and statistics than I.

One of the reviewers was Lisa Linowes of the Industrial Wind Action Group – better known as windaction.org. She had this to say about her critique:

> "We worked closely with an appraiser experienced in regression analysis and hedonics in developing our comments. Given the flaws in Hoen's approach, we are confident that a qualified appraiser with experience in regression techniques and the problems of hedonic analysis will effectively counter Hoen's conclusion. You may be interested to know that neither Hoen or the others who were part of his research team have any experience in real estate appraisals or the correct application of regression techniques for determining house value."

Her critique is posted on their web site at
http://www.windaction.org/documents/24178 and a backup copy is at
http://amherstislandwindinfo.com/linowes-hoen-critique.pdf.

Albert R. Wilson is another professional real estate appraiser, and while he has (correctly) no opinion on wind turbines and property values, he eviscerates Hoen's techniques at
http://www.arwilson.com/pdf/newpdfs/WindFarmsResidentialPropertyValuesandRubberRulers.pdf
also saved at
http://amherstislandwindinfo.com/wilson-hoen-critique.pdf.

For a shorter version and some additional commentary, visit windaction.org
http://www.windaction.org/releases/25672 also saved at

http://amherstislandwindinfo.com/iwa-hoen-critique.pdf.

Michael McCann, a professional appraiser in Illinois and the Midwest was another reviewer, and he had two comments. The first one mentioned that this study would likely be used in official government proceedings, and an emphasis on the disclaimer would be a good thing. Link at http://www.windaction.org/?module=uploads&func=download&fileId=1948 with a backup copy at http://amherstislandwindinfo.com/mccann-hoen-review-disclaimer.pdf.

He goes on to write a longer and in many ways a harsher critique than mine, at http://www.windaction.org/?module=uploads&func=download&fileId=1950 with a backup copy at http://amherstislandwindinfo.com/mccann-hoen-review-total.pdf.

The Acoustic Ecology Institute had the same sorts of concerns with the close-in neighbors, and noticed some of the same things I did, per http://aeinews.org/archives/529.

EXHIBIT L

posted: December 21, 2010 • New York, Property values

Ben Hoen on need for Property Value Guarantee

[Alternate short URL for linking • HOME]

Author: Schneider, Clif

The following is an excerpt from a conversation I had in April 2010 with Ben Hoen, whose work with property value impacts associated with wind projects is widely referenced by developers, including those developers hoping to have wind projects approved here in Jefferson and St. Lawrence Counties. Hoen's comments below are very different from the spin suggested by Madden of BP Alternative Energy and Acciona's FEIS. Hoen indicates if developers believe turbines won't devalue neighboring property they should guarantee it, and he's right:

"You know we are very cautious about what happens close to the turbines. We really don't know what's going on there (e.g., 1,250 ft from turbines). I just spoke in Illinois about this. You might know about a Property Value Guarantee. It's a dicey situation and complicated, but I think homes that are very close, there is just too much unknown right now; that seems reasonable. I think one of the things that often happens is that (wind) developers put our report forward and say look property values aren't affected, and that's not what we would say specifically. On the other hand, they have little ground to stand on if they say we won't guarantee that. I think for homes that are close we have a lot more ambiguity and real issues. If we are talking about views that's one thing, if we are hearing it or shadow flicker that might be really regular, the kind of things that happen at night. …

"I'm not a lawyer and I'm not the developer, these (PVGs) are just options in the tool kit. I don't know whether it's reasonable to put together, I have looked at one, I don't know if there is a better way to write it or whether the one I read from Illinois is good or bad. They have to be thought about, they all probably have cost implications, so the developer is not going to give away the house if they were too generous; on the other hand if they are not generous enough they don't have any impact. That's just one of the tools available, there are neighbor agreements that may be more applicable whether folks nearby get compensation, if they are not a participating land owner. One of the things I've always hoped is somebody would offer one or the other and see what landowners would do."

Reported by:
Clif Schneider
April 12, 2010

Listen to the recording of Hoen's comment:

Via Jefferson's Leaning Left