INDIANA RENEWABLE ENERGY

Siting through Technical Engagement and Planning (R-STEP™)

A Hedonic Analysis of Wind Power Facilities in Indiana

Produced for the Indiana R-STEP Collaborative by the Center for Business and Economic Research, Ball State University

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Abstract

This paper uses 2004-2024 Multiple Listing Service real estate data to examine the impact of utility-scale wind farms on the sale price of residential properties in three Indiana regions. We used more recent real estate data than examined in most existing studies and provide state specific estimates to inform state and local officials and residents of the impact of wind turbines on house values. Results of the hedonic models and event study estimates suggest that wind turbines *have not negatively impacted* the sale prices of nearby homes.

Introduction

The number of wind turbines operating in Indiana has increased dramatically since the first utility scale wind farm became operational during 2008. The number of turbines has increased from 87 in 2008 to 1,684 in 2023, and electricity generation from commercial wind has increased from 1.4 million MWH (Megawatt hours) in 2008 to 8.84 million MWH in 2023 (a 530% increase).[1] By 2023, turbines accounted for about 10% of utility scale electricity generation in the state.[2] This capacity has occurred primarily in three regional clusters in the northern half of the state. Over this same period, Indiana emissions of sulfur dioxide, nitrogen oxide, and carbon dioxide by the electric power industry have decreased dramatically (96%, 77%, and 51% decreases measured in short tons, respectively).[3]

As growth of commercial wind energy developments has increased, so has opposition to new projects. Among the concerns for property owners is the impact of wind turbines on nearby property values.[4] Negative externalities associated with wind turbines that may affect property values include shadow flicker, signal interference, sound and vibration levels, lights, drainage, visual changes to the landscape, and decommissioning issues. Due to these potential effects, the siting of new wind

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[1] This amount of electricity will power about 842,000 typical homes in a typical year.

[2] These statistics are from the U.S. Energy Information Administration, *Indiana Electricity Profile 2023, Full Data Tables 1-17* or authors' calculations using these data.

[3] See U.S. Energy Information Administration, *Indiana Electricity Profile 2023, Table 7* for details.

[4] See https://investigatemidwest.org/2013/08/01/tilting-at-windmills-a-closer-look-at-indianas-expanding-wind-power-industry/

facilities in Indiana is controversial with eight of 92 counties imposing moratoria on wind as of 2021 (Ogle & Salazar, 2021).[5] One of the benefits of turbine placement are lease payments to landowners, which guarantee a steady stream of income over the life of the wind project. Other benefits include environmental improvements, job creation, and payments-in-lieu-of-taxes (PILOTS) or economic development payments to local governments.

The purpose of this report is to analyze how proximity to commercial wind turbines affects housing values in Indiana. It contributes to the literature by examining the impact of utility scale wind projects on house prices using more recent real estate data than examined in existing studies (with the exception of Brunner et al., 2024 and Dong et al., 2023). We provide state-specific estimates for Indiana, which has not been examined in the literature, to inform state and local officials and residents about the impact of wind turbines on house values. We also examine the impact of wind turbines in rural areas. Other recent studies (Brunner et al., 2024; Dong et al., 2023) using larger samples found that impacts on house values driven by wind projects occur primarily in populated, urban metro areas. We approach this with two empirical techniques to examine the impact of distance from wind turbines on the sale prices of residential properties: The first is a series of hedonic differences-in-differences estimates, and the second is an event study.

To accomplish this, we describe the characteristics of wind turbine locations in Indiana, describe our data sources and specific features of these data. We then turn to our hedonic difference-in-difference modeling approach, including a discussion of the evolution of the outcome variable (natural logarithm of home prices) between the treatment group by distance and the control group. Following this, we provide the results of an event study that shows the evolution of home prices following the siting of wind turbines. We conclude with a summary. We begin with a review of the existing literature.

Literature

The most recent studies investigating the impact of utility scale wind turbines on house values have used longer time periods and larger datasets than earlier studies and found heterogeneous results both over time and distance and among geographic regions. In their analysis of wind turbines and home values in the U.S., Brunner, Hoen, Rand, and Schwegman (2024) found statistically significant negative impacts on housing prices in urban counties (population > 250,000). They found a 14.94% decrease in house prices for homes located within 1 mile of the nearest turbine and a 4.27% decrease for homes located within 1 to 2 miles. They found no statistically significant impact of turbines on home prices in rural areas. In their examination of the impact of wind turbines on property values in Massachusetts and Rhode Island, Dong, Gaur, and Lang (2023) found differing effects among regions of these states with the negative findings driven by the Nantucket and Cape Cod, Massachusetts region, which is a high income, coastal area. Properties within 1 km of a wind turbine experienced a decline in prices ranging from 7% to 10.8% relative to properties 3 to 10 km from a turbine. The impacts in other regions of these states were smaller (6% or less) or not statistically significant. They found that the negative impact on house values in Nantucket and Cape Cod dissipated over time but never reached zero. Both studies found a temporal, U-shaped pattern where house prices declined during the wind farm's pre-construction period and continued to decline after construction was completed and the project became operational and then began to rebound.

Guo, Wenz, and Auffhammer (2024) used a spatial hedonic model to examine differences in sale prices for residential properties within view of a wind turbine compared to those with no view of a turbine within 10 km of wind farms and found the sale price of homes within a wind turbine's viewshed is 1% lower, with a larger effect (up to 8%) for homes located closer to a wind turbine and no effect for properties 8 km from the turbine. They also found that the impact on price diminishes over time and that wind farms are more likely to locate in areas with lower property values. In a meta-analysis that does not include the aforementioned studies, Schutt (2023) used estimates from 20 hedonic pricing studies and found that the average decrease in property values was -0.68% for properties 1.89 miles away, with effects that decreased to zero beyond 2.8 miles.

[5] Ogle and Salazar are currently working on an update of their 2021 report. Hartley, Weise and Schneider (2025) reported, "40 of Indiana's 92 counties had bans or impediments on new wind development and 24 counties had similar restrictions on solar energy as of September 2025."

In sum, the most recent studies using data for longer time periods found negative impacts on house prices primarily in urban areas. These impacts were limited to a relatively close distance (2 miles or less) to the turbines and were not durable (dissipated over space and time).

Earlier studies of the U.S. and Canada mostly found no impact of wind projects on property values. Laposa and Mueller (2010) examined the impact of an announced wind farm on nearby property values in rural Colorado and found no significant impact on the sale prices of nearby properties. Hoen et al. (2011) investigated the role of views and proximity to wind turbines on residential sale prices in nine states and found no impact of view or distance to wind facilities on sale prices. Hoen et al. (2015) examined the impact of wind turbines in counties with at least 250 home sales and found no statistically significant impact on sale prices during the turbine construction period or post construction. Hoen and Atkinson-Palombo (2016) examined home sales in densely populated areas of Massachusetts with a relatively small number of wind turbines (three or less) and found no net positive or negative effects of wind turbines and other amenities and disamenities on sales price or on rate of sales. In response to concerns about the potential negative effects of wind turbines on property values near Melancthon Township in Ontario, Canada, Vyn and McCullough (2014) examined the impact of a large wind farm on rural residential sale prices and farmland sale prices. They use a variety of specifications and found no impact, although they noted the small number of observations near the turbines in the post-turbine period as well as large standard errors, which would limit the ability to detect statistically significant effects.[6] Lang et al. (2014) examined the impact of wind turbines on house values in Rhode Island and found no significant impact in their overall sample. However, an examination of repeat sales showed a negative impact (-5%) for properties located between 0.5 and 1 mile of a turbine during the post announcement preconstruction period. They also found that there was a negative impact on properties within 2 miles or so of large turbines (producing 600 kW or more). Heintzelman and Tuttle (2012) found a significant decline in sale price (-8% to -16%) for homes within a half mile of a wind turbine in two of three counties studied in Northern New York using data on repeat sales.

Attitudes toward wind energy in a community may affect perceptions regarding the impact of wind turbines. Negative perceptions may contribute to opposition to wind development, which may in turn negatively affect nearby property values. Vyn (2018) compared differences in property values near wind turbines in municipalities that opposed wind turbines and those that did not and found negative impacts on property values in municipalities that were opposed to wind development and no significant impact in communities that did not oppose this type of development.

Earlier studies of European countries, which are much more densely populated than most of the U.S., found consistent negative effects of wind turbines on property values. Several studies (Jensen et al., 2014 & 2018; Gibbons, 2015; Droes & Koster, 2016 & 2021; Sunak & Madlener, 2016; Jarvis, 2021) found significant reductions in sale prices ranging from 1.4% to 14%, with estimates of 6% or less in most of the studies depending on distance to turbine, view of turbine, and noise level. A few studies showed no significant effect (Sims & Dent, 2007; Sims et al., 2008). Parsons and Heintzelman (2022) provide a detailed review of studies conducted between 2011 and 2021.

Housing density seems to be especially relevant for determining outcomes and likely drives the significant effects found in urban areas relative to less-dense rural areas. This may be because there are more observations in denser areas, leading to more robust statistical results, or because there are indeed stronger effects. In addition, results of recent studies that include large numbers of observations over broad regions may miss effects that would be significant in a particular community or region.

Other studies have examined the impact of wind turbines on other outcomes. Brown et al. (2012) outlined the various direct and indirect effects of wind power facilities on local economies. Studies have shown that utility-scale wind energy facilities modestly increased wages (2%) in the typical rural county (Mauritzen, 2020) with some counties experiencing much larger impacts, increased per capita county GDP, per capita income, median household income, and median home values along with shifts from farm to non-farm employment while not stopping population decline (Brunner & Schwegman, 2022).

Fiscal effects include improved community services (from associated local tax revenue) without increasing the cost of living (Shoeib et al., 2021), increased school district revenues and associated capital spending with little effect on class sizes,

[6] We have similar issues in the current analysis as detailed below – a small number of observations near the turbines in the pre- and post-turbine period and relatively large standard errors.

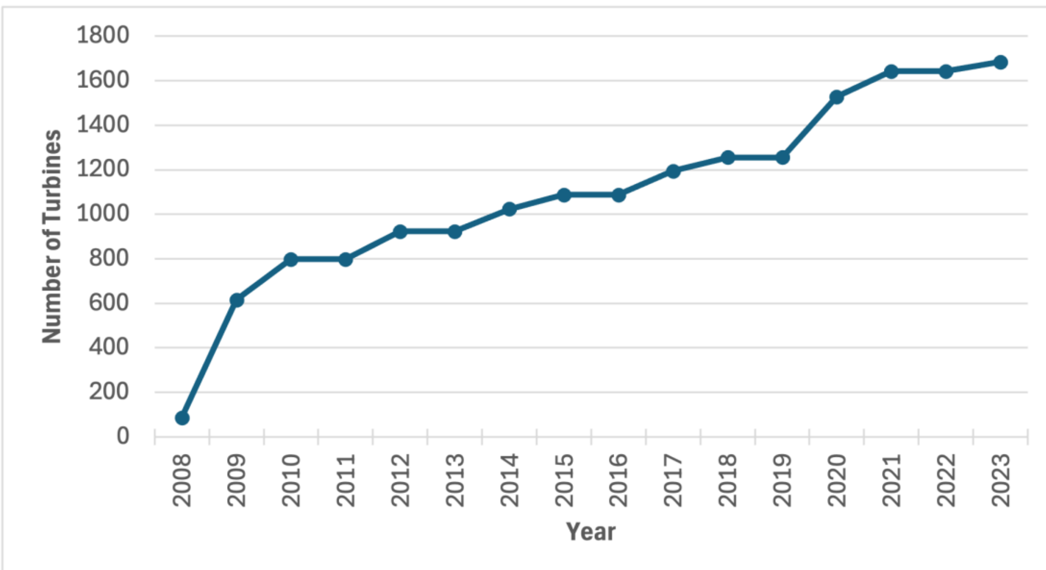
teacher salaries, or student test scores in Texas (Brunner et al., 2022), increased county government revenue and spending on highways and hospitals (Brunner & Schwegman, 2021). These effects are not examined here and are left for future work.

Profile of Indiana Wind Projects

The National Renewable Energy Laboratory (NREL) estimated wind speeds at 30m and 50m heights for Indiana.[7] Using this data, 19 counties have Class 3 wind speeds.[8] While this may not reflect climatic prohibitions on wind power placement, all of Indiana's commercial turbines are in counties with these wind speeds.

Indiana's first commercial wind turbines went into operation in Benton County in 2008. As wind energy has become an increasingly important source of energy, the number of turbines has increased reaching almost 1,700 in 2023, up from less than 90 in 2008.[9] See *Figure 1* for the number of wind turbines by year. Of Indiana's 92 counties, seven have commercial wind energy installations (> 600 kW). All the completed wind projects are located in rural areas with limited residential development in the immediate vicinity.

Figure 1. Number of Wind Turbines in Indiana, 2008-2023



Source: Authors calculations using data from the United States Wind Turbine Database.

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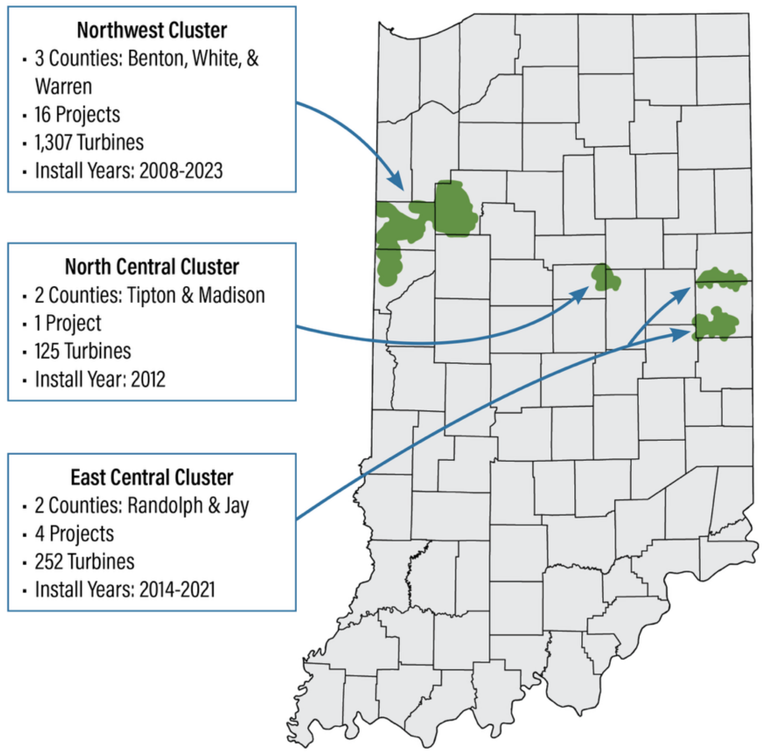
[7] The National Renewable Energy Laboratory (NREL) is now the National Laboratory of the Rockies (NLR).

[8] Class 3 wind areas have wind speeds between 14.3 and 15.7 miles per hour at 50 meters from the earth's surface. See *Appendix Table B1* for a list of Indiana counties with Class 3 wind areas and *Appendix Figure B2* for the corresponding map.

[9] Authors' calculations using the U.S. Wind Turbine Database (USWTDB) (Hoen et al., 2025).

Figure 2. Indiana Counties with Commercial Wind Energy Installations, 2008-2023



Source: Authors calculations using data from the United States Wind Turbine Database.

Three clusters of utility-scale wind projects, all located in the northern half of the state, were completed 2008-2023. *Figure 2* shows a map of these project clusters.

The Northwest cluster is the largest and spans three counties (Benton, White, and Warren counties) near the Indiana-Illinois border. In this region, 16 projects were completed 2008-2023, containing 1,307 wind turbines (78% of all Indiana wind turbines). More than 60% of total Indiana wind turbines over that period (798 turbines statewide) were in the Northwestern cluster of projects, completed 2008-2010. The remaining projects on the western border were completed sporadically 2015-2023.

The North Central cluster contains one project that crosses two counties, Madison and Tipton. The Wildcat I project was completed in 2012 with 125 turbines (7.4% of total wind turbines). This is a rural area, and the low housing density likely attracted the utility-scale wind project.

Four projects were completed near the Indiana-Ohio border (the East Central cluster). Those four projects (Headwaters, Headwater II, Bluff Point, and Bitter Ridge) cross Jay and Randolph counties with a total of 252 turbines (15% of total wind turbines). This cluster of projects was completed 2013-2021.

Data and Method

U.S. Wind Turbine Database (USWTDB): The U.S. Wind Turbine database began in 2016 through a collaboration between the U.S. Geological Survey (USGS), Lawrence Berkeley National Laboratory (LBNL), and the American Wind Energy Association (AWEA). The USWTDB is publicly available and has been a trusted source for multiple types of analyses in the public and private sectors. The data are created from multiple collection efforts of the USGS, LBNL, AWEA and Federal Aviation Administration (FAA). Wind turbine points are confirmed within 10 meters of the base of the turbine location (Hoen et al., 2018). Data for Indiana was used in this analysis and included latitude and longitude of each turbine, the year each turbine became operational, and installed capacity (kW).

Multiple Listing Service (MLS) Data: The dependent variable (sale price) for this analysis is from MLS data for residential property sales from the Indiana Association of Realtors (IAR). All sales are at the address level. The IAR database includes residential property transactions between January 1, 2004, and September 30, 2024, and contains characteristics including address, latitude-longitude coordinates, property type, living area, number of bedrooms and bathrooms, sale amount and sale date for each transaction. Obvious data entry errors and observations without necessary information were omitted. Properties with a sale price lower than $10,000, smaller than 450 square feet, larger than 5,500 square feet and located on less than one-tenth of an acre were omitted from the dataset.[10] In addition to the aforementioned cleaning, the top and bottom 1% of sale prices were omitted from the dataset for each region, to eliminate potential data errors and unrepresentative outliers. Each data source was joined by geographic point location. Sale prices are adjusted to 2024 levels using the Midwest regional housing Consumer Price Index from the U.S. Bureau of Labor Statistics.

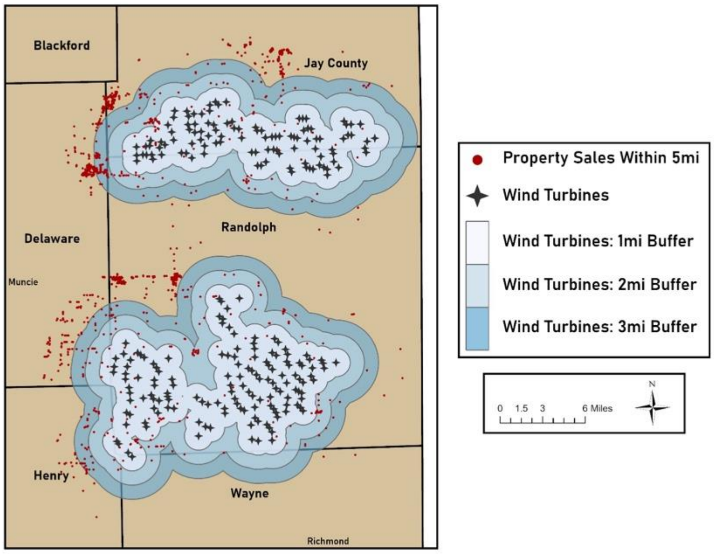
We conduct separate analyses for each of the three regions and restrict the data to homes sold within 5 miles (26,400 feet) of the nearest wind turbine in each region. See *Figure 3*. For the East Central region, turbines are in Jay and Randolph counties, and the dataset consists of 2005-2024 home sales in Jay, Randoph, and surrounding counties (*Figure 3a*), except Wayne County, due to unavailable MLS data. [11,12] For the Northwest region, turbines are in Benton, Warren and White counties, and the dataset consists of 2004-2024 home sales in these and surrounding counties (*Figure 3b*). For the North Central Region, turbines are in Madison and Tipton counties, and the dataset consists of 2004-2024 homes sold in these and the surrounding counties (*Figure 3c*).

[10] Observations with these criteria are likely to be typos in the MLS dataset.

[11] Because MLS data is not available for Wayne County, residential properties solely located in Wayne County are not included in this analysis.

[12] There were only two 2004 property transactions in the East Central dataset, so 2004 data were omitted from the sample.

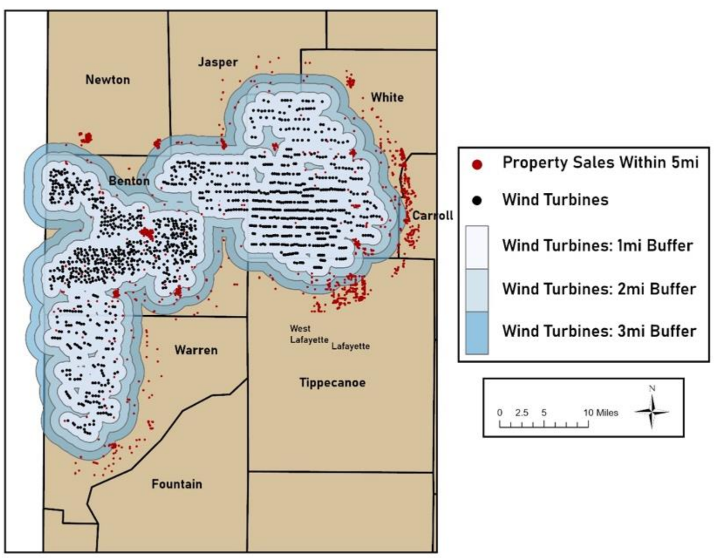
Figure 3a. Wind Turbines and Residential Property Transactions, East Central Region, 2005-2024



Source: Indiana Realtor's Association MLS data and United States Wind Turbine Database

Notes: Properties sold within 5 miles of a wind turbine, 2005-2024. MLS data on residential sales is not available for Wayne County.

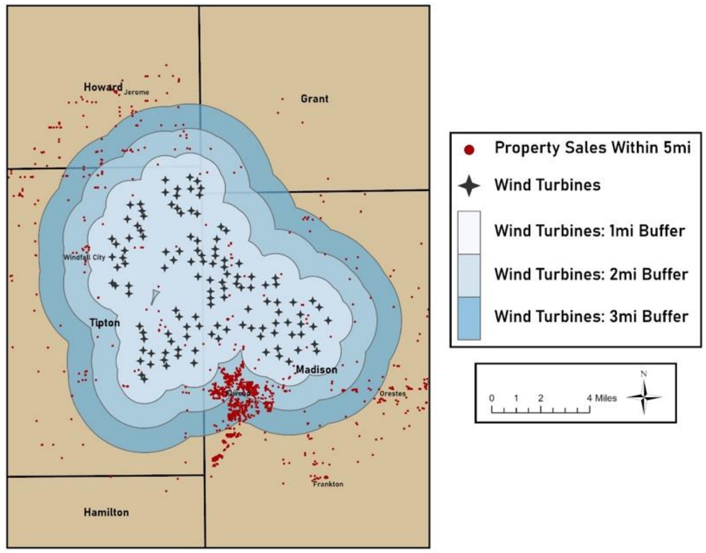
Figure 3b. Wind Turbines and Residential Property Transactions, Northwest Region, 2004-2024



Source: Indiana Realtor's Association MLS data and United States Wind Turbine Database

Note: Properties sold within 5 miles of a wind turbine from 2004-2024.

Figure 3c. Wind Turbines and Residential Property Transactions, North Central Region, 2004-2024



Source: Indiana Realtor's Association MLS data and United States Wind Turbine Database

Note: Properties sold within 5 miles of a wind turbine from 2004-2024.

One notable feature of *Figures 3a-c* is that the location of turbines appears to have avoided large clusters of home sales appearing in our MLS data. This is likely purposeful, as a siting and permitting process would have considered issues of proximity to homes. Thus, the data generating process of turbine location with respect to residential property would have included efforts to mitigate the effect of turbines on home values. This has policy implications, which we discuss in our conclusion.

Appendix Tables A1-A3 present summary statistics for properties in the dataset. The top section of each table shows the statistics for the entire sample followed by statistics for the pre- and post- turbine periods. Of the three regions, average home prices are lowest in the East Central region at $144,936 and highest in the Northwest region at $230,804 (adjusted to 2024 levels). For the North Central region, the average sale price was $148,855. The inflation-adjusted average sale price is higher in the post-period than the pre-period in each of the three regions. The average house size was similar in the three regions with three bedrooms and two bathrooms, and the living area for the typical property was around 1,700 square feet in each region. The average lot acreage was highest in the East Central region at 2.2 acres and was closer to an acre for the two other regions. The average distance to the nearest turbine was 3.2 miles in the East Central and Northwest regions and was 2.4 miles in the North Central region.

Appendix Tables A4-A6 show variable means for properties in distance bins during the pre-periods. It also shows the transaction counts across the various distance bins for the pre-period, and a test for differences in the means between properties 1 mile from the nearest turbine (which is one of the treatment groups in the difference-in-difference models and event studies) compared to properties 3 to 5 miles from a turbine (the control group).

In comparison to broader national studies (e.g. Brunner, et al., 2024), our analysis relies upon a much smaller number of transacted properties. As *Appendix Tables A4-A6* illustrate, the distance bins (0-1 miles, 1-2 miles, 2-3 miles, and 3-5 miles) treatment properties in the East Central region have the most similar characteristics (uncontrolled) prior to the treatment period. Only one characteristic, lot acreage is statistically different between the first treatment group (< 1 mile bin) and control group (3-5 miles bin), which suggests that the treatment and control properties in this region are similar and that the control properties will provide good counterfactual for the treatment group. Properties in the other two regions show statistical differences in sale price and a few other characteristics between the treatment group and the control group suggesting that the control group will provide a lower quality counterfactual for the treatment group.

Methods of Analysis

To test the range of treatment effects, we use two approaches. First, we estimate a series of hedonic difference in difference regression models. The first set of hedonic models use the inverse distance (similar to Vyn & McCullough, 2014) and the second set uses distance bins (like Dong et al., 2023 and Brunner et al., 2024). Geographic information systems (GIS) were used to calculate the distance from each property to the nearest turbine which was then inverted. We also use the distance to the nearest turbine to group transactions into distance bins: transactions within 1 mile, 1 to 2 miles, and 2 to 3 miles from a turbine site as the treatment groups for the Northwest and East Central regions. In the North Central region there are not enough property transactions within one mile of a turbine to test effects on sale prices at this distance, so we create distance bins for transactions within 2 miles and 2 to 3 miles as treatment groups for this region. [13] For all three regions, properties 3 to 5 miles from a turbine are the control group. A third hedonic model examines turbine density defined as the number of turbines within specific distances (0.5 to 3 miles) of a home. The second approach is to perform event studies examining property transactions within 1 mile of the nearest wind turbine (2 miles for the North Central region) for each region.

To examine the relationship between wind turbine proximity and residential property values in each region, we first use a standard difference-in-difference (DiD) hedonic valuation model for the North Central region and staggered DiD models in the Northwest and East Central regions.[14] [15] Properties located near wind turbines are compared to similar properties that are further away from turbines. The estimating equation is:

$$\ln(\boldsymbol{P_{icst}}) = \boldsymbol{\beta_0} + \boldsymbol{\beta_1 X_i} + \boldsymbol{\beta_2 D_i} + \boldsymbol{\beta_3 Post_t} + \boldsymbol{\beta_4 D_i} * \boldsymbol{Post_t} + \boldsymbol{\gamma_c} + \boldsymbol{\delta_s} + \boldsymbol{\varphi_t} + \boldsymbol{\varepsilon_{icst}} \quad \textbf{(1)}$$

…where $\boldsymbol{P_{icst}}$ is sales price of property $\boldsymbol{i}$ in county $\boldsymbol{c}$, school district $\boldsymbol{s}$ and year $\boldsymbol{t}$ adjusted for inflation. The variable $\boldsymbol{X_i}$ represents home characteristics for property $\boldsymbol{i}$ including number of bedrooms, number of bathrooms, square feet of living area, lot acreage, age of the home, and a basement dummy variable. $\boldsymbol{D_i}$ is the inverse distance to the nearest turbine, and $\mathbf{Post_t}$ is a dummy variable measuring the project completion period. We also include county and school district fixed effects to control for localized price variation, year fixed effects to control for common price fluctuations across these areas over time and an error term.[16] We are not able to cluster the standard errors due to limited observations and use Huber-White-Hinkley heteroskedasticity consistent standard errors.

The coefficient of interest is $\boldsymbol{\beta_4}$, and if visual and noise disamenities associated with proximity to a wind turbine negatively affect the sale price of a home, the sign on this coefficient is expected to be negative and statistically significant. To augment this model, we estimate a model that replaces the inverse distance with distance bins, $\sum_1^b \boldsymbol{D_i^b}$, where $\boldsymbol{D_i}$ is a dummy variable equal to one if property $\boldsymbol{i}$ lies within the $\boldsymbol{b^{th}}$ distance bin relative to the nearest turbine. The distance bins are $\boldsymbol{b} \leq 1$ mile, 1-2 miles, 2-3 miles, and 3-5 miles for the East Central and Northwest regions and $\boldsymbol{b} \leq 2$ miles, 2-3 miles, and 3-5 miles for the North Central region. We expect the sign to be negative and the coefficient to be larger for properties that are close to a wind turbine.

Because the disamenity effects may also depend on the number of turbines near the property, we also estimate a hedonic model that includes turbine density in distance bins surrounding each property (similar to Vyn & McCullough, 2014). This variable accounts for the existence of multiple turbines near properties and is calculated as the number of turbines within a specified radius of the property the year the property sold. For example, if there are two wind turbines within 0.5 miles of property $\boldsymbol{i}$ when it sells in year $\boldsymbol{t}$, the density variable for that property will equal 2 in the 0.5-mile bin. If that same property

[13] In the North Central region, there are only 23 transactions within a mile of a turbine before 2012 (pre-period) and 54 transactions during the 2012-2024 period.

[14] The East Central region's wind turbines became operational in 2014, 2017, 2020, and 2021. The pre- and post-periods were formed around these years. The Northwest region contains the most turbines (1,307), and the pre- and post-periods were formed around the year they became operational, 2008, 2009, 2010, 2015, 2017, 2020, 2021, and 2023. In the North Central region, the 125 turbines became operational during 2012, so the pre-period is 2004-2011 and the post-period is 2012-2024.

[15] Several alternative approaches have been suggested for control groups in staggered difference in difference models. The Callaway and Sant'Anna (2021) estimator allows for comparison of the treatment with 'never treated' and 'not yet treated' groups as alternative controls. Unfortunately, the small sample size here makes this a low power test, which effectively precludes its use in this application.

[16] The East Central region has nine school districts within the study area, while Northwest has 10, and North Central has eight. School quality is one of the primary determinants of house value (Brasington, 1999).

has three turbines within 0.75 miles when it sells, the density variable is 3 in the 0.75-mile bin, which includes the two turbines within 0.5 miles. We expect the coefficient to be negative and larger for properties closest to multiple turbine(s).

The estimating equation is:

$$\ln(\boldsymbol{P_{icst}}) = \boldsymbol{\beta_0} + \boldsymbol{\beta_1 X_i} + \boldsymbol{\beta_2 Post_t} + \boldsymbol{\beta_4 Dens_i^b} * \boldsymbol{Post_t} + \boldsymbol{\gamma_c} + \boldsymbol{\delta_s} + \boldsymbol{\varphi_t} + \boldsymbol{\varepsilon_{icst}} \qquad \textbf{(2)}$$

…where ***Dens*** is the density variable for each sold property. If there are at least thirty properties in a distance bin, we include estimates for distance bins of **b** = 0.5 miles, 0.75 miles, 1 mile, 2 miles and 3 miles. The other variables are defined as in *Equation 1*.

In any DiD estimate, we are concerned with the potential presence of pre-trend, or a stable relationship in the dynamics of the treatment and control group prior to treatment. The pre-trends tests were performed prior to estimation of our difference-in-difference models. Depending on the region we tested three to eight periods prior to treatment and are satisfied that the comparison between the treatment and control groups are empirically identical for the distance measures we use for treatment and the non-treated controls.

A second approach we employ is a series of event studies, which examine the expected home prices in periods before and after the operation of commercial wind turbines. This provides a more dynamic estimate than the average treatment effects of the difference in difference models. The model we estimate is:

$$\ln(\boldsymbol{P_{icst}}) = \boldsymbol{\beta_0} + \boldsymbol{\beta_1 X_{it}} + \sum_{\boldsymbol{k \neq -1}} \boldsymbol{\beta_k D_{it}^k} + \boldsymbol{\gamma_c} + \boldsymbol{\delta_s} + \boldsymbol{\varphi_t} + \boldsymbol{\varepsilon_{icst}} \quad \textbf{(3)}$$

…where $\mathbf{P_{icst}}$ is the natural log of the sale price for house ***i*** in county ***c*** and school district ***s*** at year ***t***. $\boldsymbol{X_{it}}$ is a vector of house characteristics, and $\boldsymbol{D_{it}^k}$ are event time dummy variables, where ***k*** represents the number of periods, and the period before the first turbine becomes operational is omitted and serves as a reference period. $\boldsymbol{\beta_k}$ is the coefficient of interest and denotes the price effect of turbine placement on hedonically controlled home prices in period ***k*** relative to the reference period. The remaining terms are county, school district, and time fixed effects; and an error term. Event study graphs for properties within 1 mile of the nearest wind turbine (2 miles for the North Central region) are presented in *Figures 4a-c*.

Results and Discussion

Tables 3a-c show the results from estimating *Equation 1*. We present a base model which does not contain any information about proximity to wind turbines and two DiD specifications that incorporate information about wind turbines. The base model shows that an additional bedroom increases the sale price by 2.9% to 5.3% in the Northwest and North Central regions but has no effect on the sale price in the East Central region, while an additional bathroom increases the sale price by about 15% to 20% depending on the region. These results are consistent across all the specifications presented in the models.

Table 3a. Impact of Wind Turbine Proximity on Housing Prices, East Central Region

Variable	**Base Coeff. [Std. Error]**	**Model 1 Coeff. [Std. Error]**	**Model 2 Coeff. [Std. Error]**
Intercept	11.658*** [0.117]	11.550*** [0.126]	11.525*** [0.126]
# of Bedrooms	-0.011 [0.022]	-0.012 [0.022]	-0.011 [0.022]
# of Bathrooms	0.194*** [0.023]	0.195*** [0.023]	0.192*** [0.023]
Sq. Ft. Living Area	0.0003*** [2.79E-05]	0.0003*** [2.79E-05]	0.0003*** [2.81E-05]
Lot Acreage	0.032*** [0.002]	0.032*** [0.002]	0.032*** [0.002]
Age	-0.011*** [0.003]	-0.011*** [0.003]	-0.011*** [0.003]
Age Sq.	1.86E-05 [2.71E-05]	1.68E-05 [2.70E-05]	2.18E-05 [2.70E-05]
Basement	0.127*** [0.029]	0.127*** [0.029]	0.125*** [0.029]
Post Project Completion Dummy		0.089* [0.048]	0.090** [0.045]
Inv. Dist. to Nearest Turbine (1,000 Ft.)		0.096 [0.169]	
Inv. Dist. to Nearest Turbine X Post Project		-0.295 [0.252]	
< 1 Mile from Turbine			0.005 [0.062]
1-2 Miles from Turbine			0.083 [0.057]
2-3 Miles from Turbine			0.069** [0.034]
< 1 Mile X Post Project			-0.115 [0.098]
1-2 Miles X Post Project			-0.068 [0.083]
2-3 Miles X Post Project			-0.017 [0.067]
Adj. R^2	0.5893	0.5904	0.5911
F-Statistic	67.28***	62.61***	57.04***
Number of Observations	1,668	1,668	1,668

Note: All models include school district, county, and year fixed effects. *** p<0.01; **p<0.05, *p<0.10

Table 3b. Impact of Wind Turbine Proximity on Housing Prices, Northwest Region

Variable	Base Coeff. [Std. Error]	Model 1 Coeff. [Std. Error]	Model 2 Coeff. [Std. Error]
Intercept	11.856*** [0.125]	11.767*** [0.128]	11.822*** [0.126]
# of Bedrooms	0.029** [0.013]	0.031** [0.013]	0.031** [0.013]
# of Bathrooms	0.156*** [0.013]	0.153*** [0.013]	0.153*** [0.013]
Sq. Ft. Living Area	0.0003*** [1.86E-05]	0.0003*** [1.86E-05]	0.0003*** [1.85E-05]
Lot Acreage	0.029*** [0.003]	0.028*** [0.003]	0.029*** [0.003]
Age	-0.007*** [0.001]	-0.007*** [0.001]	-0.007*** [0.001]
Age Sq.	8.67E-06 [1.41E-05]	1.07E-05 [1.42E-05]	7.22E-06 [1.43E-05]
Basement	0.119*** [0.017]	0.121*** [0.017]	0.119*** [0.017]
Post Project Completion Dummy		0.013 [0.031]	0.0007 [0.029]
Inv. Dist. to Nearest Turbine (1,000 Ft.)		0.188 [0.118]	
Inv. Dist. to Nearest Turbine X Post Project		0.222 [0.148]	
< 1 Mile from Turbine			-0.029 [0.049]
1-2 Miles from Turbine			-0.105** [0.046]
2-3 Miles from Turbine			-0.171*** [0.061]
< 1 Mile X Post Project			0.075 [0.047]
1-2 Miles X Post Project			0.041 [0.048]
2-3 Miles X Post Project			0.181*** [0.066]
Adj. R^2	0.7156	0.7166	0.7179
F-Statistic	173.8***	163.12***	150.87***
Number of Observations	2,886	2,886	2,886

Note: All models include school district, county, and year fixed effects. *** p<0.01; **p<0.05, *p<0.10

Table 3c. Impact of Wind Turbine Proximity on Housing Prices, North Central Region

Variable	Base Coeff. [Std. Error]	Model 1 Coeff. [Std. Error]	Model 2 Coeff. [Std. Error]
Intercept	10.869*** [0.117]	10.608*** [0.135]	10.869*** [0.142]
# of Bedrooms	0.053** [0.025]	0.051** [0.024]	0.050** [0.024]
# of Bathrooms	0.200*** [0.043]	0.197*** [0.043]	0.189*** [0.041]
Sq. Ft. Living Area	0.0003*** [3.45E-05]	0.0003*** [3.42E-05]	0.0003*** [3.36E-05]
Lot Acreage	0.064*** [0.009]	0.064*** [0.008]	0.064*** [0.008]
Age	0.004 [0.003]	0.005* [0.003]	0.002 [0.003]
Age Sq.	-8.41E-05** [2.70E-05]	-9.42E-05*** [2.70E-05]	-6.78E-05** [2.72E-05]
Basement	-0.045 [0.038]	-0.035 [0.038]	-0.051 [0.038]
Post Project Completion Dummy		0.422*** [0.102]	0.446*** [0.104]
Inv. Dist. to Nearest Turbine (1,000 Ft.)		-0.105 [0.279]	
Inv. Dist. to Nearest Turbine X Post Project		0.572* [0.312]	
< 2 Miles from Turbine			-0.218*** [0.061]
2-3 Miles from Turbine			-0.230*** [0.067]
< 2 Miles X Post Project			0.058 [0.069]
2-3 Miles X Post Project			0.071 [0.079]
Adj. R^2	0.5271	0.5250	0.5299
F-Statistic	45.91***	43.75***	42.36***
Number of Observations	1,432	1,432	1,432

Note: All models include school district, county, and year dummy variables. *** p<0.01; **p<0.05, *p<0.10

Does the Distance from a Turbine Affect House Value?

Models 1 and 2 incorporate information about distance to wind turbines. The first specification (Model 1) examines the relationship between the residential sale prices and distance to the closest wind turbine where the dataset includes home sales within 5 miles of the nearest wind turbine. The results show that proximity to a wind turbine has no statically discernable *negative* effect on the sale price of residential properties after the wind turbine became operational. The coefficient for the East Central region has the expected negative sign indicating that properties closer to the turbine experience disamenities that negatively affect sale price, but the coefficient is not statistically significant, which means that it is not statistically different from zero. The coefficients on the distance measure in the other two regions are positive and insignificant in the Northwest region and significant in the North Central region.

In Model 2 (*Equation 2*), we isolate sales in specific distance bins so that there are clear treatment and control groups after the turbines are operational. Model 2 examines property transactions within 1 mile (2 miles for the North Central region) of a turbine and properties 1-2 miles and 2-3 miles relative to properties 3 or more miles from a turbine (2-3 miles relative to properties 3-5 miles from the nearest turbine for the North Central region). After the turbines became operational, close proximity to the turbine did not have a statistically significant effect on the property sale price in any of the three regions. In the East Central model, the coefficients have the expected sign and magnitude suggesting that sale prices are 11.5% lower for properties within a mile of a turbine compared to properties 3-5 miles from a turbine. Similarly, the results suggest that properties in the 1-to-2-mile bin sell for 6.8% less than similar properties 3-5 miles from a turbine, but neither of these results are statistically significantly different from zero.

In the Northwest region, coefficients have a positive sign for properties located close to the turbine but are not statistically significant (different from zero). The exception is the Northwest region for properties located 2-3 miles from the nearest turbine. The statistically significant model results show that properties at this distance sell for 18% more than properties farther away (3-5 miles) from a turbine.

Within the limitations of the data and estimation methods, significant, negative price effects of wind turbines on nearby properties in these three regions are not found. The results of this analysis are in line with the findings of other analysis showing that properties beyond 2 miles experience no impact on property values after large-scale wind turbines become operational. This analysis differs from previous studies in that we find no negative effect of wind turbines on nearby properties at closer distances. Other studies have shown that properties closest to wind turbines experienced decreases in sale price. The relatively small sample sizes in these rural, low-density regions are likely reasons we get these results.

Does the Density of Wind Turbines Affect House Values?

In the final DiD specification, we examine the relationship between turbine density (defined as the number of turbines within a specific distance of the sold property) and the sale price of a residential property (*Equation 2*). *Table 4* shows these model estimates.

Table 4. Impact of Wind Turbine Density on Housing Prices by Distance and Region

Variable	East Central Coeff. [Std. Error]	Northwest Coeff. [Std. Error]	North Central Coeff. [Std. Error]
Intercept	11.465*** [0.101]	11.775*** [0.133]	10.676*** [0.129]
# of Bedrooms	-0.010 [0.022]	0.033*** [0.013]	0.0496** [0.024]
# of Bathrooms	0.195*** [0.023]	0.153*** [0.013]	0.193*** [0.043]
Sq. Ft. Living Area	0.0003*** [2.81E-05]	0.0003*** [1.87E-05]	0.0003*** [3.37E-05]
Lot Acreage	0.032*** [0.002]	0.029*** [0.003]	0.062*** [0.007]
Age	-0.011*** [0.003]	-0.007*** [0.001]	0.003 [0.003]
Age Sq.	1.71E-05 [2.71E-05]	1.03E-05 [1.42E-05]	-7.38E-05*** [2.69E-05]
Basement	0.127*** [0.029]	0.122*** [0.017]	-0.042 [0.037]
Post Project Completion Dummy	0.086** [0.039]	0.018 [0.026]	0.538*** [0.097
0.50 Miles Turbine Density X Post Project	NA	-0.057 [0.042]	NA
0.75 Miles Turbine Density X Post Project	-0.052 [0.066]	0.021 [0.023]	0.031 [0.067]
1 Mile Turbine Density X Post Project	0.016 [0.055]	0.0003 [0.016]	-0.012 [0.039]
2 Miles Turbine Density X Post Project	0.007 [0.019]	0.007 [0.005]	0.033*** [0.009]
3 Miles Turbine Density X Post Project	-0.004 [0.008]	-0.001 [0.002]	-0.014*** [0.003]
Adj. R^2	0.589	0.716	0.533
F-Statistic	60.527***	152.926***	41.922***
Number of Observations	1,664	2,886	1,432

Notes: All models include school district, county, and year fixed effects. Distance bins contain at least 30 properties. The 0.5 turbine density was not estimated for the East Central and North Central regions because only 21 and 27 properties had a wind turbine within 0.5 miles in these regions. There were not enough properties (3, 2, and 5 respectively in the East Central, Northwest, and North Central regions) with wind turbines within 0.25 miles to include this distance bin in the analysis. *** p<0.01; **p<0.05, *p<0.10

The East Central region shows a negative relationship between wind turbine density within 0.75 miles of homes and the sale price. This relationship is not consistently negative for density at other distances, and none of these impacts are statistically significantly different from zero.

We are particularly interested in the model results for the Northwest region, which has the highest concentration of wind turbines in the state. In this region there is a negative effect at the closest distance, indicating that as the number of turbines within 0.5 miles of a property increases, the sale price decreases, but this effect is not statistically significant, and the sign on the coefficients for the remaining distance bins are positive but also not significant.

In the North Central region, the number of turbines within any distance up to 1 mile do not have a statistically significant effect on the sale price of residential properties. The number of turbines within 2 miles shows a positive and significant effect on the sale price, indicating that each additional turbine within the 2-mile range increases the sale price by 3.4%. In contrast the number of wind turbines within 3 miles has a negative and significant effect on sale price where an additional turbine within the 3-mile range decreases the sale price by 1.4%. These results could represent false positives (Type I errors), which occurs when the null hypothesis is incorrectly rejected (we conclude there is a difference in sale price when none exists) and which can be caused by small sample sizes and/or high data variability. These results are more likely related to the clustering of properties within 2-3 miles of turbines (*Figure 3c*). The turbines were intentionally placed at a distance from most residential properties and neighborhoods which may have characteristics that that positively or negatively affect home prices and are not captured in the model.

With the exception of the turbines within 3 miles in the North Central region, these results provide no statistical evidence that the density of turbines near a residential property has a negative effect on the sale price.

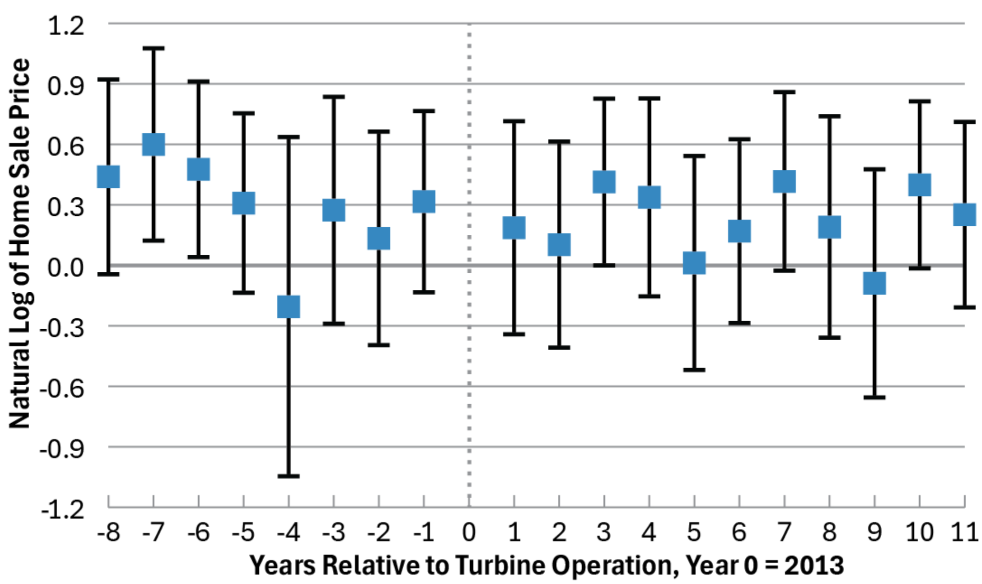
Does the Impact of Wind Turbines Vary Over Time?

Next, we turn to the event study analysis. *Figures 4a-c* show the event study results. We present event studies for homes sold within 1 mile of the nearest wind turbine (2 miles for the North Central region). The results show confidence intervals around the coefficient estimates mostly overlapping zero during the pre-treatment period (years < 0 on the graph). This indicates that there is no statistically significant difference in the sale price between homes located within 1 mile of a turbine (2 miles for the North Central region) and homes further away during the period before turbines became operations, so the parallel trends assumption appears to hold in our visual assessment. Except for a few early years in the pre-treatment period in the East Central region, in no case were the treated effects different from zero during the pre-treatment period.

In none of the event studies is there any evidence of decline in home prices post-treatment (years > 0 on the graph). The results during the post-treatment period show no statistically significant difference in sale prices for transactions within 1 mile of the nearest turbine (2 miles for North Central) relative to the control groups of transactions greater than 1 mile from the nearest turbine (2 miles for North Central). The exception is Year 17 in the Northwest region, which shows a statistically significant positive increase in sale prices relative to properties more than 1 mile from the turbine.

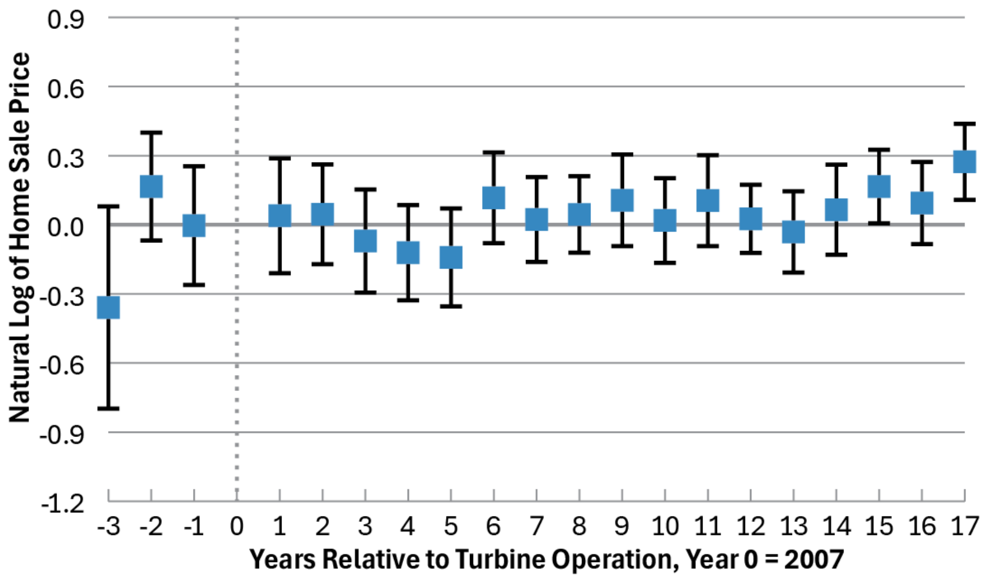
As noted previously (and in *Figures 3a-c*), the relatively small number of transactions, compared to other studies, may affect the results. The placement of industrial scale turbines is not random, and the most affected communities are likely to be those with very low-density housing, leading to modest sample sizes. Indeed, there are many more turbines than there are home sales within 1 mile.

Figure 4a. Event Study: Homes within 1 Mi. of Nearest Wind Turbine, East Central Region, 2005-2024



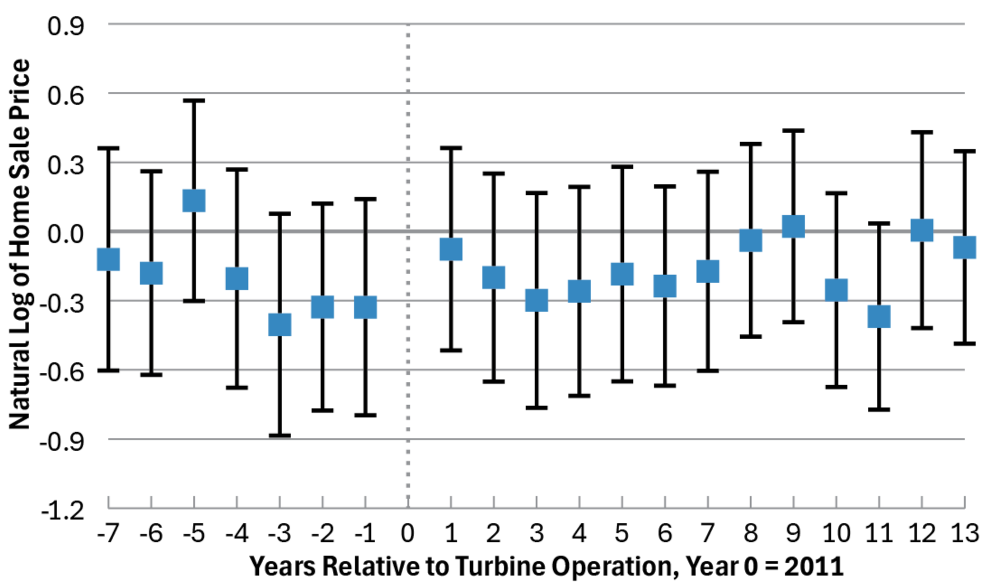
Note: **First turbines were operational in 2014 (Year 1).** The graph presents estimated coefficients from the event study specification given by *Equation 2*. Estimates are for homes located within 1 mile of the nearest wind turbine. The control group includes transactions occurring 1-5 miles from the nearest turbine. The vertical lines denote the 95% confidence interval. Corresponding data is available in *Appendix Table A7.*

Figure 4b. Event Study: Homes within 1 Mi. of Nearest Wind Turbine, Northwest Region, 2004-2024



Note: **First turbines were operational in 2008 (Year 1).** The graph presents estimated coefficients from the event study specification given by *Equation 2*. Estimates are for homes located within 1 mile of the nearest wind turbine. The control group includes transactions occurring 1-5 miles from the nearest turbine. The vertical lines denote the 95% confidence interval. Corresponding data is available in *Appendix Table A8.*

Figure 4c. Event Study: Homes within 2 Mi. of Nearest Wind Turbine, North Central Region, 2004-2024



Note: **First turbines were operational in 2012 (Year 1).** The graph presents estimated coefficients from the event study specification given by *Equation 2*. Estimates are for homes located within 2 miles of the nearest wind turbine. The control group includes transactions occurring 2-5 miles from the nearest turbine. The vertical lines denote the 95% confidence interval. Corresponding data is available in *Appendix Table A9*.

Conclusions

Since 2008, wind energy has grown from a relatively small component of Indiana's energy supply to about 10% and is expected to continue to grow into the future. This paper estimates the effects of utility-scale wind farms on nearby residential property values in three regions of Indiana using hedonic difference-in-difference regression models and event studies. We use three different approaches to examine the potential disamenity effects of the turbines. The results of the hedonic models and event study analysis show that proximity to wind turbines does not have a statistically significant, negative effect on the sale price of homes.

While the results suggest a lack of significant, negative effects among the properties examined in the three regions of this study, individual properties may experience negative effects. Difference in differences results are average treatment effects and individual properties may experience differing effects. The results of this study are not able to refute the claims that some nearby properties are negatively impacted.

Indeed, as we discussed earlier, the siting of turbines (see *Figures 3a-c*) are not random, but almost certainly involved efforts by local elected officials and utility representatives to choose locations that mitigated the potential property effects we discussed in our literature review. Thus, our findings may be interpreted not as a rejection of the potential negative effects of turbines on home values. Rather, our findings might be interpreted as evidence that the site selection and permitting process resulted in small or zero effects on home prices proximate to industrial scale turbines. Finally, the low-to-no impact of turbine placement on property values is not unexpected given the findings of other studies. Indiana's utility scale wind developments are in very rural areas. As discussed above, other studies have shown negative effects of wind turbines on property values primarily in urban areas.

We have not examined the fiscal effects of large wind projects on the local area and leave that for future work.

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Appendix

Contents

Descriptive Statistics by Region (Tables A1-A3)

Table A1, Panel A. Descriptive Statistics, East Central Region, Total Sample

Total (2005-2024)	Mean	Std Dev	Min	Median	Max	Sum	Obs
Real Sale Price ($)	144,936	98,621	14,103	118,075	757,496		1,668
# of Bedrooms	3.0	0.7	1	3	8		1,668
# of Bathrooms	1.9	0.8	1	2	5		1,668
Living Area (sq. ft)	1,638	682	576	1,453	5,150		1,668
Lot Acreage	2.2	4.6	0	1	70		1,668
Age	53.1	20.1	3	54	100		1,668
Basement Dummy	0.22	0.41	0	0	1		1,668
Distance to Nearest Turbine (ft)	16,829	6,526	684	18,048	26,311		1,668
Post Project Completion Dummy	0.28	0.45	0	0	1	466	1,668
< 1 Mile Dummy	0.08	0.27	0	0	1	136	1,668
[1, 2) Mile Dummy	0.10	0.30	0	0	1	165	1,668
[2, 3) Mile Dummy	0.17	0.38	0	0	1	291	1,668
# Turbines Within 0.25 Mi	0.00	0.04	0	0	1		1,668
# Turbines Within 0.5 Mi	0.02	0.25	0	0	4		1,668
# Turbines Within 0.75 Mi	0.05	0.44	0	0	7		1,668
# Turbines Within 1 Mi	0.09	0.64	0	0	9		1,668
# Turbines Within 2 Mi	0.49	2.37	0	0	23		1,668
# Turbines Within 3 Mi	1.25	5.06	0	0	53		1,668

Table A1, Panel B. Descriptive Statistics, East Central Region, Pre-Treatment

Pre-Treatment (Varies)	Mean	Std Dev	Min	Median	Max	Sum	Obs
Real Sale Price ($)	142,419	100,924	14,992	113,711	757,496		1,202
# of Bedrooms	3.0	0.7	1	3	8		1,202
# of Bathrooms	1.9	0.8	1	2	5		1,202
Living Area (sq. ft)	1,660	696	576	1,471	5,150		1,202
Lot Acreage	2.4	5.1	0	1	70		1,202
Age	52.0	20.0	5	53	100		1,202
Basement Dummy	0.20	0.40	0	0	1		1,202
Distance to Nearest Turbine (ft)	16,875	6,391	935	17,907	26,310		1,202
Post Project Completion Dummy	0.00	0.00	0	0	0	0	1,202
< 1 Mile Dummy	0.08	0.27	0	0	1	92	1,202
[1, 2) Mile Dummy	0.09	0.29	0	0	1	112	1,202
[2, 3) Mile Dummy	0.20	0.40	0	0	1	237	1,202

Table A1, Panel C. Descriptive Statistics, East Central Region, Post-Treatment

Post-Treatment (Varies)	Mean	Std Dev	Min	Median	Max	Sum	Obs
Real Sale Price ($)	151,427	92,202	14,103	132,537	512,125		466
# of Bedrooms	3.0	0.7	1	3	5		466
# of Bathrooms	1.8	0.8	1	2	4		466
Living Area (sq. ft)	1,579	645	648	1,400	4,257		466
Lot Acreage	1.5	2.6	0	0	20		466
Age	56.0	20.1	3	59	100		466
Basement Dummy	0.26	0.44	0	0	1		466
Distance to Nearest Turbine (ft)	16,711	6,870	684	18,293	26,311		466
Post Project Completion Dummy	1.00	0.00	1	1	1	466	466
< 1 Mile Dummy	0.09	0.29	0	0	1	44	466
[1, 2) Mile Dummy	0.11	0.32	0	0	1	53	466
[2, 3) Mile Dummy	0.12	0.32	0	0	1	54	466
# Turbines Within 0.25 Mi	0.00	0.04	0	0	1		466
# Turbines Within 0.5 Mi	0.02	0.25	0	0	4		466
# Turbines Within 0.75 Mi	0.05	0.44	0	0	7		466
# Turbines Within 1 Mi	0.09	0.64	0	0	9		466
# Turbines Within 2 Mi	0.49	2.37	0	0	23		466
# Turbines Within 3 Mi	1.25	5.06	0	0	53		466

Table A2, Panel A. Descriptive Statistics, Northwest Region, Total Sample

Total (2004-2024)	Mean	Std Dev	Min	Median	Max	Sum	Obs
Real Sale Price ($)	230,804	147,866	21,238	196,000	923,919		2,886
# of Bedrooms	3.2	0.8	1.0	3.0	6.0		2,886
# of Bathrooms	2.2	0.9	1.0	2.0	6.0		2,886
Living Area (sq. ft)	1,830	690	465	1,731	5,481		2,886
Lot Acreage	1.4	2.9	0.1	0.4	60.0		2,886
Age	47.3	24.9	1.0	50.0	100.0		2,886
Basement Dummy	0.4	0.5	0.0	0.0	1.0		2,886
Distance to Nearest Turbine (ft)	17,157	8,138	1,113	20,310	26,398		2,886
Post Project Completion Dummy	0.62	0.49	0.00	1.00	1.00	1,790	2,886
< 1 Mile Dummy	0.16	0.36	0.00	0.00	1.00	452	2,886
[1, 2) Mile Dummy	0.11	0.32	0.00	0.00	1.00	326	2,886
[2, 3) Mile Dummy	0.07	0.26	0.00	0.00	1.00	212	2,886

Table A2, Panel B. Descriptive Statistics, Northwest Region, Pre-Treatment

Pre-Treatment (Varies)	Mean	Std Dev	Min	Median	Max	Sum	Obs
Real Sale Price ($)	194,368	130,450	21,238	166,492	923,919		1,096
# of Bedrooms	3.0	0.7	1.0	3.0	6.0		1,096
# of Bathrooms	1.9	0.8	1.0	2.0	6.0		1,096
Living Area (sq. ft)	1,664	641	472	1,554	5,481		1,096
Lot Acreage	1.8	3.8	0.1	0.5	60.0		1,096
Age	52.7	22.0	4.0	53.0	100.0		1,096
Basement Dummy	0.4	0.5	0.0	0.0	1.0		1,096
Distance to Nearest Turbine (ft)	17,304	7,777	1,156	19,891	26,398		1,096
Post Project Completion Dummy	0.00	0.00	0.00	0.00	0.00	0	1,096
< 1 Mile Dummy	0.12	0.32	0.00	0.00	1.00	131	1,096
[1, 2) Mile Dummy	0.13	0.34	0.00	0.00	1.00	144	1,096
[2, 3) Mile Dummy	0.08	0.27	0.00	0.00	1.00	87	1,096

Table A2, Panel C. Descriptive Statistics, Northwest Region, Post-Treatment

Post-Treatment (Varies)	Mean	Std Dev	Min	Median	Max	Sum	Obs
Real Sale Price ($)	253,114	153,402	23,375	223,187	846,835		1,790
# of Bedrooms	3.3	0.8	1.0	3.0	6.0		1,790
# of Bathrooms	2.3	1.0	1.0	2.0	6.0		1,790
Living Area (sq. ft)	1,932	699	465	1,864	5,376		1,790
Lot Acreage	1.1	2.2	0.1	0.4	21.8		1,790
Age	44.1	26.0	1.0	47.0	99.0		1,790
Basement Dummy	0.4	0.5	0.0	0.0	1.0		1,790
Distance to Nearest Turbine (ft)	17,067	8,351	1,113	21,038	26,392		1,790
Post Project Completion Dummy	1.00	0.00	1.00	1.00	1.00	1790	1,790
< 1 Mile Dummy	0.18	0.38	0.00	0.00	1.00	321	1,790
[1, 2) Mile Dummy	0.10	0.30	0.00	0.00	1.00	182	1,790
[2, 3) Mile Dummy	0.07	0.25	0.00	0.00	1.00	125	1,790
# Turbines Within 0.25 Mi	0.00	0.03	0.00	0.00	1.00		1,790
# Turbines Within 0.5 Mi	0.03	0.28	0.00	0.00	6.00		1,790
# Turbines Within 0.75 Mi	0.15	0.74	0.00	0.00	12.00		1,790
# Turbines Within 1 Mi	0.36	1.36	0.00	0.00	22.00		1,790
# Turbines Within 2 Mi	3.65	9.03	0.00	0.00	70.00		1,790
# Turbines Within 3 Mi	10.38	24.44	0.00	0.00	120.00		1,790

Table A3, Panel A. Descriptive Statistics, North Central Region, Total Sample

Total (2004-2024)	Mean	Std Dev	Min	Median	Max	Sum	Obs
Real Sale Price ($)	148,855	97,747	13,512	131,109	590,239		1,432
# of Bedrooms	3.0	0.7	1.0	3.0	7.0		1,432
# of Bathrooms	1.9	0.8	1.0	2.0	11.0		1,432
Living Area (sq. ft)	1,750	706	576	1,572	5,238		1,432
Lot Acreage	1.1	2.3	0.1	0.3	30.0		1,432
Age	56	23	0	59	100		1,432
Basement Dummy	0.21	0.41	0	0	1		1,432
Distance to Nearest Turbine (ft)	12,961	6,017	1,204	11,971	26,375		1,432
Post-Project Completion Dummy	0.69	0.46	0	1	1	989	1,432
< 2 Mile Dummy	0.43	0.50	0	0	1	622	1,432
[2, 3) Mile Dummy	0.29	0.45	0	0	1	409	1,432

Table A3, Panel B. Descriptive Statistics, North Central Region, Pre-Treatment

Pre-Treatment (2004-2011)	Mean	Std Dev	Min	Median	Max	Sum	Obs
Real Sale Price ($)	132,781	93,228	16,080	111,612	545,246		443
# of Bedrooms	3.1	0.7	1.0	3.0	6.0		443
# of Bathrooms	1.9	0.7	1.0	2.0	4.0		443
Living Area (sq. ft)	1,686	688	600	1,536	4,664		443
Lot Acreage	1.2	2.5	0.1	0.3	30.0		443
Age	55	23	13	58	100		443
Basement Dummy	0.19	0.39	0	0	1		443
Distance to Nearest Turbine (ft)	13,134	6,076	1,314	12,239	26,375		443
Post Project Completion Dummy	0.00	0.00	0	0	0	0	443
< 2 Mile Dummy	0.41	0.49	0	0	1	182	443
[2, 3) Mile Dummy	0.31	0.46	0	0	1	136	443

Table A3, Panel C. Descriptive Statistics, North Central Region, Post-Treatment

Post-Treatment (2012-2024)	Mean	Std Dev	Min	Median	Max	Sum	Obs
Real Sale Price ($)	156,055	98,907	13,512	143,391	590,239		989
# of Bedrooms	3.0	0.7	1.0	3.0	7.0		989
# of Bathrooms	1.9	0.8	1.0	2.0	11.0		989
Living Area (sq. ft)	1,778	712	576	1,604	5,238		989
Lot Acreage	1.1	2.2	0.1	0.3	23.6		989
Age	57	23	0	60	100		989
Basement Dummy	0.23	0.42	0	0	1		989
Distance to Nearest Turbine (ft)	12,884	5,992	1,204	11,927	26,341		989
Post Project Completion Dummy	1.00	0.00	1	1	1	989	989
< 2 Mile Dummy	0.44	0.50	0	0	1	440	989
[2, 3) Mile Dummy	0.28	0.45	0	0	1	273	989
# Turbines Within 0.25 Mi	0.00	0.06	0	0	1		989
# Turbines Within 0.5 Mi	0.04	0.33	0	0	4		989
# Turbines Within 0.75 Mi	0.11	0.67	0	0	7		989
# Turbines Within 1 Mi	0.22	1.29	0	0	13		989
# Turbines Within 2 Mi	1.89	4.72	0	0	37		989
# Turbines Within 3 Mi	7.88	11.51	0	0	66		989

Pre-Treatment Means by Region (Tables A4-A6)

Table A4. East Central Region, Pre-Treatment Means, by Distance

Pre-Treatment Means	[0, 1) Miles	[1, 2) Miles	[2, 3) Miles	[3, 5) Miles	Normalized Difference in Means
Real Sale Price ($)	151,989	157,505	159,323	133,777	0.125
Living Area (sq. ft)	1,665	1,735	1,715	1,632	0.036
# of Bedrooms	3.0	3.0	3.0	3.0	-0.012
# of Bathrooms	1.9	2.0	2.1	1.9	0.035
Lot Acreage	4.2	4.0	2.7	1.8	*0.321*
Age	54.0	51.7	46.7	53.4	0.019
Basement Dummy	0.3	0.3	0.2	0.2	0.178
Distance to Nearest Turbine (ft)	3,501	7,919	13,324	20,916	
Observations	92	112	237	761	

Notes: The normalized difference in means is calculated according to Imbens and Woodridge (2009) for properties located within 1 mile and those located 3-5 miles (control group in Difference-in-Difference models) during the pre-treatment period. Normalized differences larger than *0.25* in absolute value are considered statistically different (*marked in italics*).

Table A5. Northwest Region, Pre-Treatment Means, by Distance

Pre-Treatment Means	[0, 1) Miles	[1, 2) Miles	[2, 3) Miles	[3, 5) Miles	Normalized Difference in Means
Real Sale Price ($)	145,142	136,407	174,102	216,964	*-0.442*
Living Area (sq. ft)	1,694	1,493	1,740	1,686	0.009
# of Bedrooms	3.1	2.9	3.1	3.1	0.048
# of Bathrooms	1.8	1.7	1.9	2.0	-0.204
Lot Acreage	2.2	1.7	3.9	1.5	0.144
Age	63.8	55.3	51.2	50.4	*0.432*
Basement Dummy	0.6	0.3	0.3	0.4	*0.275*
Distance to Nearest Turbine (ft)	3,214	7,125	13,466	22,216	
Observations	123	152	86	735	

Notes: The normalized difference in means is calculated according to Imbens and Woodridge (2009) for properties located within 1 mile and those located 3-5 miles (control group in Difference-in-Difference models) during the pre-treatment period. Normalized differences larger than *0.25* in absolute value are considered statistically different (*marked in italics*).

Table A6. North Central Region, Pre-Treatment Means, by Distance

Pre-Treatment Means	[0, 2) Miles	[2, 3) Miles	[3, 5) Miles	Normalized Difference in Means
Real Sale Price ($)	115,792	108,606	183,820	*-0.530*
Living Area (sq. ft)	1,657	1,510	1,921	*-0.257*
# of Bedrooms	3.1	2.9	3.2	-0.170
# of Bathrooms	1.9	1.7	2.1	*-0.262*
Lot Acreage	0.8	0.9	2.0	*-0.329*
Age	54	59	53	0.009
Basement Dummy	0.2	0.2	0.2	-0.071
Distance to Nearest Turbine (ft)	7,509	13,163	21,291	
Observations	182	136	125	

Notes: The normalized difference in means is calculated according to Imbens and Woodridge (2009) for properties located within 1 mile and those located 3-5 miles (control group in Difference-in-Difference models) during the pre-treatment period. Normalized differences larger than *0.25* in absolute value are considered statistically different (*marked in italics*).

Corresponding Data for Event Study (Tables A7-A9)

The data in these tables correspond with Figures 4a-c in the body of the document.

Figure A7. Event Study: Homes within 1 Mi. of Nearest Wind Turbine, East Central Region, 2005-2024

Note: Year 0 = 2013. First turbines operational in 2014. Confidence interval 95%.

Year	Treatment	High	Low
-8	0.439056	0.922127	-0.044015
-7	0.599641	1.076405	0.122877
-6	0.476465	0.912285	0.040645
-5	0.308597	0.753582	-0.136388
-4	-0.205072	0.636383	-1.046527
-3	0.273376	0.836094	-0.289342
-2	0.133839	0.662963	-0.395285
-1	0.31618	0.765696	-0.133336
0	-	-	-
1	0.186413	0.714741	-0.341915
2	0.103008	0.614443	-0.408427
3	0.413167	0.826402	-6.76E-05
4	0.337189	0.828261	-0.153883
5	0.011757	0.542104	-0.51859
6	0.169712	0.625759	-0.286335
7	0.416345	0.859044	-0.026354
8	0.190168	0.739039	-0.358703
9	-0.089192	0.476636	-0.65502
10	0.399134	0.813652	-0.015384
11	0.25146	0.711648	-0.208728

Figure A8. Event Study: Homes within 1 Mi. of Nearest Wind Turbine, Northwest Region, 2004-2024

Note: Year 0 = 2007. First turbines operational in 2008. Confidence interval 95%.

Year	Treatment	High	Low
-3	-0.358831	0.080038	-0.7977
-2	0.165907	0.399802	-0.067988
-1	-0.003804	0.254034	-0.261642
0	-	-	-
1	0.039124	0.287977	-0.209729
2	0.045353	0.261872	-0.171166
3	-0.070527	0.152897	-0.293951
4	-0.121134	0.08564	-0.327908
5	-0.141702	0.070711	-0.354115
6	0.116882	0.313582	-0.079818
7	0.022932	0.207058	-0.161194
8	0.044726	0.210803	-0.121351
9	0.106323	0.305522	-0.092876
10	0.018586	0.202289	-0.165117
11	0.104774	0.302309	-0.092761
12	0.025832	0.173755	-0.122091
13	-0.0311	0.145531	-0.207731
14	0.065306	0.260792	-0.13018
15	0.165785	0.325674	0.005896
16	0.094232	0.272537	-0.084073
17	0.273252	0.438106	0.108398

Figure A9. Event Study: Homes within 2 Mi. of Nearest Wind Turbine, North Central Region, 2004-2024

Note: Year 0 = 2011. Turbines first operational in 2012. Confidence interval 95%.

Year	Treatment	High	Low
-7	-0.121428	0.360401	-0.603257
-6	-0.180351	0.260927	-0.621629
-5	0.133282	0.567845	-0.301281
-4	-0.204327	0.269156	-0.67781
-3	-0.404064	0.077224	-0.885352
-2	-0.327529	0.120962	-0.77602
-1	-0.328252	0.140435	-0.796939
0	-	-	-
1	-0.076844	0.361963	-0.515651
2	-0.199844	0.251603	-0.651291
3	-0.29846	0.167295	-0.764215
4	-0.259463	0.193769	-0.712695
5	-0.18479	0.28011	-0.64969
6	-0.23648	0.195463	-0.668423
7	-0.172547	0.25929	-0.604384
8	-0.038258	0.379371	-0.455887
9	0.021818	0.437185	-0.393549
10	-0.253928	0.166127	-0.673983
11	-0.368771	0.034464	-0.772006
12	0.00545	0.43001	-0.41911
13	-0.068954	0.348338	-0.486246

Regulations and Classifications by County (Table B1 & Figure B1)

Table B1. Class 3 Wind Speeds at 50 Meters Elevation by Indiana County

Source: U.S. National Renewable Energy Laboratory (NREL).
Note: Class 3 wind power areas have wind speeds between 14.3 and 15.7 miles per hour at 50 meters elevation.

County	Rated Wind Class 3 @ 50 Meters
Adams	No
Allen	No
Bartholomew	No
Benton	Yes
Blackford	No
Boone	Yes
Brown	No
Carroll	Yes
Cass	No
Clark	No
Clay	No
Clinton	Yes
Crawford	No
Daviess	No
Dearborn	No
Decatur	No
DeKalb	No
Delaware	Yes
Dubois	No
Elkhart	No
Fayette	No
Floyd	No
Fountain	No
Franklin	No
Fulton	No
Gibson	No
Grant	Yes
Greene	No
Hamilton	Yes
Hancock	No
Harrison	No
Hendricks	Yes
Henry	No
Howard	Yes
Huntington	No
Jackson	No
Jasper	Yes
Jay	No
Jefferson	No
Jennings	No
Johnson	No
Knox	No
Kosciusko	No
Lagrange	No
Lake	No
LaPorte	No

County	Rated Wind Class 3 @ 50 Meters
Lawrence	No
Madison	Yes
Marion	No
Marshall	No
Martin	No
Miami	No
Monroe	No
Montgomery	Yes
Morgan	Yes
Newton	Yes
Noble	No
Ohio	No
Orange	No
Owen	No
Parke	No
Perry	No
Pike	No
Porter	No
Posey	No
Pulaski	No
Putnam	No
Randolph	Yes
Ripley	No
Rush	No
Scott	No
Shelby	No
Spencer	No
St. Joseph	No
Starke	No
Steuben	No
Sullivan	No
Switzerland	No
Tippecanoe	Yes
Tipton	Yes
Union	No
Vanderburgh	No
Vermillion	No
Vigo	No
Wabash	No
Warren	Yes
Warrick	No
Washington	No
Wayne	No
Wells	No
White	Yes
Whitley	No

Source: U.S. National Renewable Energy Laboratory (NREL).
Note: Class 3 wind power areas have wind speeds between 14.3 and 15.7 miles per hour at 50 meters elevation.

Figure B1. Class 3 Wind Speeds at 50 Meters Elevation by Indiana County

Source: U.S. National Renewable Energy Laboratory (NREL).

Note: Class 3 wind power areas have wind speeds between 14.3 and 15.7 miles per hour at 50 meters elevation.