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Common concerns about wind power (2nd edn)

Chapter 9 Wind turbines and property prices

This is one of a series of chapters of evidence-based analysis drawing on peer-reviewed academic research and publicly funded studies.

For other chapters, see
www.cse.org.uk/concerns-wind-power-2017

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Chapter 9 Wind turbines and property prices

The first edition of Common Concerns about Wind Power was published in 2011 to provide factual information about wind energy, in part to counter the many myths and misconceptions surrounding this technology.

Since 2011, much has changed in the legal and economic sphere, and a second edition became necessary. Research has been carried out for this edition since 2014. Therefore, this edition is formatted as a series of individual chapters available for download at www.cse.org.uk/concerns-wind-power-2017

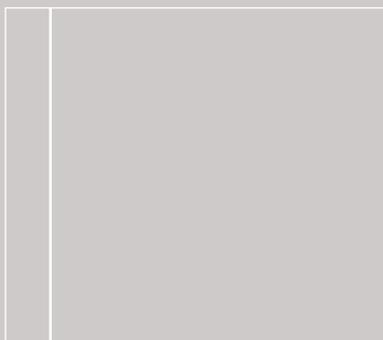
All chapters written and researched by Iain Cox.

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We are based in Bristol although most of our work has relevance and impact across the UK. Our clients and funders include national, regional and local government agencies, energy companies and charitable sources.



Chapter 9

Wind turbines and property prices

Summary

As the number of proposals for wind farms across the UK increases, detractors fear that nearby residents will see their property values drop. Given the negative press that wind turbines often receive in the mainstream media, it is not surprising that this becomes a concern for local residents during the planning and development of a wind farm. In fact, a great deal of research in the UK and abroad shows that there is no devaluation in property prices nearby once a wind farm is operating. A single large-scale study suggests some effect relating to turbine visibility, but lack of detailed analysis of changes over time and assumptions relating to the actual visibility used in this single study may go some way to explain these contradictory findings. Fears over property value losses frequently manifest as ‘anticipation stigma’, which has been found to exist during the planning and construction of wind farms, often bearing little relation to the actual community opinion or local property markets. It is no great surprise that opponents of wind farms are quick to seize on this sensitive issue, but the evidence overwhelmingly supports the view that wind turbines do not cause house prices in the surrounding area to fall.

What is this based on?

This is a common objection raised against the siting of onshore wind farms. As property is the single largest financial and emotional investment a person is likely to make, residents’ concerns are legitimate and understandable. The premise seems obvious: why would someone be willing to pay as much for a property (especially when situated in a rural area) that has wind turbines in view, when compared with a property that does not? Peoples’ direct experience of wind farms remains relatively rare and the uncertainty a new development brings can lead residents to anticipate detrimental local impacts that will result in reduced property values. As of 2014, there are several updated and comprehensive studies on the effects of wind turbine developments and housing prices that have been released, mostly using data from North America and Great Britain. As wind farm developments become more and more common, the level of data open to analysis will continue to increase. For the studies published so far, the vast majority of evidence shows that the proximity of wind turbines in an area does not have any negative impact on surrounding house prices, although there are a small handful of exceptions that suggest there is indeed some adverse effect on prices that is attributable to turbines being visible to properties within several kilometres.

The largest and most robust studies that failed to find any link between lower property values and the presence of wind turbines have frequently taken the different stages of wind farm development into consideration: prior to construction, during construction, after construction once turbines are operating, and some

even going back to the period before any announcement of a possible wind farm development was made. This has been beneficial in terms of revealing certain trends associated with wind farm developments and the response in the local housing market, and may help explain some of the reasons behind the few studies that do suggest a reduction in property prices.

What is current evidence?

Since the first UK commercial wind farm began operation in Delabole, Cornwall in 1991, wind turbines have become an increasingly common feature of the landscape across the UK.¹ This reflects the trend in several European countries that are leading exponents of wind energy (e.g., Germany and Spain), and also in the United States, where the rapid expansion of wind farms is continuing across many states.² The continued growth the wind industry since the 1990s means that there is an increasing number of areas that have an established history of wind farm development, and this has facilitated several large-scale studies in Great Britain and North America that look at the effect the presence of wind turbines have on house prices over time. As noted by several later researchers, many of the earliest studies were contradictory and contained several limitations: over-reliance on survey results instead of historical transaction data; the inclusion of confounding data that were not arms-length sales;* treating turbines as being visible from all properties in the radius area studied;

* House sales may not be ‘arms-length’ sales when the parties are not independent of each other or on an equal footing, e.g. in transactions between family members, a sale resulting from a divorce, or the break up of an estate. These types of sale are likely to result in unreliable price indicators.

assuming visibility impacts are the same regardless of proximity; and general lack of statistical rigour, including not properly isolating other amenities and disamenities that may affect property value, known as the hedonic pricing method.^{3,4}

One research group, sponsored by the Royal Institute of Chartered Surveyors (RICS), who looked at 919 transactions in the period 2000–2005 near two wind farms in Cornwall, used an analysis that incorporated a hedonic approach to allow for other factors that may influence house prices (e.g. waterfront views) The initial data from these areas showed no linear correlation between the proximity of a wind farm on house prices for properties within 6.4 km (4 miles), and the authors stated that non-linear effects were likely attributable to other variables not analysed in their regression analysis.⁴ The same researchers focused on a smaller group of houses (199) that were situated within 1.6 km (1 mile) of one of the Cornish wind farms, and analysed in more detail the effect of turbine visibility from the properties, including which side of the house the turbines could be seen from. In this sample, the authors discovered both positive and negative effects on house price in relation to turbine visibility; for example, a rear-facing view of turbines had a slight negative effect overall, in contrast to a positive effect for side- and front-facing views of the turbines, but terraced houses with rear-facing views of the turbines also displayed a slight positive effect on property value. The authors again concluded there was no direct relationship between turbine visibility and property values within 1.6 km of a wind farm.⁵

The first truly large-scale statistical analyses, encompassing transaction data from multiple states in the USA and using the hedonic pricing method, were carried out by a research group at the Lawrence Berkeley National Laboratory.³ The authors have included data relating to different stages of wind farm development, grouped as ‘pre-announcement’, ‘post-announcement pre-construction’ and ‘post-construction’.⁶ The sales data stretched back to 1996, several years before any of the earliest wind farms were announced, and the authors applied several multiple hedonic models, as well as analysing repeat sales and testing to see if volume of sales in an area were affected.^{3,6} The first report looked at 7,459 arms-length house sales up to 2008 and found no measurable relationship between house prices and distance or visibility of wind turbines.³

The second study was able to obtain a larger data set, compiling 51,276 transactions involving properties across nine states that surround 67 different wind farms in total, and as the sales data spanned 1996–2012 there were significant numbers of sales from prior to any announcement and well after the wind turbines became operational.⁶ Again, there was no statistical evidence to show that wind turbines affected house prices.[†]

Finally, in a collaborative study, the Berkeley group looked at another very large data set of 122,198 transactions in the densely populated state of Massachusetts, with properties concentrated in more urban areas that surrounded a total of 26 wind facilities.[‡] Following their analyses similar to before, the authors concluded:⁷

“The results of this study do not support the claim that wind turbines affect nearby home prices. Although the study found the effects on home prices from a variety of negative features (such as electricity transmission lines, landfills, prisons and major roads) and positive features (such as open space and beaches) that accorded with previous studies, the study found no net effects due to the arrival of turbines in the sample’s communities. Weak evidence suggests that the announcement of the wind facilities had an adverse impact on home prices, but those effects were no longer apparent after turbine construction and eventual operation commenced.” (p.36)

An analysis by a different group of 48,554 transactions in the state of Rhode Island, looking at an area similarly urbanised to the Massachusetts study that contained wind facilities of a comparable or smaller scale (half of the sites had turbines in the 100–275 kW range), also found no statistically significant impact of turbines on property values.⁸ As with the earlier Berkeley group studies, the data for Massachusetts and Rhode Island covered a period of more than a decade, with a substantial number of sales and repeat sales from before any announcement of a development to several years after the turbines became operational.^{7,8}

Two major studies based in England and Wales were officially published in 2014. Although a draft version of the report from the LSE’s Spatial Economics Research Centre (SERC) was released in 2013, the final revised version was only published in April 2014.⁹ This report obtained a very large dataset from England and Wales postcodes where either wind turbines were already operational or became operational at some point. Sales data were from the period between 2000 and the first quarter of 2012, covering more than 125,000 transactions in rural postcodes within 4 km (2.5 miles) of turbines, of which 36,000 of these were within 2 km (1.25 miles) of turbines. In all, the author incorporated data up to 14 km (8.7 miles) from wind farms, which encompassed 148 wind facilities in all, with a median of

† This second study from the Berkeley group was also published online in July 2014 (prior to print publication) in the peer-reviewed *Journal of Real Estate Finance and Economics*.

‡ These 26 sites consisted of between one and three turbines, except for one ten-turbine wind farm; the nameplate capacity of the turbines was mostly in the 1.5–2 MW range, with the lowest being 0.6 MW found at six of the sites.

6 turbines per wind farm (the average was skewed by a handful of very large offshore farms), and a total of more than 1,700,000 property sales over the 12-year period. The author approximated whether the turbines would be visible by using information about the elevation and aspect of the houses in question, and used this as a basis to measure the 'visibility coefficient' by comparing houses within the same postcodes that have turbines in view with those that do not. Although cases were removed when the potential visibility was highly ambiguous, landscape features such as trees and buildings were not taken into account when assessing visibility. In summary, this study suggested that wind farms 1–10 turbines in size cause a 5% reduction in prices for properties within 2 km from which turbines are visible, with this impact falling to 1.5% by 4 km distance and becoming insignificant thereafter. When the very largest wind farms were also included, the average price reduction caused by visible turbines within 2 km was between 5 and 6 per cent, falling to just below 2% by 4 km; there is a very small effect (less than 1%) at distances up to 14 km.⁹

In contrast, a different study published in March 2014 that took site-specific data from England and Wales came to quite the opposite conclusion.¹⁰ This study looked at transaction data over a lengthy period, from 1995 to mid-2013, and analysed trends between rural house prices for properties within 5 km (3.1 miles) of wind turbines compared with average trends for comparable properties across the county, a total database of over 1,043,000 transactions. In total, 82,223 sales occurred that involved houses within 5 km of a wind farm, across seven different sites that included both small (2–6 turbines) and large facilities (two wind farms had 26 turbines each). Tracking the county averages and comparing them with the 82,223 sales that took place within 5 km of a wind farm showed that the presence of a wind farm had no effect on house prices.¹⁰ In one case, prices were reduced slightly in the phase following planning permission being awarded for six turbines, but these quickly recovered during construction of the wind farm and comfortably outperformed the county average. Two other sites saw prices within the 5 km radius actually outperform the county averages, and transaction data for the other sites all closely tracked the county averages.

A further econometric analysis within the same study was designed to separate out variables affecting house prices to see the effects that a wind farm may have had during either public planning, construction or operation of the turbines.¹⁰ The study authors removed smaller datasets for two of the wind farms⁵ because the transaction data within 5 km was too limited in terms of distribution of property types or number of sales to be

statistically valid – this excluded 2,854 sales from the total used for the econometric analysis. Regression analysis of the remaining 79,369 transactions across five wind farms demonstrated that price trends closely tracked the county averages for all of the sites, and were clearly driven by factors operating across the county-wide market. The fall in prices across all properties following the 2008 financial crisis was particularly evident, but the presence of wind turbines had no effect on this trend; in fact, the analysis revealed a small but statistically significant positive effect (1%–2%) on property prices for dwellings within the 5 km radius of a wind farm across both the construction phase and following operation of the turbines.¹⁰

One United States study of significant size (11,331 transactions within 16 km) purportedly revealed that turbines may negatively affect property values, although it was not nearly as robust as the SERC study mentioned earlier.¹¹ The authors show that in two adjacent New York counties there was a significant reduction in house prices caused by nearby wind farms (based on 210 transactions within 5 km), although in the third, non-adjacent county studied there was a slight positive effect (from 250 transactions in the same size radius). Data from the two negatively affected counties consisted mostly of post-announcement pre-construction sales, with the turbines only becoming operational for a very short period before the study ended. The county that showed a slight positive effect had more data covering both pre-construction and post-construction periods because the wind farms in question became operational several years earlier. Furthermore, due to the way the authors incorporated the distance variable into their model (using an inverse distance effect), they extrapolated the negative effects to within a very close distance of the turbines, despite the fact that they only had 10 transactions within half a mile of any of the turbines studied.¹¹ This makes it difficult to warrant the conclusions of this study as statistically valid.⁶

Tracing property prices in relation to the development phase of a nearby wind farm can be important. What many hedonic price model studies have shown is an 'anticipation stigma', whereby the perceived negative impact of wind turbines being constructed nearby causes a transitory drop in house prices, which quickly reverses when these negative affects fail to materialise post-construction.^{3,4,6,7,12} This anticipatory effect was also illustrated by community responses to early wind farm developments in the UK. In 2003 the Scottish Executive commissioned a landmark survey to assess the impact of wind farms on nearby residents, using ten major sites across the region.¹³ The survey design was carefully planned and extensive in scope, and took into account how close to the wind farms residents lived, encompassing the surrounding 20 km of each site. Overall, only 7% of those questioned said their local

§ This included one of the larger wind farms comprising 26 turbines.

wind farm had had a negative impact on the area; this is compared to 20% who said the impact was positive, and 73% who felt it had no impact either way.

Perhaps most surprisingly of all, respondents in the Scottish survey who lived closest to the wind farm (<5 km) and could see the turbines most often made up the highest proportion of those who responded positively. Those respondents who were already living in their house prior to the wind farm being built were asked about house prices. Some 7% of them said that they had anticipated that house prices would be reduced by the wind farm; when asked about the actual effect, the number who said house prices had fallen dropped to 2%.¹³

In many cases, the stigma is reinforced by the opinions of estate agents when planning for wind farms begins, but this viewpoint is found to be misguided when post-construction data is available.^{4,14,15} It is accepted that predictions by estate agents are found to be inaccurate (negative predictions in particular often being significantly inflated) when compared with actual transaction data and the views of the buyers themselves.^{3-5,14,15} Furthermore, the actions of groups inherently opposed to the construction of wind turbines can distort popular perceptions of how a community integrates a new installation. The RICS-sponsored research on early wind farm developments in Cornwall found that 95% of objections raised during the planning stage originated from non-locals.⁴

Failing to account for the trends in property values at all times before, during and after wind farm development can obscure drivers of house prices that are independent of the presence of wind farms. It is clear from the most robust studies that incorporate this detail that lower house prices are not related to wind farms, often being lower than the surrounding average before plans to site a wind farm are even announced.^{6-8,10,12} Due to the anticipation stigma effect, house prices may drop temporarily before construction begins, at a time when the influence of residents' own uncertainty is particularly acute, often compounded by negative reactions from outside sources and a tendency for estate agents to treat future wind farms as a disamenity.^{3-5,12,14} This has been found to recover relatively quickly when construction is complete and the sites are operating.^{3,4,12,13}

The largest studies that show a negative effect due to turbine proximity or visibility, such as the report from the LSE's SERC, do not account for the whole timeline and therefore much of the data does not reveal price trends prior to any planning announcement.^{9,11} In addition, the LSE study does not account for house price trends within the postcode areas that received wind farms, but has to rely on broader regional trends, which makes it difficult to control for the effect of wind farms in this instance.⁹

For the majority of large-scale studies, which show wind farms have no effect, the data show no change in sales activity in areas that receive wind farms, and repeat sales data that is available suggest no drop in prices between pre-announcement and post-construction for houses with nearby wind farms.^{3,7,8} The England and Wales study from SERC also reported a remarkably consistent sales volume for all sites pre- and post-operation of wind farms,⁹ although it is difficult to know if pre-operation sales covered the pre-announcement or just pre-construction phases. The SERC report did discount the variable of lower-quality housing after analysing postcode data within a 4 km radius. The large U.S. studies, however, analysed property prices within less than 1 km of wind farms, where turbines could reasonably be expected to be visible from all properties. These analyses showed both consistently lower property values prior to any announcement of a wind farm, and did not show any effect of the wind turbines following construction, even though the samples were large enough to catch an effect of the size reported in the SERC report.^{7,8}

Lack of detailed data relating to timing in the SERC study, in contrast to the different construction and operation phases described in the Berkely group reports, can obscure the real effect of variables other than wind turbines themselves.^{6,7} First, it is impossible to see the impact of any parallel trends in house prices that existed already and were unrelated to wind turbines. Second, lack of data on how prices track over the course of a wind farm's development also fails to account for any anticipation effects. For instance, homeowners who are convinced they must move as soon as news of a wind farm development is made public can skew results based on the limited sales data from a handful of postcodes close to the turbines, because such owners are more likely to accept a lower price to ensure they can move. Thus, this drives the downwards trend in house prices observed near wind turbine sites, but does not capture the temporary nature of this trend. Other studies based in the UK have, indeed, shown that house prices can rebound and even exceed the overall regional trends in property values.^{6,10,12,13}

Conclusion

The amenity and disamenity effect of any infrastructure development must be seriously considered, and wind turbines are no exception. Residential property is the single largest financial investment most people will make in their lifetime, and it is justifiable that owners are concerned by changes that may negatively affect property values. The anxiety over house price trends caused by many different factors can be compounded by the uncertainty introduced whenever a major development such as a wind farm takes place near a community. The novelty and high visibility of

commercial-scale wind farms makes them an obvious conduit for residents' concerns, but also one for misinformation. Despite anti-wind protests insisting that wind turbines will lower property values in the surrounding area, an increasingly large body of evidence from several major UK and American studies shows that this is not the case. In many cases, detailed analysis over the different phases has revealed that an 'anticipation stigma' commonly manifests in a short-lived drop in values close to proposed wind farms, but prices quickly recover following construction and operation, and may even outperform regional averages. Fears stoked by pressure groups and mistaken preconceptions by estate agents add to residents' own worries, and it is not surprising that this can translate into a temporary dip in house prices at a time when the real impact of a such a development can only be imagined.

One major study released by the London School of Economics (LSE) used England and Wales postcode sales data to demonstrate a possible effect driven largely by the visibility of nearby wind farms. The study draws on a very large dataset, but the maximum price reduction effect stated (roughly 5% if within 2 km) is large enough that it should have been caught by several other large-scale studies, but the majority of these studies have failed to show any significant effect.

Therefore, it is difficult to say why this one study contradicts the other major studies, although it is possible that the lack of any detailed analysis of pre-planning data versus the post-operation phase of the wind farms may introduce confounding factors. This means any pre-existing trends in property prices, or short term trends driven by anticipation stigma, may not be properly accounted for.

However, it is possible that lack of timeline data may actually obscure the negative impact of wind farms on house prices. For instance, the LSE's report (mentioned above) only takes account of operational turbines, i.e. not those that are partially constructed. If the construction phase does cause house prices to be lowered, then this might affect overall house price trends, as we seen in the anticipation stigma. In the case of the LSE's report, this would lead to an underestimate of the effects of wind farm developments, since the downward trend in house prices attributed to completed

wind farms would not appear to be as dramatic, thanks to prices already being lower as a result of the negative impact of wind farm construction. However, this can only be speculated, because the existing LSE study does not account for house price trends within the postcode areas that received wind farms, but has to rely on broader regional trends. This makes it hard to control for confounding factors that are affecting house price trends generally.

A different study using site-specific data from England and Wales, but one that accessed a similarly large number of transactions as the previous report, assessed a longer time period both before and after wind farms were planned and built. This study demonstrated that the state of the regional (county) housing market was the main driver of house prices between 1995 and 2013, and this remained the case during and after wind farm construction. Property values within 5 km of a wind facility were not reduced at all by the presence of turbines, in fact, in some cases, the proximity of a wind farm had a small positive effect on property values.

Given the importance property value holds with a large proportion of the population, controversy over the effects of wind turbine proximity on house prices is unlikely to diminish in the near future. In sporadic cases, it is entirely possible that the presence of a commercial wind turbine may act to reduce a particular amenity associated with a property, and such a tiny fraction is unlikely to be revealed in anything but the most exhaustive statistical analysis. However, the balance of evidence clearly shows that wind turbines have no long-term effect on house prices in surrounding areas. Fears that prices may be reduced are largely driven by uncertainty surrounding local changes to an area coupled with activism by anti-wind groups, often instigated by remote actors rather than local residents. Within this milieu, it is not surprising that some temporary price reductions can occur, typically in the early stages of planning and construction. The experience of operating wind farms is that long-term effects are generally neutral or even slightly positive.

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