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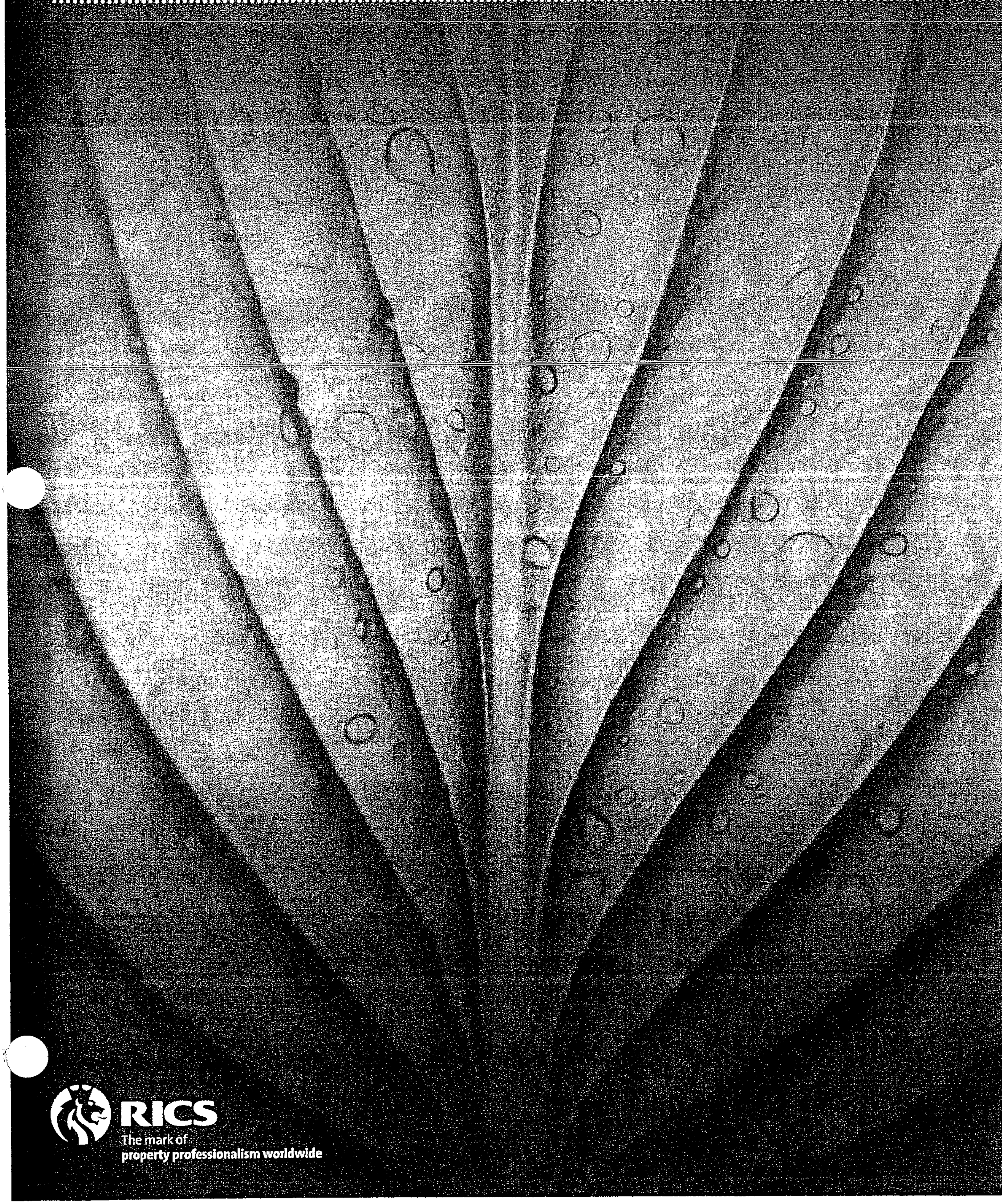

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MODELLING THE IMPACT WINDFARMS ON HOUSE PRICES IN THE UK

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ABSTRACT

This paper discusses the findings from a UK study to determine the likely impact of a windfarm on house prices using a hedonic pricing model.

The Government's commitment to wind power, has resulted in the growth of a new environmental feature; the wind turbine. Despite concerns that the visual and aural presence of these turbines could have a negative impact on house prices, research undertaken to date has found little evidence to support such a claim. Findings from an earlier UK study by Sims and Dent (2007) were inconclusive, perhaps due to the lack of available property specific data. However, their methodology did provide a sound framework for further research and has formed the basis for this study.

The research presents an analysis of 201 sales transactions undertaken between 2000 and 2007 in St Eval, Cornwall using hedonic modelling and comparative sales analysis. St Eval is located within half a mile of Bears Down wind farm and approximately 2miles from the sea.

The results indicated that distance from the nearest turbine is not a significant factor in house price, whereas having a view of the countryside can significantly increase price. Whilst no causal link was established between the presence of the wind farm and house price there was some evidence to suggest that both noise and flicker from the turbine blades could blight certain property. The results also indicated that in addition to noise and flicker, the vista (the view of countryside, sea etc from the property) enjoyed by the occupier had some intrinsic value which may be affected by the presence of a wind farm and therefore future research needs to develop a methodology which will capture the relationship between these factors and price more fully.

Keywords: *Stigma, residential values, wind-power, renewable energy, hedonic*

1.0 INTRODUCTION

The 2007 Energy White Paper, published in May 2007, sets out the Government's international and domestic energy strategy to respond to Climate Change with the main aim of cutting, "*CO^2 emissions [in the UK] by some 60% by about 2050, with real progress by 2020*" (DTI. 2007) In order to meet these targets, the government expects "*20% of our energy to come from renewable sources...by 2020*" (BBC, Costing the Earth, 2007).

According to the Sustainable Development Commission (SDC, 2005), wind is a prime candidate since the UK has the "*best and most geographically diverse wind resources in Europe, more than enough to meet current renewable energy targets*" (SDT 2005). However, although wind power is now the fastest growing renewable energy sector in Britain (BBC, Costing the Earth, 2007), "*experts interviewed on 'Costing the Earth,' claim that the power of the wind to deliver electricity is being overestimated*" (Country Guardian 2007). They argue that although the Government has already invested, "*half a billion pounds so far*" wind power has "*as yet...failed to deliver half of one per cent of our electricity needs" (ibid*).

Whilst appearing to offer many advantages, there is now considerable opposition to such developments particularly with regard to their inefficiency, with many turbines producing less than 25% of their predicted output. The unreliability of wind power means that customers must have the ability to switch over from wind power to an alternative source of electricity, (nuclear, oil or coal fired power stations). In real terms, this means that "*even on the most optimistic assumptions, renewable sources of energy, such as wind power, will have only a 'minor impact' on reducing carbon dioxide emissions*" (Keay, 2005). The reliance on wind energy has raised public concern, not just about the ability of this technology to provide sufficient energy to meet the 2020 target, but also with regard to the impact that the visual and aural presence of turbines could have on wildlife, surrounding property values and the health of residents living close by, particularly since the number of wind turbines sited around the UK continues to grow (Country Guardian, 2007; Sagrillo, 2003; English Nature, RSPB, WWF and BWEA, 2001; Milner, 2004).

With the current number of operational onshore windfarms standing at 143 and a further 32 under construction, 97 with planning permission and consent being sought for a further 217, opposition towards windfarms seems to be growing exponentially, which would suggest that the 'windfarm' may be the latest environmental feature to stigmatise residential property. Therefore, exploring their influence on house values and amenity would be of benefit to the property and wind generation industry.

This paper presents the results from an analysis of transaction data from homes sold in the vicinity of the Bears Down 16 turbine windfarm in St Eval, Cornwall (turbines are 60m high). A hedonic pricing model at the micro spatial level is applied and data analysed using linear and log-linear multiple regression in addition to comparative analysis.

2.0 LITERATURE

Whilst there have been several studies in this area, most have been opinion surveys. As a consequence there is little empirical evidence on the impacts (positive or negative) of living near a windfarm and only five studies which consider the impact on value. One study found a small number of homes could suffer from diminution (Jørgensen (1996). Two studies found insufficient evidence to either reject or accept the claim that windfarms have an effect on value (Poletti, 2005; Hoen, 2006). One found house values increased (Sterzinger et al. 2003) and the fifth, whilst finding a reduction in house values within one mile of the windfarm, attributed this diminution to a local condition and not the presence of the windfarm (Sims and Dent 2007).

2.1 Opinion Surveys

Public perception of non-physical contamination such as visual impacts, noise and odour pollution can create property stigma which, according to Chan (2001) is "a loss to property value due to the presence of a risk perception-driven market resistance." Previous research on the impact of environmental features such as, high voltage overhead power lines (HVOTLs) and mobile phone masts (MPBS) (both of which exhibit similar characteristics to wind turbines), indicates that, physical characteristics such as visibility, size and location can influence property stigma; especially when there is a perception of an associated health risk. However, the effect of stigma damage is difficult to quantify because it is created by opinion and perceptions which can change in response to media attention (including information available on the internet[1]), time and spatial proximity (McClelland et al., 1990; Chalmers and Roehr, 1993; Fischhoff, 1985; Mundy, 1992; Slovic et al., 1991; Gallimore and Jayne, 1999; Bell, 1999; Bond, 2003; Sims and Dent, 2005).

Most windfarm studies have been undertaken as part of an impact assessment statement prior to construction. Survey work undertaken by the then Scottish

[1] A search for information on 'Wind farms' can generate over 1.6million results (Google15-11-07) and is currently used by many anti-windfarm campaign groups to elicit support following a planning application for a new windfarm within their local community (Dartdorset, Countryguardian, Turbineaction.

Executive (now Scottish Government) suggests that residents living near windfarms have experienced less negative impact than anticipated as shown in Figures 1 and 2.

The British Wind Energy Association (BWEA, 2004) commissioned Tom Barrow from Knight Frank (2004), to undertake an initial investigation into the factors affecting property values near windfarms. The findings indicated that public reactions tend to vary considerably, with more support for windfarms being observed when the public are involved in the decision making process. However, although there was a general consensus amongst estate agents that there is a 'detrimental effect on values either due to close proximity of the windfarm or its visibility', Barrow concluded that determining the real impact on value would require a more detailed case study using data from the Land Registry and interviews with Property Professionals.

The 2004 RICS members' survey found that 60 per cent of the 405 respondents thought proximate windfarms decreased property values when the turbines were in view, despite a lack of evidence from sales transactions to support this view. The majority of respondents believed that any depreciation starts at the planning stage and lessens with time. Sims and Reed (2005) reached a similar conclusion when asking valuers to speculate on which features associated with a windfarm would be most likely to reduce value. The response indicated that a 'view of the turbine' would cause the largest diminution in value followed by a 'fear of blight'. The size of the windfarm seemed immaterial. Sims and Dent (2006) explored this in more detail and asked valuers and agents to quantify their opinion of the degree of diminution. The majority of respondents expected a reduction of between 5% and 20% for homes sited at distances of half a mile from a windfarm.

Other research has observed some positive benefits from windfarm development. Grover (2002) found that a plot of land with planning permission for a windfarm could be worth significantly more than land without (presumably due to the potential income stream). By contrast, Jørgensen (1996) and Andersen (*et al., 1997*) explored the issue of co-ownership in Norway and Denmark and found that the most important factor to influence occupiers' attitudes related to whether or not they benefited directly from the electricity produced (ie the degree of financial benefit to be derived from this technology). On the other hand, those owning or co-owning turbines expressing little or no objection to their presence.

2.2 Valuation Studies

Jørgensen (1996) was one of the first researchers to use a hedonic regression model to analyse the impact of a windfarm on house prices in Denmark. He attempted to quantify the visual and aural impact of a wind turbine to enable the cost versus benefit of wind generated electricity to be calculated. Results indicated that, on average, eight homes are affected by single turbine, 6 households by cluster and 12 by windfarms. Homes near a single turbine are on average Euro 2,174 cheaper than other houses in the vicinity and houses which lie closer to a windfarm containing 12 or more wind turbines are Euro 12,614 cheaper. However, not all were statistically significant and, therefore, impacts on house prices could be due to other factors.

Sterzinger (*et al.* 2003) set out to determine whether the presence of a windfarm had any impact on proximate property values in the US. The study examined 24,300 property transactions from 10 locations within the US, over a period of six years; this period spanned, in some cases, three years prior to the siting of the windfarm and three years following installation. Using multiple regression to analyse data they concluded that there was little or no evidence to suggest that windfarms sited within a 5 mile radius of property had a negative impact on value. In fact, to the contrary, property values appeared to rise above the regional average within the case study locations, suggesting that wind turbines actually had a positive effect on value. However the validity of Sterzinger's results are somewhat questionable (Hoen, 2006; Potetti, 2005) since, he included transactions which were not 'arms-length' (not undertaken under normal market conditions ie; divorce and sales between family members) and, "*make the erroneous assumption that all properties within the 5-mile radii can see the windfarm, when many houses' views in fact are obstructed by geological features, trees and other houses*" (Hoen 2006 p16).

Poletti's (2005) study of "*roughly 300 sales*" (Hoen 2006 p17) around the Lincoln and Rosiere windfarms in Wisconsin and Illinois, found insufficient evidence to either confirm or reject the claim that windfarms have an effect on property values. Whilst the analysis was slightly more rigorous than Sterzinger; in that he removed any sales which were spurious (not arms-length transactions) he did not control for distance or factor in the degree of visual encumbrance each home experienced from the presence of the windfarm.

Hoen (2006) improved on earlier research by including variables which would measure the effect of distance and varying degrees of visual encumbrance on transaction price. He used a hedonic regression model to analyse 280 sales transactions from homes sold within 5 miles of a 20 turbine windfarm at Madison Country, New York and visited each home included in the sample to measure the degree to which the occupiers could see the turbines. He did not however, consider the orientation of the windfarm which had been found by Sims (2006) to have a significant impact on the degree of diminution suffered with regard to electricity pylons. He found no measurable effect from windfarm visibility on value, even where property was within one mile of a turbine.

Sims and Dent (2007) considered the 'before' and 'after' effects of windfarm development by first undertaking an analysis of nearly 900 transactions of homes sold between 2000-2005 within five miles of two windfarms in North Cornwall, UK, and then examining the likely reason for any diminution in value. Their analysis of Planning Application objections (obtained from Bodmin Planning Department) to the Bears Down windfarm indicated that, whilst many people objected to the windfarm at the planning stage, the majority of objections were received from members of the public who did not live in the area. This is partly explained by the fact that, in this particular area, nearly fifty percent of dwellings were second homes. It is, therefore, difficult to measure the true reaction from permanent residents.

The second part of the study applied a hedonic regression model to analyse property sales. The results showed that semi-detached and terraced houses within one mile of the windfarm were lower in price than elsewhere in that location. However, no linearity was observed between distance to the windfarm and value. Whilst the results suggest that the windfarm could be responsible for this diminution, selling agents attributed any reduction in value specifically to a local condition (the fact that the majority of houses within one mile of the windfarm were ex-Ministry of Defence (MOD) homes built for Air Force personnel stationed at St Eval Airbase). In addition, the large number of houses included in the sample (919, before the outliers were removed), meant that the view of the windfarm from each house had not been measured and the vista (views of the surrounding countryside, sea or rivers) had only been estimated using GIS software (Google Earth).

So far, despite improvements in research methodology, the results from existing studies remain inconclusive. The central aim of this study, therefore, is to improve on existing research and to explore this issue further.

3.0 METHODOLOGY

Having developed the basic methodological framework in the previous study, this research focused on property within one mile of the Bears Down windfarm as this is, possibly, currently the only location within the UK where there are a sufficient number of sales transactions within close proximity to a windfarm to facilitate this type of modelling.

3.1 Hedonic Modelling

Since the transaction price for a house will reflect the value placed on the particular set of locational and physical attributes it possesses and as each house sale takes place in terms of a single transaction, the implicit price placed on each attribute (characteristic) is not observed. Breaking down a property into its main characteristics allows the influence of each attribute on the total price to be determined through the use of a statistical package capable of performing multiple regression analysis. This is referred to as the *"hedonic approach to price measurement in which goods are not valued for themselves as such but for the set of attributes which they possess"* (Fleming and Nellis 1997).

When conducting property research where transaction data are available, the accepted method of conducting a robust analysis of valuation data is to adopt a hedonic approach. Rossini states that the hedonic approach "affords the opportunity to quantify external costs" (Rossini et al., 2002) from any number of environmental features providing such features can be expressed in numerical form, such as time or distance (Theriault et al, 2003), noise, measured in decibels (Rossini 2002), or visual encumbrance (Sims, 2003; Bond, 2003). This methodology is particularly useful when determining the impact on value from a contaminant or detrimental condition, as it enables the combination of property specific variables and external or condition specific variables for every unit under consideration to be analysed by establishing a model, determining the parameters and then evaluating the result using multiple regression analysis (Kauko, 2002). Each characteristic then becomes a function of price (P) and can be expressed as:

$$Pi=b_0+b_1 X_{1i}+ b_2X_{2i}+ \ldots\ldots b_jX_{ji}+ ei$$

where the price (P) of each house (i) is a function of its characteristics Xi and b_1, $b_2 \ldots b_j$ are the regression coefficients corresponding to the property and locational variables (Xj). There are always several factors that will affect the total price but cannot be measured, in other words, the margin of error represented in the equation as ei (Fleming and Nellis 1997).

The hedonic pricing model has been used in the past to examine the impact of aircraft noise and high voltage overhead power lines on house price (Priestley and Ignelzi, 1989; Bond and Hopkins 2000; Rosiers 2002; Rossini et al 2002; Sims and Dent 2005) and is therefore well suited to "*dissect the issues revolving around windfarm acceptance*" (Hoen, 2006).

Therefore, the most appropriate methodology was found to be a hedonic approach with an inflation index considered appropriate to calculate the present value of each case (property sale) used in the analysis[2]. The results were then analysed using multiple regression, correlation and frequency analysis.

3.2 Case Study Location

This study focuses on 201 transactions from the sale of terraced and semi detached homes located in St Eval Cornwall (see Figures 3, 4, 5). The majority of homes were sold into private occupation by the MOD in 2000. Homes are sited at distances ranging between half a mile and one mile from Bears Down windfarm. Both house types have a range of views from the property which include the windfarm, surrounding countryside, sea and other houses.

There were a total of 326 properties on this estate of which data was available on 201. Of these 131 were semi-detached and 70 terraced

3.3 Variable Selection and Data Collection:

Transaction data for all house sales completed within the period 2000-2005 from the postcode area surrounding the Bears Down windfarm were gathered from Property POD online (www.propertypod.co.uk). Their online database provides details of all residential property sales in England and Wales, as recorded by the Land Registry since April 2000. This resulted in 201 property transactions and included information on house type, transaction data and price. Additional data were gathered and divided into 3 categories (see Table 1). These were:

House Characteristics = House type, number of bedrooms, parking facilities.

Locational View (Vista) = Houses/other buildings, playing field, countryside, sea.

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2 This approach was also adopted by Sims and Dent (2005) to determine the impact of HVOTLs on house prices in the UK and is currently used to determine the National House Price Index in the UK.

Windfarm Characteristics = Distance (DISTMETRE) from each house was measured using GIS. Site visits and GIS enabled the visual impact of the windfarm from the front and rear of the house to be calculated based on a scale of 0 to 4.

(FWF0 & FWF0 = no view;

FWF1 & RWF1= partial view of one turbine;

FWF2 & RWF2= up to a complete view of one turbine and a partial view of another;

FWF3 & RWF3= up to a complete view of 2 turbines and partial view of another.

FWF4 & RWF4= a complete view of 3 or more turbines.

No houses included in the analysis had a view of 3 or more turbines. The orientation of turbines (from front and rear of house) was also measured since the position of similar environmental features (HVOTLs) had been found to influence the degree of value diminution (Rosiers, 2002; Sims and Dent, 2005).

Data were input into SPSS for analysis and an inflation multiple was applied to all transaction data which adjusted for year and month of sale bringing all data up to the 2nd quarter 2007.

4.0 ANALYSIS

Before any regression analysis was undertaken, data were tested for multicolliniarity, heteroscedacity and outliers. A number of variables were found to be highly correlated and were therefore not used together in the models (a threshold of sig., 0.750 was applied). Tests for normality showed the data were not normal (see Figures 6 and 7). This was probably due to the high number of properties sold in 2000 at the £95,000-£99,000 price range (84 sales). Natural log of price (LNPRICE) produced a slightly more normal curve (Mean = 11.6648, Std Dev. = 0.21094, N. =201, Z= 2.468), so this form was adopted for the regression analysis.

Data were checked for outliers (extreme values). One property under £65,000 and four over £180,000 were removed, leaving 196 sales for further analysis.

To ensure that the variables selected were the best predictor of the dependent variable (LNPRICE), the independence of the error term and the independent variables were tested by regressing the residuals on the independent variables (Hoen, 2006). The independent values ranged from 0.214 to 0.998 and were therefore not significant (f-value 0.104, p-value 1.000, Adj R^2 -0.075).

Multiple regression analysis was performed using log linear functional forms. In all models the variables constructed to represent a semi-detached house (SEMI) and on road parking (PONROAD) were excluded for computational purposes, in order to avoid problems of indeterminacy. Therefore the unstandardised coefficients (B) in these models indicate the difference in price between a terraced (TERRACE) house and a semi-detached (SEMI) house.

Model 1 (see Model 1) which explained 51% of the total house price showed as predicted, that terraced (TER) houses were less expensive than (SEMI) semi-detached (t= -1.849; sig.= .066) and that the number of bedrooms was highly significant (t= 9.457; sig. = .000). Front and rear views of the field (FVISTA2 t= -3.364, sig.= .001; RVISTA2 t= -2.835, sig.= .005) were found to have a negative impact on value, possibly due to the fact that houses with views of the field were also likely to have a view of some aspect of the windfarm. It was hypothesised that having a view of the countryside or a vista which included a view of the sea would increase value. Surprisingly, a view of the sea from the rear garden (RVISTA4) was found to reduce house price (t= -2.365, sig.= .019) although there were only 19 houses in this category and all were semi-detached. The orientation of the windfarm appeared to have little impact on the degree of diminution experienced. A screened view of the windfarm from the front of the house was found to reduce value (FSCREENV, t= -1.811, sig.= .072) whereas a facing view from the rear increased value (RFACINGV, t= 2.109, sig. = .036).

Model 2 (see Model 2) was calculated using stepwise regression analysis in which all variables must pass the criterion level of 99 per cent to be entered in the equation. In addition, a variable was not included if it would cause the tolerance of another variable already in the model to drop below the tolerance criterion. Using this method to calculate the significant determinants of house price in St Eval indicated that house type (TER), number of bedrooms (NOBED), a rear view of the countryside (RVISTA3) and a rear view of other houses (RVISTA 1) were the significant determinant of price in this location. Neither distance to the windfarm nor the visual impact were found to be significant for this location.

5.0 CONCLUSIONS

This case study focused on one location in the UK where there was a significant number of houses located within half a mile of a wind farm to enable a hedonic regression analysis to be undertaken. The results found some evidence to suggest that the view of the surrounding environment from a property could influence selling price, although there was no clear relationship between having a view of the windfarm and a reduction in value. Nor was there any evidence to suggest a relationship between distance to the windfarm and house price. Whilst the conclusions drawn relate specifically to this location, they support the findings from other studies (Sims and Dent 2007, Hoen 2006, Poletti, 2005) and therefore may be indicative of the likely impact in other areas within the UK. However, whilst there seems to be little evidence to suggest that windfarms reduce house prices (one exception to this was observed within the case study location; a farm where the rateable value had been reduced by one rating band due to the problem of flicker from the turbine blades), these results do raise a number of questions relating to the value or perceived value of the 'vista". As model 1 indicates, certain vistas can inflate or diminish house price suggesting that landscape has some intrinsic value to either community or the individual which has not been captured by the variables included in this analysis.

Previous research also suggests that the degree of benefit received from windfarms by those living in close proximity to them will influence public opinion, with support given towards wind turbines which are co-owned by local residents.

5.1 Future Research

Future work seeks to broaden the debate to examine some of the other issues arising from windfarm developments, in particular the impact of windfarms on the surrounding environment focusing specifically on the effects on community and private values.

Figure 1. Perceived impact of wind farms on the local area

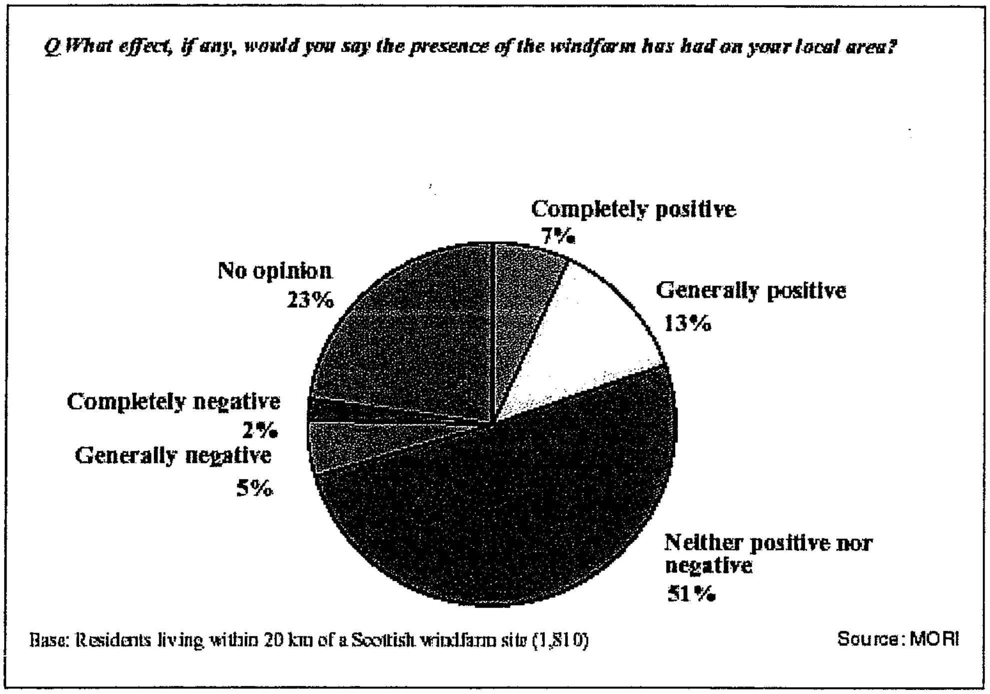


Figure 2. Perceived problems caused by wind farms in the local area

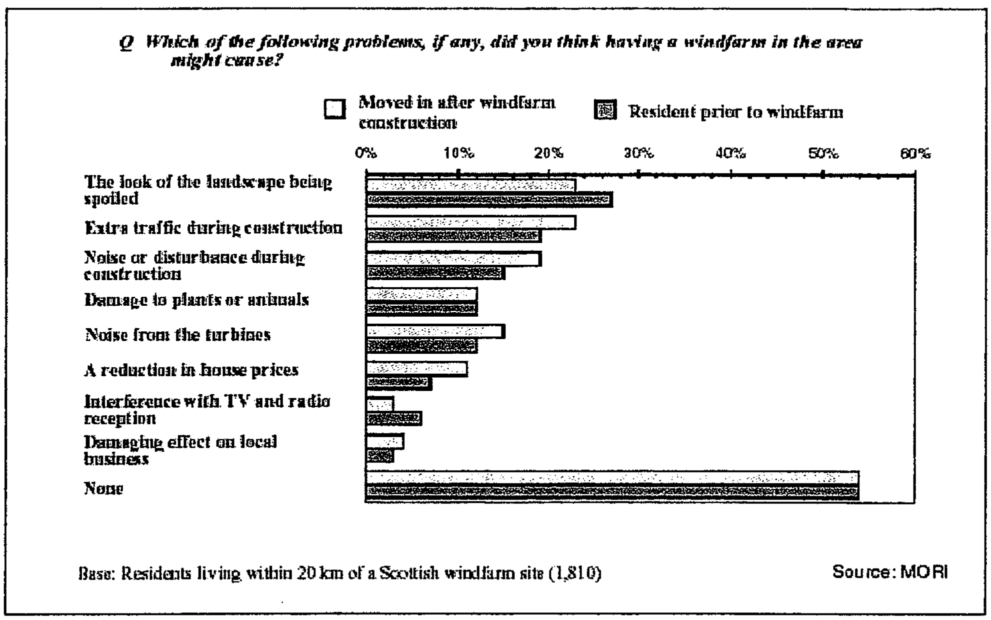


Figure 3: Location of Windfarm in North Cornwall

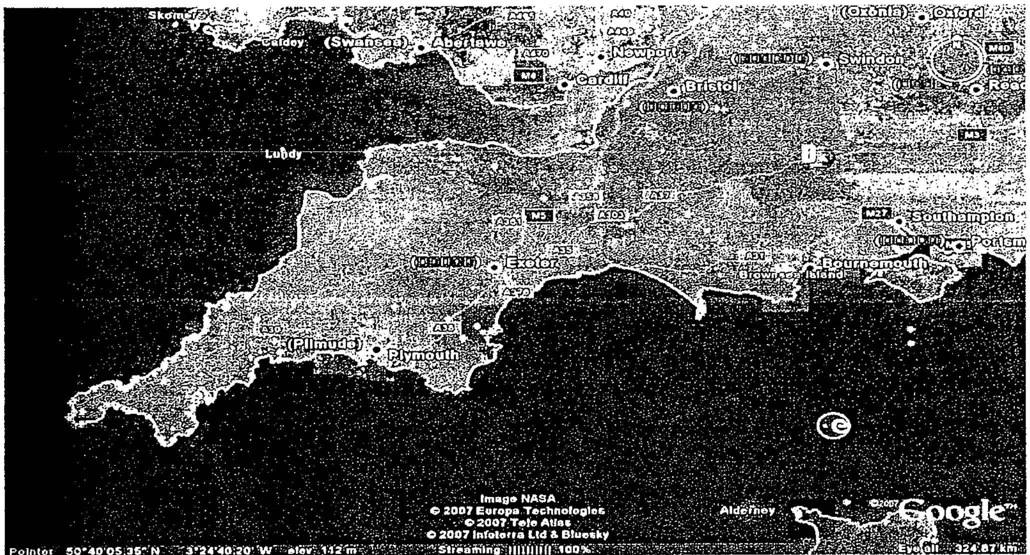


Figure 4: GIS view of the location of St Eval and Bears Down Windfarm

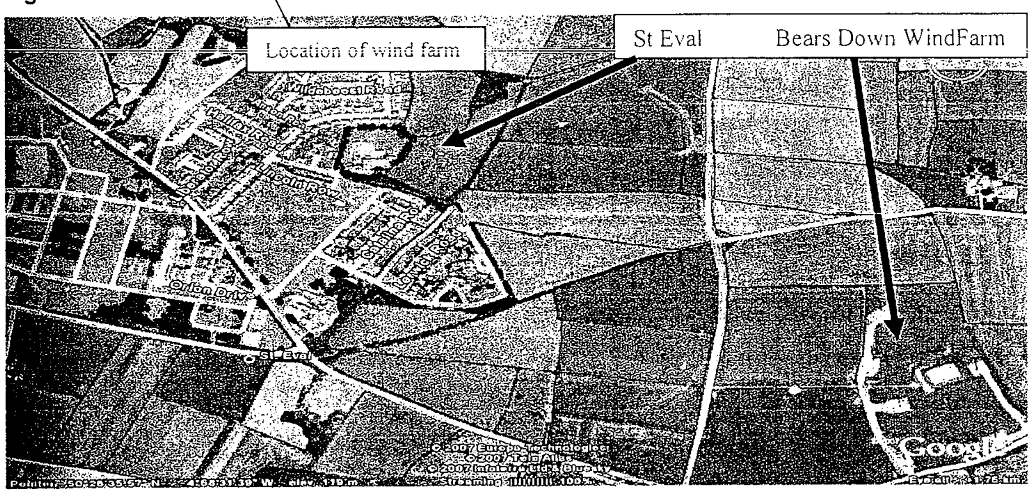


Figure 5: Aerial view of houses in St Eval using GIS

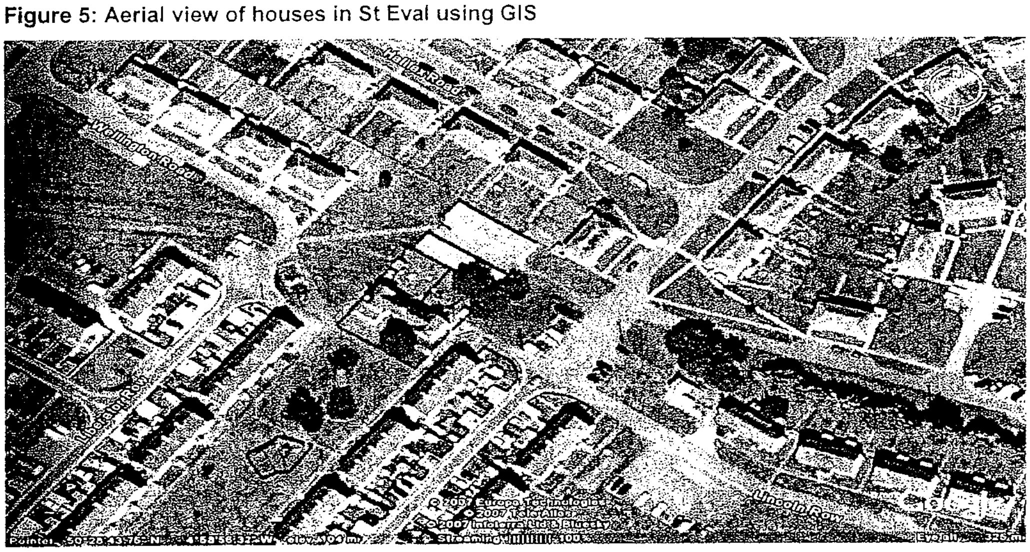


Table 1: Variables Used in the Analysis

Variable Name	Variable Type	Explanation of the Values
TER	Dummy*	Type of property
SEMI	Dummy	Type of property
NOBED	Measurement	Number of Bedrooms
PGARAGE	Dummy	Presence of a garage
POFFROAD	Dummy	Designated car parking available in driveway or off road
PONROAD	Dummy	No designated parking space
MONTH	Measurement	Month of sale
YEAR	Measurement	Year of sale
QUARTER	Dummy	Inflation multiple based on quarterly sales data from Halifax house price index
ADJPRICE	Measurement	Seasonally adjusted house price for aggregating data
DISTMETRE	Measurement	Distance to the nearest turbine in metres
FVISTA1	Dummy	Vista from front of house =Houses
FVISTA2	Dummy	Vista from front of house =Field
FVISTA3	Dummy	Vista from front of house =Countryside
FVISTA4	Dummy	Vista from front of house =Sea
RVISTA1	Dummy	Vista from rear of house =Houses
RVISTA2	Dummy	Vista from rear of house =Field
RVISTA3	Dummy	Vista from rear of house =Countryside
RVISTA4	Dummy	Vista from rear of house =Sea
FWF0	Dummy	No view of windfarm from front of house
FWF1	Dummy	Partial or full view of 1 turbine
FWF3	Dummy	Partial or full view of more than 3 turbines from the front of house
FSCREENV	Dummy	View of turbines screened at front of house
FSIDEV	Dummy	Side view of turbines from the front of house
FFACINGV	Dummy	Facing view of turbines from the front of house
RWF0	Dummy	No view of windfarm from the rear of house
RWF3	Dummy	Partial or full view of more than 3 turbines from the rear of house
RFACINGV	Dummy	Facing view of turbines from the rear of the house
LNPRICE	Measurement	Natural log of adjusted price

*A dummy variable is a numerical variable used in regression analysis to represent subgroups of the sample in this study. For instance, a detached house would be given a value of 1 in the variable 'Det' and 0 in the variables 'Semi', 'Flat' and 'Terraced'.

Figure 6: One-Sample Kolmogorov-Smirnov Test- dependent variable= adjusted price (ADJPRICE)

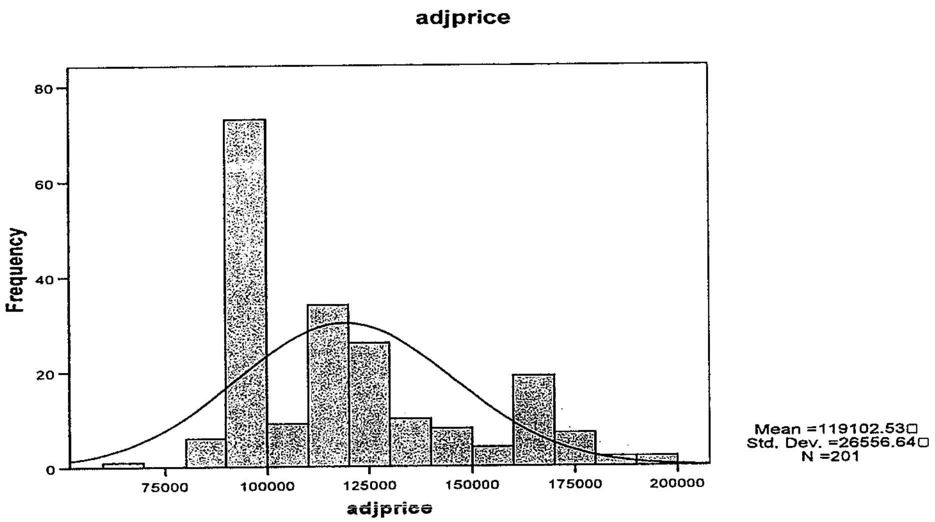
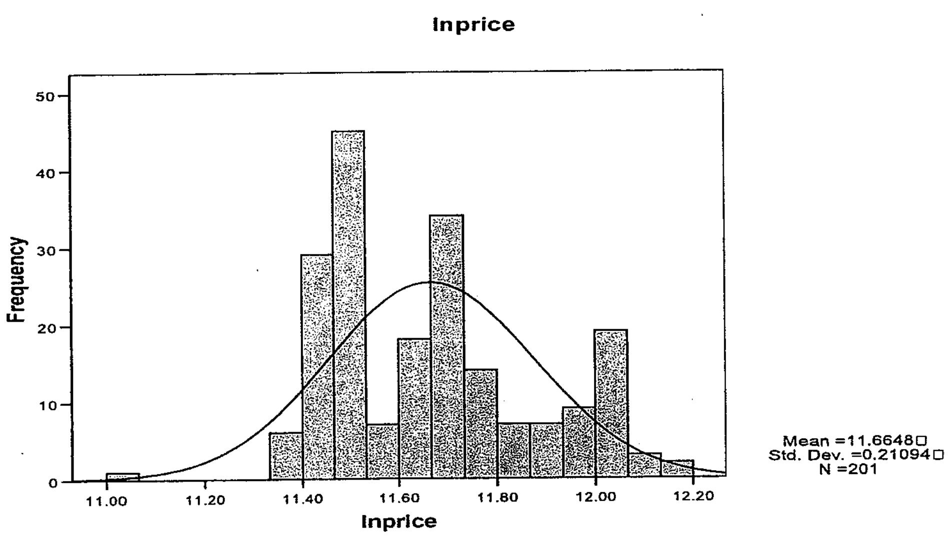


Figure 7: One-Sample Kolmogorov-Smirnov Test- dependent variable= natural log of adjusted price (LNPRICE)



Model 1: Standard log linier regression. Dependent Variable: Inprice

Model 1 Adj R2 .509	Unstandardized Coefficients *B*	Std. Error	Standardized Coefficients Beta	t	Significance *(P)*
(Constant)	11.509	.431		26.693	.000
FVISTA2	-.194	.058	-.438	-3.364	.001
RVISTA2	-.224	.079	-.211	-2.835	.005
RVISTA3	.181	.059	.171	3.094	.002
RVISTA4	-.121	.051	-.181	-2.365	.019
FSCREENV	-.118	.065	-.143	-1.811	.072
RFACINGV	.108	.051	.229	2.109	.036
TER	-.046	.026	-.111	-1.771	.078
NOBED	.272	.029	.695	9.457	.000

Model 2: Stepwise log-linier Regression. Dependent Variable: Inprice

Model 2 Adj R2 .461	Unstandardized Coefficients *B*	Std. Error	Standardized Coefficients Beta	t	Significance *(P)*
(Constant)	11.121	.067		166.630	.000
NOBED	.234	.026	.599	9.079	.000
RVISTA3	.170	.058	.161	2.955	.004
RVista4	-.120	.039	-.180	-3.080	.002
RVISTA2	-.117	.057	-.110	-2.061	.041
TER	-.052	.026	-.127	-2.020	.045

6.0 BIBLIOGRAPHY

Bond S. (2003) 'The Impact of Cellular Phone Base Stations n Property Values' Paper presented at the European Real Estate Conference in Helsinki 2003.

Climate Change Communications Strategy Document prepared by Futurra Feb 2005 for DEFRA

Colwell P. (1990) 'Power Lines and land Value' *The Journal of Real Estate Research* American Real Estate Society. Vol.,5 No1 Spring. 1990

Dear M. (1992) 'Understanding and Overcoming the NIMBY Syndrome' American Planning Association Journal. Vol 58. Summer. pp288-300

DeLisle 1985, 505 cited in Jaconetty T. A (1996) 'Stigma Phobias, and Fear: Their Effect on Valua' Assessment Journal. 1996 3. (1): 51-67

DTI (2003) 'Our Energy Future- Creating A Low Carbon Economy'. Energy White Paper, www.dti.gov.uk/energy/whitepaper

Fleming M.C., and Nellis J.G. (1997) The Halifax House Price Index: Technical Details Customer Information. Halifax plc.

Grover, S (2002) 'Economic Impacts of Wind Power in Kittitas Country'. ECO Northwest. Portland. USA

Hopkins J. (1999) 'Not in My Back Yard Syndrome': The Effect of NIMBYs on Residential Property Value *Australian land Economics Review,* Vol. 5, No. 2, 1999

Impact Assessment Unit (2003) 'Public Opinion on the Impact of the Proposed Westmill Farm Wind Farm, Watchfield, Oxfordshire.' Report prepared by the Impact Assessment Unit Oxford Brookes University School of Planning 2003

Jørgen Jordal Jørgensen AKF, (1996) 'Social Assessment of Wind Power: Visual Effect and Noise from Windmills-Quantifying and Valuation'. Report found at www.akf/dk/eng/wind0.htm

Kauko T. (2002) 'Modelling the Locational Determinants of house prices: neural networking and value tree approaches' Labor Grafimedia b.v.-Utrecht.

Keay M, (2005) Wind Power in the UK: Has the Sustainable Development Commission Got it Right? May 2005 Oxford Energy Comment, Oxford Institute for Energy Studies.

Keeney, R.L. (1980) 'Siting Energy Facilities' Academic Press. New York

Kinnard W. H. Jr & Worzala E. (1996) 'A Study Into the Attitudes and Policies of Institutional Investors and lenders Towards On-site and Nearby Property Contaminants' Colorado State University. Unpublished Paper

Milner C. (2004) 'Wind farms 'make people sick who live up to a mile away' Daily Telegraph 25/01/2004

Newton M. and Harwood O. (2005) 'Windfarms- asset or eyesore? *Country Landowner* November 2005 pp16-17.

Priestly T. and Ignelzi P.C., (1989) 'A Methodology For Assessing Transmission Line Impact in Residential Communities'. Edision Electric Institute, Washington DC, June 1989.

RICS (2004) 'Impact of Wind Farms on the Value of Residential Property and Agricultural Land'. Royal Institute of Chartered Surveyors (RICS), 2004

Ross Clark (2004) 'An Ill Wind Blowing?' The Daily Telegraph. London (UK): Feb 14, 2004. pg. 01.

Rossini P., Marano W., Kupke V. and Burns M. (2002) 'A Comparison of Models Measuring the Implicit Price Effect of Aircraft Noise'. Paper presented at the PRRES Conference in Brisbane, Australia.

Sagrillo M. (2003) 'Putting Wind Power Effects on Birds into Perspective' American Wind Energy Association (AWEA) 2003

Scottish Executive- Mori Poll on public attitudes towards wind farms. www.scotland.gov.uk

Seley, J.E. (1983) 'The Politics of Public Facility Planning' Lexington Books. Toronto, U.S.A.

Sims S. (2003) 'The Effect of Electricity Distribution Equipment on the UK Residential Property Market' Paper presented at the Pacific Rim Real Estate Society Conference. 2003. Melbourne, Australia.

Sims S. and Dent P. (2005) "High Voltage Overhead Power Lines and Property Values: a residential study in the UK" *Urban Studies* Vol. 24 No. 4, pp 665-94

Sims S. and Dent P. (2007) "Property stigma: wind farms are just the latest fashion" Journal of Property Investment & Finance, Vol. 25 No. 6, 2007.

Sims S. and Reed R. (2005) 'Windfarms, Powerlines and Phone Masts: The Changing Face of Stigma' Conference Paper presented at the 12th Annual European Real Estate Society Conference. 15 - 18 June 2005 – Dublin, Ireland

Sterzinger, G., Beck, F. and Kostiuk, D. (2003) *The Effect of Wind Development on Local Property Values.* Renewable Energy Policy Project (REPP). Washington. USA

The Green Party's Alternative Energy Review March (2003) Dr David Toke and David Olivier. Published by Spencer Fitz-Gibbon London. Available at www.greenparty.org.uk/files/reports/2003

Theriault M., Rosiers F.D., Joerin F., Menetrier L., Gosselin M.L and Villeneuve P. (2003) 'Modelling the Impact of Accessibility to Services on House Prices: A Comparative Analysis of Two Methodological Approach' Paper presented at the European Real Estate Conference in Helsinki 2003.

Weightman F. (1995) 'Planning for Wind Power'. Friends of the Earth. London.

WEBSITES

www.countryguardian.co.uk

www.countryguardian.net/Manifesto.htm

www.greenparty.org.uk

www.dti.gov.uk

www.defra.gov.uk

www.bwea.com

www.bwea.com/ref/faq

www.propertypod.co.uk

www.owen.eru.rl.ac.uk

www.dti.gov.uk/energy/whitepaper/page39534.html

www.bbc.co.uk/radio4/science/costingtheearth_20070830.shtml Accessed 7-11-07

www.bbc.co.uk/radio4/science/costingtheearth_20070830.shtml Accessed 7-11-07

www.countryguardian.net/Costing%20the%20earth.htm

www.countryguardian.net

EXECUTIVE SUMMARY

Client

Mr. Jeremy A. Fielding
Lynn, Tillotson & Pinker LLP
7500 North St. Paul Street, Suite 1400
Dallas, Texas 75201

Property Identification

Eight properties in Cooke and Montague Counties, all located within eight miles of the town of Muenster, Cooke County, Texas 76252

Purpose of Appraisal/Property Rights Appraised

The purpose of our appraisal is to estimate the fee simple, hypothetical market value of the subject properties under the following scenarios:

1. As if the proposed Wolf Ridge wind farm was not to be constructed.

2. As if the proposed Wolf Ridge wind farm was complete according to specifications.

Extraordinary Assumptions and Limiting Conditions

1. It is an extraordinary assumption that the information and data within the report are materially accurate and complete. If not, our opinions may be different from those contained therein. Significant data provided to us include, but are not limited to, proposed turbine locations and turbine specifications.

2. The value estimates assume the stated site and improvement sizes as reflected in Cooke and Montague County appraisal district records are correct. Any variance from the stated sizes may alter the value estimates.

3. It is specifically assumed that subject properties are not impacted by any environmental conditions that would be detrimental to the usage of the properties. The appraiser was not provided with any environmental site assessments of subject properties.

Extraordinary Assumptions and Limiting Conditions (cont.)

4. We were provided with a Sound Level Measurement Report prepared by Epsilon Associates, Inc. that projects noise levels resulting from the proposed Florida Power & Light Company wind turbines to be constructed in Cooke County. We were also provided with a Sound Level Measurement Report, prepared by Epsilon Associates, Inc., of the Horse Hollow Wind Farm owned by Florida Power & Light Company in Taylor County. Verification of the data is beyond the expertise of the appraiser. Hence, reliance has been placed upon studies provided by our client. Any variation from the estimated noise levels may impact our opinions of market value.

Dates of Report Preparation May – August 2008

Effective Date of Valuation May 24, 2007

Date Appraiser Viewed Property May 24 and July 6, 2007

Personal Property/Non-realty Included in Valuation None

Estimated Market Values

Tract as Referred to Herein	Physical Location	Acres	Opinions of Market Value		Resulting Damage of Wind Farm
			As if Wind Farm Not Constructed	As if Wind Farm Constructed As Planned	
Klement 2	SWC of CR-424 and CR-427	83.68	$350,000	$350,000	$0
Klement 3	NWC of CR-424 and CR-457	160.00	425,000	425,000	0
Stoneledge Ranch	SEQ of CR-414 and CR-477	400.00	1,460,000	1,460,000	0
Walterscheid 4	N of intersection of FM-373 and CR-450	20.67	1,300,000	1,300,000	0
Walterscheid 6	SEQ of CR-414	186.75	890,000	890,000	0
Walterscheid 8	N of CR-424, between CR-431 and CR-457	138.83	355,000	355,000	0
Lucas	Largely east of FM-677, between Field and Littlefield Roads	570.00	1,245,000	1,245,000	0
O'Dell	SEQ of US-82 and FM-1198	287.31	1,110,000	1,110,000	0

CERTIFICATION

I certify that, to the best of my knowledge and belief:

- The statements of fact contained in this report are true and correct.
- The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are my personal, impartial, and unbiased professional analyses, opinions, and conclusions.
- I have no present or prospective interest in the property that is the subject of this report and no personal interest with respect to the parties involved.
- I have no bias with respect to the property that is the subject of this report or the parties involved with this assignment.
- My engagement in this assignment was not contingent upon developing or reporting predetermined results.
- My compensation for completing this assignment is not contingent upon the development or reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal.
- The reported analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the requirements of the Code of Professional Ethics & Standards of Professional Appraisal Practice of the Appraisal Institute, which include the Uniform Standards of Professional Appraisal Practice.
- The use of this report is subject to the requirements of the Appraisal Institute relating to review by its duly authorized representatives.
- Mr. Crosson made a personal inspection of the properties that are the subject of this report.
- Mr. Dennis Young, assisted in demographic analysis and comparable sale verification, and Mr. Paul Agruso assisted in market analysis, research, and data analysis. Mr. Gavin Mogan assisted in valuation analysis and report writing. Mr. Chris Cavanagh, Ph.D., provided assistance with statistical modeling and analyses. No one else provided significant real property appraisal assistance to the person signing this certification.

- As of the date of this report, Mr. Crosson has completed the continuing education program of the Appraisal Institute.

Stephen T. Crosson, MAI, SRA, MRICS
Appraiser

From: Charles Schriber [mailto:cschriber@mhtc.net]
Sent: Tuesday, March 10, 2009 9:33 AM
To: 'Ted Weissman'
Subject: RE: Thank you

Ted:

In regard to the sales in Eden Township they look positive. I have attached the sales for the past few years and the one that is highlighted in red sold twice and is about a half mile away from the towers and has a full view. County Road B runs parallel to US HWY 18 and the wind towers are located in between; and as you can see from the attached there are a few sales on County B. If you would like to discuss any sale further just give me a call. In my opinion the Montfort Wind Farm has not negatively affected the property values in Eden Township.

Thanks,

Charles Schriber
Town Of Eden Assessor

TOWN OF EDEN SALES

2004

SELLER	BUYER	PRICE	ACRES	ADDRESS	TYPE
DAVID BEAMAN	WM CROWLY	$ 270,000.00	50	CAVE HOLLOW	DWELLING
BRIAN WELSH	KEVIN HILDRETH	$ 32,500.00	2.8	BADGER HOLLOW	OPEN
DONALD SCHULT	CATHERINE WEINKES	$ 63,500.00	3.7	MONTFORT	OPEN
ROBERT MITCHELL	JENNIFER THOMAS	$ 196,500.00	6.6	CTH B	DWELLING
ROBERT MITCHELL	DAVID FAULL	$ 180,000.00	60	CTH B	OPEN
SHIRLEY SMART	TIMOTHY WIEGAL	$ 460,000.00	160	CTH B	FARM
VONALLMEN TRUST	DON CAMPELL	$ 20,400.00	5.1	BERG RD	OPEN
JIM SMITH	LFL LLC	$ 83,100.00	24.2	BERG RD	OPEN
JIM SMITH	DUANE OLSON	$ 60,500.00	4.89	BERG RD	OPEN
VONALLMEN TRUST	MIKE SHEA	$ 22,600.00	5.6	BERG RD	OPEN

2005

SELLER	BUYER	PRICE	ACRES	ADDRESS	
MICHAEL SEMINICK	MARK LAUFENBERG	$ 140,000.00	40.2	WOLNEC RD	OPEN LAND
GRIMM TRUST	JESS SCHMELZER	$ 723,810.00	314.7	TOWER RD	FARM
DAVID BEMAN	STEVE LINCHIED	$ 352,500.00	150	CAVE HOLLOW RD	OPENLAND
MARK EDGINGTON	SEARLS-DANIELS	$ 700,000.00	161	EDGIINGTON RD	FARM
SHARON PHILLIPS	TED DOWELL	$ 147,500.00	2.3	20STH 18	DWELLING

SELLER	BUYER	PRICE	ACRES	ADDRESS	TYPE
BOB BISHOP	DOUGLAS TREMELING	$ 90,000.00	1.91	1234 CTH B	DWELLING
TIM WEIGEL	THOMAS SHAULL	$ 725,000.00	160	1289 CTH B	FARM
SANDRA FOREMAN	KATHERYN FRY	$ 249,900.00	98	860 WILLOW SPRINGS	OPEN LAND

2006

SELLER	BUYER	PRICE	ACRES	ADDRESS	TYPE
MARK THOMAS	KEN MOEN	$ 68,000.00	27	BADGER RD	OPEN LAND
DELMAR HENDRICKSON	SCOTT GODFREY	$ 255,000.00	21	CTH BH	DWELLING
MIKE SEMINICK	JAMES ROACH	$ 417,000.00	40	HARMS RD	DWELLING
KATHERYN FREY	MIKE PEAT	$ 130,000.00	40	WILLOW SPRINGS RD	OPEN LAND

2007

SELLER	BUYER	PRICE	ACRES	ADDRESS	TYPE
KATHERYN FREY	LLOYD MOEN	$ 155,000.00	58.7	WILLOW SPRINGS	OPEN
MERLIN GORSLINE	DON LEIX	$ 240,000.00	79.1	STH 18	OPEN
JAMES BALLARD	DENNIS TRACE	$ 8,500.00	2.2	BERG RD	OPEN
MIKE SEMINICK	NICK HOFFMAN	$ 300,000.00	100	HARMS RD	OPEN
JEAN ANN PINKEPANK	STEVE ESSER	$ 1,056,000.00	320	CTH B	FARM

2008

SELLER	BUYER	PRICE	ACRES	ADDRESS	TYPE
BOB BISHOP	TIM SHEMAK	$ 80,000.00	10	1238 CTH B	LAND & BUILDINGS
WHISKEY HOLLOW	WILIAM CROWLEY	$ 50,500.00	16.8	STEPHENS RD	LAND