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High-voltage Overhead Power Lines and Property Values: A Residential Study in the UK

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Summary. The effect of electricity distribution equipment, in particular high-voltage overhead transmission lines (HVOTLs), on the value of residential property in England remains relatively unexplored due, in part, to the lack of available transaction data for analysis. This paper compares the results of two UK studies undertaken by the authors. The first is a national survey of property valuers' perceptions (Chartered Surveyors and members of the National Association of Estate Agents) of the presence of distribution equipment in close proximity to residential property. The results from this study are then compared with an analysis of transaction data from a case study in Scotland. This paper presents the initial findings from these studies.

Introduction

The UK government's policy of using inner-city brownfield land or 'adding on' to existing residential estates for at least 60 per cent of its proposed new housing,[1] has encouraged the continued use of land crossed by electricity distribution lines for residential development. However, it may be that, due to the demand for new property, value effects from proximate high-voltage overhead transmission lines (HVOTLs) are often not apparent until new property comes up for resale (Dent and Sims, 1998, 1999). Due to the lack of available property data, in particular transaction data, determining the potential impact on value has been severely frustrated within the UK and, as a result, research has either not been undertaken or has concentrated on establishing opinions towards such features rather than value impacts (Gallimore and Jayne, 1999; Jayne, 2000; Syms, 1996).

Whilst qualitative analysis has been used to establish the opinions, attitudes and perceptions of buyers towards HVOTLs, the reliability of the results has often been questioned due, in particular, to the frequent discrepancy between stated buyer behaviour and actual buyer behaviour (Kroll and Priestley, 1992; Kinnard and Dickey, 1995). By comparison, the use of attitude surveys to determine valuers' opinions of the impact of environmental features on house prices, has been found to be surprisingly accurate (Bond and Hopkins, 2000) when compared with an analysis of transaction data from the same location.

This paper examines the use of qualitative analysis as an alternative method of determining the impact of HVOTLs on residential property values, by comparing the results of an attitude survey, specifically designed to establish the perceptions of chartered surveyors and estate agents towards the impact of HVOTLs on value, with the results of a case study in Scotland where transaction data are available for analysis.[2] Establishing the validity of a methodology to determine

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whether such an impact exists, and to what extent value is affected, would benefit

– developers when planning residential schemes;
– property professionals when conducting valuations;
– buyers who may be concerned about the future value and marketability of their property; and
– the electricity utilities.

The latter category are currently designing their own planning guidelines for future residential developments in an effort to reduce any negative effects from the visual impact of distribution equipment.

Background

The presence of high-voltage overhead power lines in proximity to residential property has been the subject of periodic media attention since the mid 1980s, following the reported link between a number of adverse health effects and living in close proximity to power lines. This association remains unsubstantiated by scientific evidence and consequently no legislation exists within the UK to restrict the development of land where HVOTLs are sited. The only limitation on new development has been statutory safety clearances and as a result "a large amount of residential development has been carried out . . . beneath and adjacent to overhead lines".[3] However, there has recently been a noticeable change in the way this type of land is developed for residential use. Prior to the late 1990s, there appeared to be little or no difference between the type of property built near HVOTLs and that built further away, often out of sight of either line or pylon. However, recent discussion undertaken as part of this work with local planning authorities, developers, valuers and agents indicates that now developers often place low-cost and social housing closest to the line and use screening or power line corridors similar to those found in the US or Canada. From his own research in the 1960s, Kinnard (1967) observed that developers in the US showed a tendency to place low-cost housing closest to lines or pylons, which he suggested was indicative of a belief on the part of the developer of an association between HVOTLs and value diminution; however, there is no evidence available to substantiate this. In addition, it has been suggested that public perception of an association between living near HVOTLs and adverse health effects (RICS, 1996; Gallimore and Jayne, 1999; Jayne, 2000) may also have a negative impact on the value and desirability of proximate residential property. To date, little or no attempt has been made within the UK to determine whether or not negative public perception translates into lower values or longer marketing periods. Arguably, this may be due to the difficulty in obtaining the data necessary for such an analysis.

Transaction data are, however, available for properties sold within Scotland, enabling a comparison to be made between the results from an analysis of transaction prices for property at varying distances from HVOTLs and the results of a national opinion survey to determine the perceptions of valuers and agents towards the impact of HVOTLs on value, marketing time and land use. By comparing the results of a perceptual study with those from a quantitative analysis of transaction data, using a hedonic approach to disaggregate house prices into their constituents statistically (Fleming and Nellis, 1997), it was theorised that it would be possible to determine whether professional perceptions of the effect on the market value of property proximate to HVOTLs, reflected reality.

Existing Literature

The main body of research carried out to determine the effects of HVOTLs on the property market has come from the US where power lines are generally situated in a 'right of way' (ROW), a corridor of land where construction is prohibited. This means that property adjacent to a 'ROW' has the benefit and enjoyment of this extra land. In the UK, there is no recommended ROW and property can be and is being built directly beneath

HVOTLs making comparisons between the US and the UK markets unreliable. Other more recent studies conducted in New Zealand (Callanan and Hargreaves, 1995; Bond, 1995; Bond and Hopkins, 2000), where HVOTLs cross over residential property, are more relevant to the UK market.

In countries where transaction data are available for analysis, research has suggested that the presence of distribution equipment may have a detrimental impact on the value of proximate residential property.[4] The results, however, are mixed with some studies suggesting no real value effects and others finding significant value diminution and even blight.[5] Kroll and Priestley (1992) found that around half the studies they reviewed and analysed had no negative value effects. They were also critical of the poor methodology generally used[6] and the fact that many case studies used too few properties to produce a meaningful result. Studies reporting a negative market reaction tend to suggest that it was not the health and safety issues that influenced the market but other factors such as unsightliness, visual and aural pollution. It was these elements which proved to be more successful in court action, especially in the US for claims of diminution of market price, increase in marketing time and decrease in sales volume (see Kinnard and Dickey, 1995). Other studies have chosen not to speculate on the cause of value diminution due the difficulty in separating negative value effects from the visual impact with those from perceived health risks resulting from the presence of the HVOTL (Gregory and von Winterfeldt, 1996; Mitteness and Mooney, 1998). This, therefore, suggests that, despite similar health factors, underground cables (using the same route as overground) would be unlikely to have a significant effect on value.

Valuation studies using robust methodology, such as econometric modelling or regression analysis (Priestley and Ignelzi, 1989; Colwell, 1990; Callanan and Hargreaves, 1995; Bond and Hopkins 2000; Rosiers, 1998, 2002; Peltomaa, 1998, 2001; Kauko, 2002) have produced a greater degree of reliability. These tend to indicate a general reduction in mean house values of between 2 and 10 per cent, with value diminution ranging from 1 to 6 per cent at around 62 metres from the HVOTL increasing to 6–9 per cent at a distance of 15 metres. A pylon appears to have an even greater negative impact (Callanan and Hargreaves, 1995; Hamilton and Schwann, 1995; Bond and Hopkins, 2000; and Rosiers, 1998) reducing value by as much as 27 per cent (Bond and Hopkins, 2000).

On the other hand, the presence of an HVOTL in a ROW can provide some benefits to an individual home-owner which could cancel out any inconvenience. For example, Rosiers (2002) highlights the "enlarged visual field, [and] increased intimacy" available to property abutting a ROW. In a study by Saint Laurent (1996; cited in Rosiers, 2002) it was argued that benefits such as increased privacy and a green corridor can outweigh concerns about possible health risks. Rosiers (2002) highlighted the importance of identifying and including variables that not only measure physical proximity to HVOTLs but also the visual encumbrance of HVOTL supporting pylons and the visual impact of surrounding environmental features. The use of an hedonic approach to identify and analyse the individual property characteristics and locational factors that make up the total house price remains the most reliable tool for measuring environmental negative externalities (Rosiers, 2002).

Perceptual Studies

Perceptual studies investigating public and professional attitudes towards HVOTLs have produced mixed responses. Early studies using basic attitude surveys to determine compensation in eminent domain cases generally found the public concerned with overt effects such as visual unsightliness, noise and loss of amenity due to land use restriction. There were some financial and health and safety concerns (Bigras, 1964), such as 'difficulty in obtaining mortgage financing' or physical danger from 'falling wires', but these were rarely cited as factors contributing to value loss or reduced demand for residential property situated close to HVOTLs. Studies conducted before 1979 (mainly sponsored by electricity supply companies) did not have the association with a possible health risk to contend with and, therefore, in some respects should have resulted in a clearer indication of the particular features or aspects of HVOTLs that might cause a negative impact on the value or marketing of nearby property. However, there has been some general criticism of the methodology used in these early studies. This criticism principally concerned the fact that regression analysis was not widely used to test the data and, in addition, plot size variables were not included. This, together with the perceptions of bias associated with electricity-utility-funded research, raises concerns over the validity of the results. Despite this, the general conclusions did, in fact, indicate some negative attitudes (professional and public) towards the presence of HVOTLs.

Kroll and Priestley's (1992) comprehensive literature review of studies (value and opinion) conducted before 1990, for the Edison Electricity Company, gave them access to many previously unpublished papers and technical reports. These, in themselves, therefore must be treated with a degree of caution and the results considered in the context of other more 'objective' and 'testable' studies. Nevertheless, Kroll and Priestley identified nine attitude studies they considered methodologically sound which either focused specifically on the perceptions of property value effects (Thompson, 1982; Kinnard *et al.*, 1984; Ball, 1989) or looked at a wider range of effects on amenity including property values, health, safety and aesthetics (Mitchell *et al.*, 1976; Boyer *et al.*, 1978; Market Trends, Inc., 1988; Rhodeside and Harwell Inc., 1988; Economics Consultants Northwest, 1990; Beauregard Consiel, Enr., 1990). Attitude studies at this time were generally undertaken in conjunction with a valuation study and usually found that the population had either little or no knowledge of any possible health risks associated with living in proximity to HVOTLs. Despite variations in the type of property studied, the location for the study and the questionnaire design, it was possible to draw some general conclusions about attitudes towards HVOTLs. For instance, buyers who had purchased their property before the line was built, expressed greater negativity towards the presence of HVOTLs. There appeared to be a general perception of negative value effects although screening was found to reduce negative attitudes. However, attitudes towards the effect on value and marketing were mixed and appeared to reflect personal feelings rather than be substantiated by fact (Bigras, 1964; Boyer *et al.*, 1978; and Carll, 1956).

Studies within the UK have focused on opinion-based surveys (Gallimore and Jayne, 1999; Syms, 1996; Dent and Sims, 1998; Sims, 2002) and hypothetical valuations (Dent and Sims, 1999). These have generally supported findings from other countries—namely, that the presence of power lines and in particular the pylon (tower) does have a negative effect on residential property values, although some results have suggested that any value diminution may be the result of overcautious professionals (valuers and surveyors), rather than a market-led response (Gallimore and Jayne, 1999).

The dichotomy between public opinion and actual behaviour when faced with a real situation was one of the major criticisms of qualitative analysis as a reliable determinant of likely public response to environmental features (Slovic, 1992; Kroll and Priestley, 1992). This led to the use of psychometric testing (Slovic, 1992), which identified a number of factors or 'heuristics' that could account for this dichotomy. Psychometric testing of public and professional perceptions towards a variety of environmental factors including HVOTLs (Slovic, 1992; Coy, 1989) have found that the presence of electricity distribution equipment in proximity to residential property, can stigmatise property in the same way as a known contaminant (Arens, 1997).[7]

More recent attitude studies have generally compared property professionals' attitudes and opinions (in particular valuers and agents) with those of home-owners, (either living in proximity to HVOTLs or further away) in an attempt to determine the likely market resistance from buyers and the degree to which valuers perceived such market resistance would impact on value. Whilst attitudes were generally negative, they often highlighted differences between the degree of negativity expressed by each group. Dent and Sims' (1999) study of the UK market indicated that, whilst both buyers and surveyors view electricity distribution equipment as a contaminant, buyers are more concerned about the visual and health aspects than surveyors. Kung and Seagle's (1992) study of home-owners' opinions found that most people who responded to their attitude survey were not aware of any link between HVOTLs and adverse health effects. When asked whether knowledge of potential health risks would have made any difference to their purchase decision, predictably most said they would either have negotiated a lower price or would have purchased in another location. However, this was a very small survey of only 80 households in 2 adjacent neighbourhoods (one proximate to HVOTLs). Bond (1995) found that residents close to HVOTLs had more negative attitudes than those further away and real estate sales persons (estate agents) appeared to have perceived the HVOTLs more negatively than the valuers. Interestingly, when asked to express their negativity in value terms, both groups suggested a similar reduction of around 10 per cent. This is much less than expected in view of the degree of negativity expressed by the residents. This may suggest that negative opinions are not always reflected in lower property prices. By contrast, their estimation of value diminution was found to be surprisingly accurate when compared with an analysis of transaction data for the same location (Bond and Hopkins, 2000).

Summary

A review of the related literature highlighted a number of factors that should be considered prior to undertaking a similar study within the UK. First, residential perceptual studies were generally considered to be unreliable and had been found to raise public awareness of the issues associated with living near HVOTLs (Coy, 1989; Morgan *et al.*, 1985; Gallimore and Jayne, 1999). These principally centred on potential health risks, impacts on future value and marketability and the difficulty in obtaining finance. In themselves, therefore, they had the potential to *increase* negative attitudes towards HVOTLs and, in turn, reduce both the number of willing buyers and the value of proximate property. By comparison (with the exception of early attitude studies), obtaining the opinions of valuers and agents appeared to produce a fairly reliable and accurate assessment of market value. The issue of valuer-induced circularity was addressed by Gallimore and Jayne (1999) who concluded that this would only occur if valuers perceived a greater negative impact on the value of proximate property than potential buyers.

Secondly, where transaction data are available, the most reliable method of analysis is to use an hedonic approach. This involves the selection of a number of property-specific and external variables; establishing a model; determining the parameters and then evaluating the result using multiple regression analysis (Kauko, 2002). Rosiers suggested that in addition to property-specific and HVOTL-specific details, variables should include the degree of visual encumbrance caused by the presence of HVOTL and its supporting structures and, the potential impact of other environmental features such as the landscape and surrounding topography since these features have the ability to either enhance or reduce negative externalities (Rosiers, 2002).

Valuation Study

Methodological Approach

Having considered the methodological approaches adopted in the literature and currently used to determine the National House Price Index in the UK, the use of an hedonic approach and an inflation index was considered appropriate to calculate the present value with data obtained at the micro-spatial level. The results were then analysed using multiple regression and correlation analyses.

Case Study Location

Due to the unavailability of property transaction data in England, a suitable site was located in Scotland (Appendix 2) where property transaction prices are recorded and available for analysis. There are no claims that this case study area is representative of all such sites, but its use is an attempt to highlight some of the issues identified in the literature which are pertinent to the on-going debate.

Variable Selection and Data Collection

The model was to use a combination of property-specific, HVOTL-specific and location-specific characteristics. However, obtaining property-specific data proved more difficult than was anticipated. Whilst the Scottish Property Register (Register of Sasines) held details of each property transaction (the date of sale, buyer and seller), it did not collect data on property-specific characteristics. As virtually all property in the study area had been constructed in 1994 or 1995, developers no longer held records of individual house types and the North Lanarkshire Planning Department held only limited information which had been archived, making access difficult. Using information gained from plot maps and three visits to the site, sufficient property details were obtained which, whilst not ideal, provided enough data to enable an analysis to be undertaken (Table 1).

Analysis

Multiple regression analysis was performed using linear, log and squared functional forms, in addition to a comparison of the mean values relative to physical proximity to both line and pylon and the visual encumbrance experienced by each property. A correlation matrix (Appendix 3) revealed that the variables representing distance to the line and the pylon, in all functional forms (*M.LINE/M.PYL, LGLINE/LGPYL, SQLINE/SQPYL*), were highly correlated and problems of multicollinearity (Flemming and Nellis, 1997) would occur if they were included in the same regression analysis.[8]

Data were checked for outliers (extreme values) for each year providing an early indication that HVOTLs, pylons in particular, had a negative impact on value. This was unexpected since early interviews with property professionals had indicated that due to demand for new property the impact of a HVOTL did not become apparent until property was resold. Analysis of the outliers (total = 13) revealed that 8 detached and 5 semi-detached new houses had been sold for prices between £17 000 and £29 900 during October 1994 and September 1996 which was less than half the price paid for similar property sold during that period. (The mean value of all property sold during that time was £66 866.62). A telephone interview with a Planning Officer from the North Lanarkshire Planning Department (March 2003) confirmed that developers of the Blackwood estate found some property particularly difficult to 'get rid of' due to the HVOTL. Since all property sold during that period was new, and built by the same developer, it was unlikely that value diminution was caused by variations in house design or condition. Analysis showed that all outliers, with one exception, were sited within 100 metres of a pylon or line and had a view of 1 or more pylons. These properties were therefore excluded from the rest of the analysis.

In all models, one dummy variable from each dummy set was excluded for computational purposes, in order to avoid the problems of indeterminacy of the ordinary least-squares nominal equations. In Models 1–5, the variables constructed to represent a detached house (*DETACHED*) sited at least 400 metres away from a pylon (*DISTPYL9*) and having no view of either pylon or line (*VISPYL0, REARPYL0, FORSC, RORSC*) were excluded and therefore the unstandardised coefficients (*B*) in these models indicate the

Table 1. Variables used in the hedonic model regression analyses

Variable name	Variable type	Explanation of values
DH	Dummy[a]	Detached house
SH	Dummy	Semi-detached house
TH	Dummy	Terrace house
FH	Dummy	Flat
N.BEDRM	Measurement	Number of bedrooms
PARKING	Dummy	1 = presence of a garage; 0 = no garage
PLOTSIZE	Measurement	in square metres
VIEW	Dummy	1 = lake or fields giving a clear view of several pylons; 0 = other houses
DATESOLD	Measurement	month and year of sale
VALUE	Measurement	£ unadjusted selling price
INFMULT	Measurement	Based on the Halifax House Price Index inflation tables for Scotland
VALUENOW	Measurement	£ inflation-adjusted selling price using Halifax Price Inflation Table
MPYL	Measurement	Distance to line in metres from the centre of the house
MLINE	Measurement	Distance to line in metres from the centre of the house
DISTPYL1	Dummy	The property is 0–49 metres from the pylon
DISTLIN1	Dummy	The property is 0–49 metres from the line
DISTPYL2	Dummy	The property is 50–99 metres from the pylon
DISTLIN2	Dummy	The property is 50–99 metres from the line
DISTPYL3	Dummy	The property is 100–149 metres from the pylon
DISTLIN3	Dummy	The property is 100–149 metres from the line
DISTPYL4	Dummy	The property is 150–199 metres from the pylon
DISTLIN4	Dummy	The property is 150–199 metres from the line
DISTPYL5	Dummy	The property is 200–249 metres from the pylon
DISTLIN5	Dummy	The property is 200–249 metres from the line
DISTPYL6	Dummy	The property is 250–299 metres from the pylon
DISTLIN6	Dummy	The property is 250–299 metres from the line
DISTPYL7	Dummy	The property is 300–349 metres from the pylon
DISTLIN7	Dummy	The property is 300–349 metres from the line
DISTPYL8	Dummy	The property is 350–399 metres from the pylon
DISTLIN8	Dummy	The property is 350–399 metres from the line
DISTPYL9	Dummy	The property is more than 400 m away from the pylon
DISTLIN9	Dummy	The property is more than 400 m away from the line
VISLINE	Dummy	Line visible from the front of the house
REARLINE	Dummy	Line not visible from the rear of the house
VISPYL0	Dummy	Pylon not visible from front
REARPYL0	Dummy	Pylon not visible from rear
VISPYL1	Dummy	1/4 pylon visible from front
REARPYL1	Dummy	1/4 pylon visible from rear
VISPYL2	Dummy	1/2 pylon visible from front
REARPYL2	Dummy	1/2 pylon visible from rear
VISPYL3	Dummy	3/4 pylon visible from front
REARPYL3	Dummy	3/4 pylon visible from rear
VISPYL4	Dummy	1 pylon visible from front
REARPYL4	Dummy	1 pylon visible from rear
VISPYL5	Dummy	1 pylon and part of another visible from front
REARPYL5	Dummy	1 pylon and part of another visible from rear
VISPYL6	Dummy	2 or more pylons visible from front
REARPYL6	Dummy	2 or more pylons visible from rear
REARLINE	Dummy	1 = line visible from the front of the house; 0 = not visible
FORSC	Dummy	The property has a screened view of the HVOTL from the front

(*Table continued*)

Table 1. *Continued*

Variable name	Variable type	Explanation of values
FORS	Dummy	The property has a side view of the HVOTL from the front
FOR SF	Dummy	The property has a side-facing view of the HVOTL from the front
FORF	Dummy	The property has a facing view of the HVOTL from the front
RORSC	Dummy	The property has a screened view of the HVOTL from the rear
RORS	Dummy	The property has a side view of the HVOTL from the rear
RORSF	Dummy	The property has a side-facing view of the HVOTL from the rear
RORF	Dummy	The property has a facing view of the HVOTL from the rear

[a]Dummy variables allow the incorporation of variable with price may be related non-linearly; they are coded either 0 or 1 (for example, 0 = not visible; 1 = visible).

difference in value compared with a detached house at 400 metres away from the *HVOTL* having no view of either pylon or line.[9] (See Appendix 3, Table A4, for details of models.)

A series of linear regressions were performed, starting with property-specific characteristics (Model 1), which explained 57 per cent of the total house price and, as predicted, showed that all variables were significant. Including power-line-specific variables improved the model's ability to predict transaction price to 61 per cent and suggested that there was a positive correlation between distance from both line *METRELIN*[10] ($t = 7.958$ $p = 0.000$) and pylon *METREPYL* ($t = 7.558$, $p = 0.000$) and value, with values rising by £37 per metre indicating that a house at 400 metres could be as much as £14 800 more than a similar house sited next to a pylon (Model 2).

Adding in the visual impact of both the line and pylon from the front and rear of the property (Model 3) produced an interesting result. First, a view of a pylon from the rear of the house (*REARPYL*), or a view of a line (*VISLINE*) from the front of the house, had a significant and negative impact on value compared with a property having 'no view'. This impact was, however, not linear, with the greatest negativity observed on the value of homes having a 3/4 pylon view. In contrast, having a side view (*FORS*) of either pylon or line (compared with a screened view) or a rear view of the line (*REARLINE*) significantly increased value at the 0.05 level ($t = 2.099$, sig. $= 0.036$; $t = 2.742$, sig. $= 0.006$ respectively). This was a similar result to that observed by Rosiers' (2002) research in Canada and possibly indicated that an open view aspect or increased privacy had a positive effect on value.

The variable *VIEW* was constructed to account for property either having a view of the lake (53 cases), woodland (4 cases) or open countryside (19 cases). As the number of cases for each category was relatively small, property was either considered to have a *VIEW* or looked out onto other houses (517) therefore having no *VIEW*. It was hypothesised that having an open view, rather than a view of other property would reduce any negative impact from HVOTLs or pylons, as found by Rosiers (2002). However, this variable was not found to be significant.

Model 4 was calculated using stepwise regression analysis in which all variables must pass the tolerance criterion of 99 per cent to be entered in the equation. In addition, a variable is 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 prices in Blackwood indicated that both physical distance (*METREPYL*) and a rear view of 3/4 of a pylon (*REARPYL3*) had a significant and negative impact on selling price.

The models' ability to predict value was marginally reduced by squaring the distance to both line and pylon, although these variables remained significant (adjusted $R^2 =$ 6.23, $f = 87.66$, $t = 7.396$, sig. = 0.000). The models' ability to predict value was marginally improved (a 1 per cent increase) by using log-transformed variables (*PLOTSIZE, M.PYL, M.LINE*). In this model (Model 5), the number of significant power line variables increased with variables representing both slight and prominent views of a pylon becoming significant (*REARPYL6*, *REARPYL1*). In addition, a rear view of the line (*REARLINE*) and a side view (*FORS*) of the HVOTL from the front of the house had a positive impact on value compared with either 'no view' or a 'screened view'. Whilst the significance of log-transformed plot size (*LOGPLOT*) and distance to pylon (*LOGMPYL*) remained the same, the *T*-value for the impact on value in relation to the distance from the pylon (*LOGMPYL*) increased from −7.732 to −8.131.

Whilst using an unencumbered property as a basis for calculating the impact of a HVOTL on value seemed to be the most logical choice, calculations were performed to test the effect of excluding other variables within each set of dummy variables on the predictive power, and therefore the efficiency, of the model. In fact, using variables from each dummy set which represented a house next to a HVOTL which had the most pronounced view of either line or pylon was found to produce the most efficient model. In Model 6, the variables excluded from each dummy set were *DETACHED, DISTPYL1, VISPYL6, REARPYL6, FORF, RORF*, thus representing a detached house with a pronounced view of 2+ pylons. This indicated that increasing the distance from the HVOTL, having a screened rear view of a pylon, a side view of a pylon from the front of the house, no rear view of a pylon and a rear view of the line, could increase value. Conversely, having a partial view of a pylon (3/4 pylon view) was found to reduce value. In addition, property sited at a distance of 400 metres or more, away from the HVOTL was observed to be less expensive than similar property sited within the 1–400 metres range. This result may be due to the fact that only 23 cases were sited in this zone, of which 20 were 2-bedroom or 3-bedroom semi-detached houses.

Due to the different categories of variables used in all regression models, the residuals were tested for normality and heteroscedasticity. No evidence of the later was identified; however, the distribution of the residuals showed some kurtosis (Kolmogorov–Smirnov and Anderson–Darling normality tests were undertaken, kurtosis = 4.295) which, in view of the large number of observations (577), was considered within a threshold which could be considered normal (Figure 1).

Plot size and proximity. The relationship between plot size and proximity to the HVOTL and pylon was explored to determine whether property near power lines was compensated by having more land than property further away.

Comparing the mean plot size of 3-bedroom semi-detached houses at various distances from the pylon showed that proximate property did have a larger plot, especially those sited within the first 100 metres (Figure 2). By comparison, the plot size of a 4-bedroom detached house was either the same or less than property 200 metres away from the HVOTL/pylon. Interestingly, no 4-bedroom detached houses were sited within 50 metres of a pylon (Figure 3).

Mean value of property. A comparison of means (Table 2) showed that all 4 property types, when situated close to a HVOTL, suffered from a reduction in value compared with similar property away from such lines. The relationship is, however, not linear but does indicate between a 10 per cent and 17.7 per cent reduction for a semi-detached property and a 6–13.3 per cent reduction for a detached property sited within 100 metres of a pylon compared with similar property sited more than 250 metres away. Property having a rear view of a pylon was found to be reduced by an average of 7.1 per cent. By comparison, the negative impact on value for

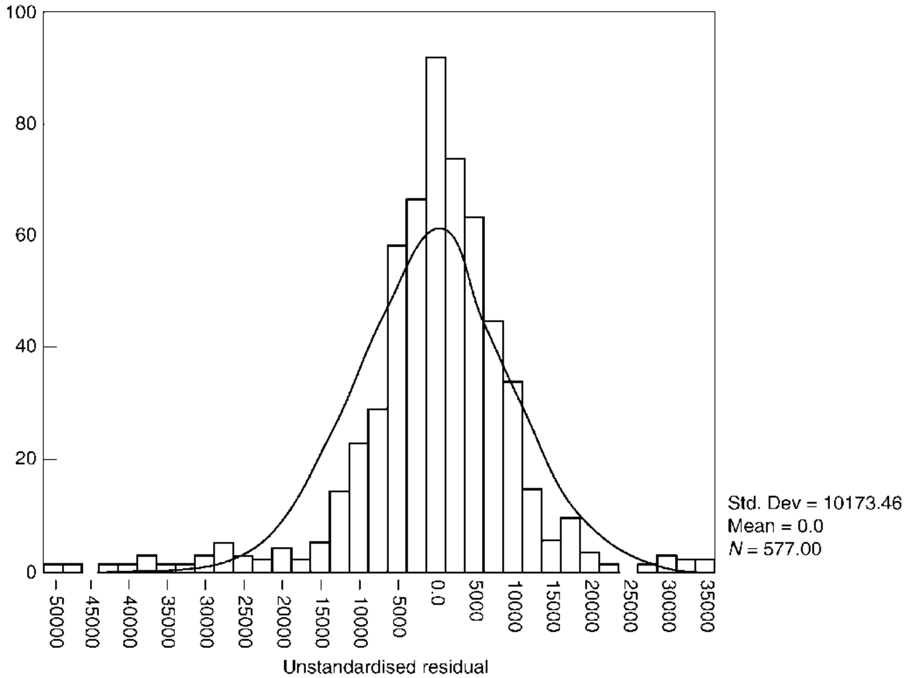

Figure 1. Test for normality.

property having a front view was found to be greater. This was measured at 14.4 per cent.

Table 3 shows that the value of property within 100 metres of the line is lower than similar property at least 300 metres away. Interestingly, property within 50 metres of the line appears to suffer less diminution than property sited 50–100 metres away from the line (150 metres for a 3-bedroom semi). However, no clear pattern of value loss is apparent.

Perceptual Study: The Professional Valuation Survey

Introduction

The first part of this research has concentrated on the impact of HVOTLs on demand and the

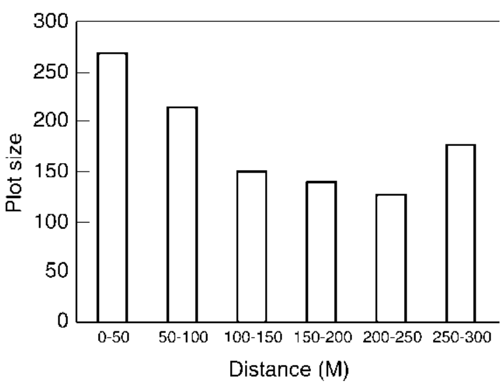

Figure 2. Distance from pylon/HVOTL and plot size: 3-bedroom, semi-detached houses.

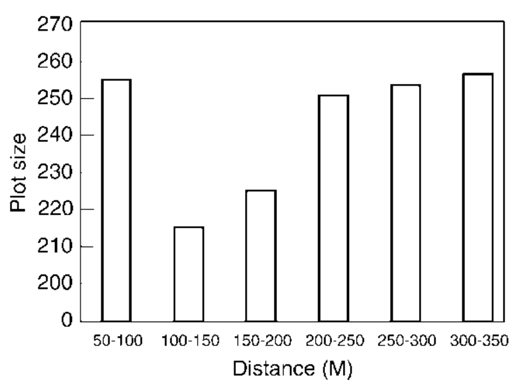

Figure 3. Distance from pylon/HVOTL and plot size: 4-bedroom, detached houses.

Table 2. Mean value of property in relation to distance from a pylon (£)

House type	>49 metres	50–99 metres	100–149 metres	150–199 metres	200–245 metres	250–299 metres	300–345 metres	350–399 metres
Semi-detached								
2-bedroom			64 171.75	66 251.50	70 563.6	66 816.67	65 498	64 469
Count			4	4	5	6	2	5
Standard deviation			7214.23	2543.39	6452.02	2200.59	1302.49	2179.64
3-bedroom	67 534.8	63 548.9	66 007.66	66 302.0	66 642.05	60 300	79 203	73 685.58
Count		25	29	34	22	4	12	19
Standard deviation	16 891.	11 108.64	8615.32	14 575.23	6557.09	19 875.18	13 794.18	5762.90
4-bedroom	86 698	65 447.75	77 982	73 481.32	76 411.29	82 873.67	81 958.86	—
Count	2	4	9	19	14	6	7	
Standard deviation	3330.4	17 520.03	4188.06	6953.66	3689.16	3424.05	2651.38	
Detached								
3-bedroom	—	—	57 237	96 824	90 090	84 606.5	93 018.5	94 279.18
Count			1	4	12	10	6	17
Standard deviation				13 281.13	4539.18	11 770.40	4256.64	5758.41
4-bedroom	—	67 429.714	75 952.71	86 863.03	93 883.12	100 851.46	98 700	98 945.8
Count			17	30	50	35	16	10
Standard deviation		32 533.38	25 209.45	18 521.48	17 038.55	15 046.25	5405.97	3952.41
5-bedroom		93 492.25	97 111.7	88 697.12	93 492.25	85 423	101 087.7	101 155.5
Count		8	10	8	8	5	3	2
Standard deviation		6922.57	4955.78	20 294.2	6922.57	30 377.87	153.08	403.76
6-bedroom	96 952	114 792.7	103 960.7	92 768.5	103 601.29	—	—	—
Count	1	3	9	8	14			
Standard deviation		4949.05	15 192.64	8005.85	7672.36			

Table 3. Mean value of property in relation to distance from the line

House type	>49 metres	50–99 metres	100–149 metres	150–199 metres	200–245 metres	250–299 metres	300–345 metres	350–399 metres	400–449 metres
Semi-detached									
2-bedroom			64 171.75	68 414	69 171.25	68 181.25	66 759.86	64 487	—
Count			4	1	4	4	7	6	
Standard deviation	—	—	7214.23		7576.66	4203.27	2014.47	1950.03	
3-bedroom	64 976.79	63 817.41	708 859	62 190.86	67 850.69	—	79 203	73 685.58	73 555.67
Count	33	32	23	21	13		12	19	15
Standard deviation	12 308.62	9800.2	13 058.81	10 283.89	11 794.89		1379.18	5762.9	6222.15
4-bedroom	73 626.92	64 227.4	78 352.45	76 855.83	79 359	82 437	82 290.20		
Count	13	5	11	18	1	8	5		
Standard deviation	11 590.15	5 858.53	3 331.39	3758		3244.25	2727.96	—	—
Detached									
3-bedroom		85 400.50	57 237	93 930.14	87 385.85	87 621.33	95 395.25	93 443.9	—
Count		2	1	7	13	6	12	8	
Standard deviation		990.66		10 053.58	10 660.19	7003.71	2691.15	3244.25	
4-bedroom	80 316.89	68 381.1	85 888.21	89 848.25	97 412.7	104 379.9	97 410.8	98 601.5	—
Count	9	20	19	40	44	2	10	8	
Standard deviation	12 855.79	28 223.93	21 356.36	22 260	14 344.27	27 398.18	3275.26	4352.19	
5-bedroom	99 306	91 286.8	97 576.3	92 023.78	—	—	85 423	101 087.7	101 155.5
Count	1	10	10	9			5	3	2
Standard deviation		17 687.4	5428.64	7831.95			30 377.87	155.08	403.76
6-bedroom	100 509.98	114 251	94 183.14	103 047.2	105 372.4	—	—	—	—
Count		3	7	12	5				
Standard deviation	14 246.19	7617.25	12 982.75	7495.03	7848.3				

subsequent effect on value. This was followed by a study of the market makers (i.e. valuers and agents) and their perceptions. One of the more important aspects of this second study was the comparison of valuers' and agents' opinions towards the likely impact of HVOTLs on house prices, with an empirical study of transaction data to determine how closely professional opinions of value impacts matched actual market behaviour.

Sample Selection and Survey Techniques

Using survey techniques similar to those of Priestley and Kroll (1992), Mitteness and Mooney (1998) and Bond and Hopkins (2000), a questionnaire was designed (Appendix 4) to test the opinions of both groups towards

- the impact of HVOTLs and pylons on residential value and marketing time;
- which aspects of HVOTLs had the greatest impact on value;
- what steps builders and developers appeared to be taking to mitigate any perceived value loss; and
- whether opinions towards this type of property differ between valuers and agents.

Five hundred Members of the Royal Institution of Chartered Surveyors (RICS), here classified as valuers, and 500 members of the National Association of Estate Agents (NAEA), here classified as agents, were selected using a stratified random sample from members of both groups and where necessary from estate agents holding no professional qualification or affiliation to a recognised professional body. Both groups received the same questionnaire and covering letter. Each envelope was coded to allow a more detailed analysis to be undertaken and to enable those who had not responded to be identified and contacted rather than repeating the entire exercise. A total of 257 valuers and 176 agents responded. Of those, 166 were excluded from the analysis for the following reasons: 154 were received from valuers and agents who either did not carry out property valuations or did not complete the questionnaire; 2 valued agricultural land and 11 were returned unopened. This left 277 useable responses (155 agents and 122 valuers) consisting of

- 57 (20.6 per cent) commercial property valuers/agents;
- 162 (58.5 per cent) residential property valuers/agents; and
- 58 (20.9 per cent) valuers/agents who regularly dealt with commercial and residential property (referred to as 'mixed property' valuers/agents).

Analysis

A comparison of means revealed that both valuers and agents perceive similar negative impacts on value, at around 5–10 per cent. A greater number of agents suggested larger value reductions than surveyors. Converting the results into a percentage within each group revealed that valuers' opinions of value reduction tended to cluster around the 5–15 per cent range, whereas agents' views were slightly more varied (Figure 4). An additional test of association using a chi squared test to test the null hypothesis was conducted to determine whether there was any significant difference between cohorts. The null hypothesis was that there was no difference between groups. The results of this test accepted the null hypothesis ($chi^2 = 8.267$, $df = 6$, $sig. = 0.219$). In addition, no significant differences were observed in relation to the 'length of time' a respondent had spent as a practising valuer/agent ($chi^2 = 16.668$, $df = 18$, $sig. = 0.616$). Similar results were obtained when respondents were sub-divided into groups depending on the type of property they normally valued/marketed.

To establish whether or not respondents who were less familiar with valuing or appraising this type of property perceived a greater negative impact on value, respondents were asked, 'Have you ever valued property near power lines?'. The levels of response were as follows: 22.6 per cent = never; 49.8 per cent = rarely; 24.6 per cent = often;

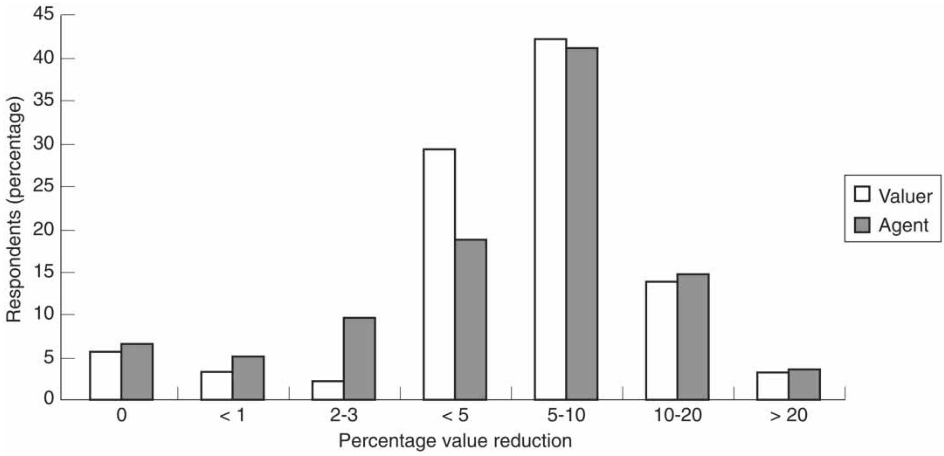

Figure 4. Perceived impact on value. *Notes:* valuers: $N = 92$, mean $= -7.5$ per cent, standard deviation $= 4.48$; agents: $N = 155$, mean $= -6.9$ per cent, standard deviation $= 4.50$.

3 per cent = frequently. Respondents who 'never' or 'rarely' valued this type of property reduced house price by a mean value of 5.78 per cent. In contrast, those who 'often' or 'frequently' valued HVOTL property, suggested the greatest degree of diminution, reducing house price by a mean value of 7.96 per cent (Tables 4 and 5).

Related factors. Following several interviews with estate agents and valuers, a number of variables were identified as being associated with the presence of power lines near residential property. These are set out in Tables 6 and 7. Respondents were asked to identify how often they had encountered each variable in association with this type of property in their professional experience. Interestingly, valuers indicated a greater reduction in the number of potential buyers whereas agents suggested longer marketing periods, which was possibly a reflection of their relative professions.

Factors affecting value and marketing. Respondents were asked to rank each variable between 0 and 10 (0 = no impact and 10 = significant impact) according to the size of the negative impact they perceived it would have on value and marketing time.

Regarding the impact on value; health concerns were ranked highest, then visual impact and concern over future value (Table 8). However, a stepwise regression analysis showed that, whilst all variables were significant, concern over future value had the greatest impact on property value followed by health concerns and noise (buzzing from lines) (Table 9).

Table 4. Group 1 valuers' (RICS) perception of value reduction relative to the number of HVOTL-proximate properties valued near power lines (shown as a percentage of the within-group respondents)

How often valued property near HVOTL	Percentage reduction						
	0	Up to 1	2–3	Up to 5	5–10	10–20	>20
Never	10	10	—	20	50	10	—
Rarely	5.6	3.7	3.7	27.8	44.4	11.1	3.7
Often	4.2	—	—	33.3	37.5	20.8	4.2
Frequently	—	—	—	50	50	—	—

Table 5. Group 2 estate agents (NAEA) perception of value reduction relative to the number of HVOTL-proximate properties valued near power lines (shown as a percentage of the within-group respondents)

How often valued property near HVOTL	Percentage reduction						
	0	Up to 1	2–3	Up to 5	5–10	10–20	>20
Never	6.2	5.5	10.3	17.8	41.8	14.4	4.1
Rarely	5.7	2.3	11.5	18.4	42.5	13.9	5.7
Often	6.7	11.1	11.1	15.6	42.2	11.1	2.2
Frequently	14.3	—	—	14.3	28.6	42.9	—

Factors found to affect marketing were also health concerns, followed by the visual impact and then the future value of the property. A stepwise regression analysis using marketing time as the dependent variable only found a relationship between an increase in the amount of time a property would be on the market before being sold and concerns over future value (Table 10).

Changes in land use. Finally, respondents were asked whether they had observed changes in the way land crossed by HVOTLs was developed. The variables to be tested were selected following observations from personal site visits and information gained from valuers and agents interviewed before the survey was undertaken. Low-cost housing, social housing and the presence of a buffer zone were cited most often, with all other variables encountered 'sometimes' (Table 11).

Conclusions

The valuation study set out to demonstrate the actual effect on value of HVOTLs at various distances and locations in relation to different house types. This work was supported by the perceptual study which, at the more general level, attempted to predict the impact of general proximity to power lines and equipment. The conclusions which follow seek to bring the results from these two studies together and to highlight some of the issues that could stem from this work.

The principal aim of undertaking this research was to determine the impact of HVOTLs on residential property value using a combination of opinion surveys. These surveys were designed to generate nationwide data on valuers' and agents' perceptions towards the impact on house price and a case study designed to gather selling price data from a residential location in Scotland. Scottish transaction data, used to establish the main determinants of value, provided actual evidence of the impact of a HVOTL on house prices. The results show that physical proximity and the visual presence of a pylon have a significant and negative impact on value, whereas a ROW created due to the presence of a line to the rear of the house can significantly increase value despite a view of the line itself. Linear, log and squared functional forms were used to determine the impact of distance to line and pylon on house price (*M.LINE, M.PYL*). All functional forms produced significant results for these variables

Table 6. RICS respondents

	Increased value	Reduced value	Removed buyers	Increased sale time	Reduce mortgage availability	Not marketable
Never	96.8	5.1	2.1	4.2	18.0	52.7
Rarely	3.2	6.1	6.3	11.6	31.5	29.7
Sometimes	—	40.8	34.4	36.8	37.1	12.2
Often	—	33.7	45.8	36.8	9.0	1.4
Always	—	—	11.5	10.5	4.5	4.1

Table 7. NAEA respondents

	Increased value	Reduced value	Removed buyers	Increased sale time	Reduce mortgage availability	Not marketable
Never	96.3	33.7	1.8	1.2	15.6	68.2
Rarely	2.5	6.8	4.9	5.5	36.4	17.2
Sometimes	1.2	35.2	35.6	35.0	32.5	7.0
Often	—	30.9	37.4	41.7	13.0	3.2
Always	—	23.5	20.2	16.6	2.6	4.5

at the 99 per cent confidence level. Calculating the impact on value using the formula from the most efficient regression model (Model 6) indicated that both physical and visual impacts (in addition to the orientation of the HVOTL), in particular from the rear of a house, had a significant impact on selling price. This model suggests that (all other variables remaining constant) due to the ROW, having a rear view of a line increases value by £2165 and the selling price increases by £44 per metre away from the HVOTL equating to an increase of up to £17 600 for a house sited at 400 metres compared with the same property adjacent to the HVOTL.

Using frequency analysis to determine the impact on selling price at various distances from the nearest pylon indicates that the value of property within 100 metres of the HVOTL is reduced by 6–17 per cent (an average of 11.5 per cent). The presence of a pylon was found to have a more significant impact on value than the HVOTL and could reduce value by up to 20.7 per cent compared with similar property sited 250 metres away.

Having a view of a pylon from the front of the house had a more negative impact on value (−14.4 per cent) than a rear view (−7.1 per cent). It was expected that property value would be less negatively affected by having either a lake view or countryside view despite also having a clear view of a number of pylons. However, in these cases value appeared to be more negatively affected. All negative impacts appeared to diminish with distance and were negligible at around 250 metres.

Comparing these results with the national average house price index for that region revealed a significant difference between the impact on a semi-detached house and a larger detached house, particularly the way in which the value of both property types responded to distance from the HVOTL. A pylon 50 metres from a semi-detached house compared with comparable property in that location (although not on an estate crossed by a power line) reduced value by 19 per cent. At 300 metres away from the HVOTL, value had risen to 1 per cent above the national average for that location. By comparison, the value of a detached property was reduced by 38 per cent at 100 metres from the HVOTL and at 300 metres was still found to be 30 per cent lower in value than comparable property on another estate in the same locality.

The findings from the valuers' perceptual study indicated that both valuers and agents perceive an average value reduction of 5–10 per cent indicating that both may

Table 8. Factors affecting value

	Visual impact ($N = 236$)	Noise/buzzing ($N = 237$)	Unsafe ($N = 230$)	Heath risk ($N = 239$)	Affect future value ($N = 227$)	Restrict land use ($N = 198$)	Birds nesting on line ($N = 191$)
Mean	6.18	5.43	3.82	6.58	6.15	5.90	2.34
Mode	5	5	5	5	5	5	0

Table 9. Stepwise regression (dependent variable = percentage value reduction)

Model		Unstandardised coefficients *B*	Standard error	Standardised coefficients Beta	*t*	Significance (*P*-value)
1	(Constant)	2.369	0.210		11.256	0.000
	Future value	0.198	0.031	0.411	6.352	0.000
2	(Constant)	2.063	0.230		8.971	0.000
	Future value	0.123	0.039	0.255	3.127	0.002
	Health concerns	0.115	0.038	0.246	3.012	0.003
3	(Constant)	1.951	0.234		8.332	0.000
	Future value	9.784	0.041	0.203	2.394	0.018
	Health concerns	9.899	0.039	0.212	2.565	0.011
	Noise from line	6.876	0.033	0.154	2.116	0.036

underestimate the impact of proximate HVOTLs on value. In addition, the results suggest that marketing time is increased, possibly due to a reduction in the numbers of willing buyers. Agents' and valuers' opinions were found to be slightly different which may be representative of the differences within their professions. However, there is no evidence to suggest that professionals having little valuation experience with property near HVOTLs overestimate the impact on value.

Whilst the assessment of value diminution is less than actually experienced within the case study location, it does reflect the findings from other (non-UK) studies that have benefited from the availability of transaction data. This may indicate that the impact on the value of HVOTL-proximate property in the case study area is unique to that location, or that valuers in the UK tend to underestimate the impact of such features on the value of proximate property. Whilst further research is clearly warranted, this study has established that professional perceptual surveys can give some estimation of the likely impact on residential property values where transaction data are unavailable.

The findings from this research can have significant implications for the electricity supply industry, local planning authorities and developers. Up until now, there has been evidence that the presence of HVOTLs impacts on value, but there has been very little understanding of the relationship between the proximity of HVOTLs and the orientation of residential units. This research attempts to address this.

The findings suggest that there could be benefits from formal ROWs to mitigate some of the adverse effects whilst, at the same time, provide beneficial effects in some cases. In addition, the research highlights the importance of both estate and house design in helping to achieve maximum value (both monetary and aesthetic) for home-owners. Further research in this area could assist planning officers and developers in their consideration of schemes proximate to HVOTLs. Many local authorities already include policies in their development plans relating to new developments and the effect of HVOTLs. It is hoped that this research might better inform such authorities in their discussions with developers in the future.

Table 10. Stepwise regressions (dependent variable = increase in marketing time)

	Unstandardised coefficients *B*	Standard error	Standardised coefficients Beta	*t*	Significance (*P*-value)
(Constant)	5.365	0.886		6.054	0.000
Future marketability	−0.539	0.132	−0.321	−4.087	0.000

Table 11. Changes in land use

	Lower price	Larger plot	Buffer zone	Low-cost housing	Social housing	Power-line corridors	Reject land for housing	Reject totally
Occasionally	35.5	41.4	25.1	27.1	24.9	25.9	40.5	36.3
Sometimes	22.6	23.7	37.2	25.2	27.3	32.7	21.0	11.4
Often	16.6	6.0	17.5	33.0	30.6	25.5	5.2	3.0
Always	1.4	0.5	4.0	3.7	2.9	3.6	—	—
Never	24.0	28.4	16.1	11.0	14.4	12.3	33.3	49.3

Notes

1. An increase from 21 million to 24 million homes between 2001 and 2021.
2. In this case, Scotland was chosen because transaction data are more readily available for analysis.
3. National Grid (NGC) document ‘Planning and Amenity Aspects of High-voltage Transmission Lines and Substations’; para. 28. Development restrictions for HVOTLs consist of the height of buildings and trees under lines and the availability of access to maintain and renew their equipment. Although the recommended minimum clearances are set out in their document, NGC prefer to make specific recommendations for each location.
4. Appendix 1 sets out in tabular form a comparison of studies undertaken over the past 40 years.
5. Blight is a term usually associated with the negative effect that a proposed development, such as a motorway, has on other proximate land and property. It is generally used by professionals in the property industry to describe a negative condition affecting property or land to such a degree that it becomes unmarketable or of little or no value under normal market conditions.
6. Studies generally used frequency analysis rather than causal analysis and omitted other factors which may have impacted on value, such as, plot size, the presence of screening or an improved view—for example, waterfront or harbour (Colwell, 1990; Rosiers, 2002; Bond and Hopkins, 2000).
7. Stigma in relation to property is a negative perception (fear of adverse health effects) within the market-place that can cause a loss in value.
8. Only *M.LINE* and *M.PYL* are shown in Appendix 3.
9. Unstandardised coefficients (*B*-value) only show the increase in property value for movement in each variable if all other variables are held constant. For instance, in Model 1 if another bedroom was added to the property, value would increase by £3716.692 providing everything else remained the same. The slope *B* can be converted into a standardised score Beta (standardised coefficients) and expresses changes in the variable in terms of standard deviations. Therefore, when value goes up by 1 standard deviation, the number of bedrooms increases by 0.209 standard deviations thus showing the relevant importance of movement in each variable in the equation. *B* and Beta equations have been included in each model.
10. This model was not shown.

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Appendix 1

Table A1. Comparison of studies on the impact of a power line on property

Year and author(s)	Methods used	Findings
1967 Kinnard	Questionnaire surveys of home-owners, assessors, realtors, lenders	General conclusion was that there was little impact on market value
1972 Clark and Treadway	Case studies (on sales transactions)	A significant price reduction only for residential land and for small commercial estates
1976 Boyer	Chi-squared test of association, frequency analysis, opinion surveys	16–29 per cent reduction in value
1979 Colwell and Foley	Regression models	Power line had no effect on the prices of single-family property above a distance of 60 metres and a significant effect only below a distance of 15 metres
1981 Blinder	Statistical tests and regression models	A small impact of the power line on the sales price of single-family property; price reductions of 2 per cent were reported for properties with a tower behind the back yard and reductions of 1 per cent for other abutting lots compared with non-abutting lots

(*Table continued*)

Table A1. *Continued*

Year and author(s)	Methods used	Findings
1981 Holmström[a]	?	The value of the area below the power line is 40–60 per cent that of a normal zoned area
1985 Cajanus	Regression models	A significant price impact only for plots situated less than a distance of 30 metres away from the line
1985 Bishop, Hull and Leahy	ANOVA	Visual impact of tower generally generates 90 per cent of people's adverse reaction
1986 Virtanen[a]	Analysis of the grounds for compensation	Similar to Holmström's study
1990 Colwell	Regression model, same data as Colwell and Foley, with added variables	Three results: power line proximity has a negative impact on price, weakening with time; having an easement clearly reduces the price; and, a power line also has an influence on property prices if they do not have an easement
1992 Kung and Seagle	Comparison of single-family property transactions prices followed by a questionnaire sent to the buyers	The comparison of prices did not show a price effect; according to the questionnaire, 53 per cent of the respondents considered the power line a scenic drawback (however, 72 per cent of these did not consider that this had affected the price they paid); none of them considered it a health risk
1992 Delaney and Timmons	A questionnaire survey to property valuers	Reductions as high as 10 per cent of the price were related to power line proximity
1995 Hamilton and Schwann	Regression analysis	Properties adjacent to a line lose 6.3 per cent of their value due to proximity and the visual impact
1995 Callanan and Hargreaves	Multiple regression analysis	Close proximity to pylon produces 27.3 per cent reduction in value
1997 Kinnard, Bond, Syms and Delottie; Kinnard, Geckler and Delottie[a]	Literature review of several studies from the US (including some cited above), Canada and New Zealand, plus a separate empirical study from Las Vegas (4269 transactions) and St Louis (1377 transactions)	Literature review: some negative impact below distances of 60–90 metres; empirical study: a 1.3–1.4 per cent negative price effect for properties situated within 800 metres of a power line in Las Vegas but not in St Louis (possible reason is more open landscape in Las Vegas)
1998, 2001 Peltomaa	Multiple regression analysis	Power lines did not show a statistically significant price effect for any sub-model of the target areas

(*Table continued*)

Table A1. *Continued*

Year and author(s)	Methods used	Findings
2000 Bond and Hopkins	Multiple regression analysis	Presence of a 'transmission line' in the case study area has a minimal effect and is not a statistically significant factor in the sale price
2002 Rosiers	Multiple regression analysis	Direct view of a pylon or conductors does exert negative impact on value ranging from 5 to 20 per cent. However, where proximity advantages exceed drawbacks, values can increase

Note: [a]These references cited in Kauko (2002).
Sources: Petlomaa (1998, 2001; cited in Kauko, 2002) updated by Dent and Sims (2004).

Appendix 2. Case Study Location 'Blackwood, Cumbernauld, near Glasgow, Scotland'

Due to the unavailability of property transaction data in England, a suitable site was located in Scotland where property transaction prices are recorded and available for analysis. The location for this study was a mid price range, mixed residential development consisting of 664 properties, built over an area of 420 000 square metres in Blackwood, Cumbernauld, near Glasgow. An important feature of this location was that mid-range, single-family homes could be found near and not near a HVOTL to enable a within case study (rather than between case study) comparison to be undertaken. Blackwood residential estate was not necessarily representative of the average house built near HVOTLs in Scotland, particularly in Glasgow and Edinburgh, as such locations appeared generally run-down and houses were found to be low-cost, mixed single- and multi-family dwellings (flats). Blackwood was, however, more representative of recent residential developments in England where an existing suburb had been expanded resulting in the development of land crossed by a HVOTL.

The location is slightly hilly with open land to the north and west giving a pronounced view of several pylons; a lake (reservoir) to the south, also with a pronounced view of several pylons, and open fields with a football stadium/sports training academy to the east. A 275kV high-voltage overhead power line runs through the centre of the estate dividing it into 2 neighbourhoods; referred to in this study as the east and west sides. The HVOTL runs from north to south in a corridor of land that varies between 40 metres and 70 metres from the boundary fence of abutting property and continues along the north-eastern border of the estate. This means that properties with either views of the lake or open land also have a clear view of the power line and several pylons. The west side of the estate consists of 75 social houses and 143 low to mid range mixed residential properties built within the past 12 months. Transaction data for this part of the estate were very limited and therefore excluded from this study. The east side consists of 446 mid-range properties built between 1994 and 1995 resulting in 593 property transactions. All property is between 33 metres and 440 metres away from the HVOTL, either having no view of a pylon or a slight, moderate or pronounced view of one or more pylons running through the estate or across open land on the northern, southern and western boundaries. As this study is based on property transactions rather than just individual properties, 472 homes (cases) had some view of a pylon/s from either the front or rear of the house.

Appendix 3

Table A2. Correlation matrix for property-specific variables including topography in Blackwood

		1	2	3	4	5	6	7	8	9
1. *FLAT*	CC		−0.023	−0.106	−0.120	−0.137	−0.141	−0.224	−0.043	−0.169
	Sig. (2-tailed)		0.581	0.011	0.004	0.001	0.001	0.000	0.303	0.000
2. *TERRACE*	CC	0.577		−0.173	−0.197	−0.045	−0.231	−0.280	−0.070	−0.229
	Sig. (2-tailed)	−0.023		0.000	0.000	0.282	0.000	0.000	0.091	0.000
3. *SEMI*	CC	−0.106	−0.173		−0.904[a]	−0.496	−0.548	−0.333	0.037	−0.578
	Sig. (2-tailed)	0.011	0.000		0.000	0.000	0.000	0.000	0.376	0.000
4. *DETACHED*	CC	−0.120	−0.197	−0.904[a]		0.542	0.664	0.488	0.000	0.699
	Sig. (2-tailed)	0.004	0.000	0.000		0.000	0.000	0.000	0.995	0.000
5. *N.BEDRM*	CC	−0.136	−0.036	−0.492	0.534		0.496	0.317	−0.077	0.542
	Sig. (2-tailed)	0.000	0.358	0.000	0.000		0.000	0.000	0.064	0.000
6. *PARKING*	CC	−0.141	−0.231	−0.548	0.664	0.511		0.387	0.019	0.576
	Sig. (2-tailed)	0.001	0.000	0.000	0.000	0.000		0.000	0.645	0.000
7. *PLOTSIZE*	CC	−0.167	−0.240	−0.353	0.480	0.294	0.372		−0.010	0.513
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000		0.809	0.000
8. *VIEW*	CC	−0.043	−0.070	0.037	0.000	−0.050	0.019	−0.013		−0.044
	Sig. (2-tailed)	0.302	0.091	0.375	0.995	0.202	0.644	0.711		0.293
9. *VAL.NOW*	CC	−0.128	−0.196	−0.493	0.593	0.450	0.493	0.417	−0.040	
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.243	

Notes: upper quadrant = Pearson correlation coefficient; lower quadrant = Kendall's Tau_b; CC = correlation coefficient (significant at the 0.05 level, 2-tailed).
[a]High degree of correlation between variables; therefore, one variable will be excluded in the analysis.

Table A3. Correlation matrix for HVOTL-specific variables in Blackwood

		1	2	3	4	5	6	7	8	9	10	11	12	13
1. M.PYL	CC		0.966[a]	−0.015	−0.100	0.116	0.005	0.156	0.048	0.018	−0.021	−0.205	0.129	0.366
	Sig.		0.000	0.723	0.016	0.005	0.913	0.000	0.250	0.660	0.613	0.000	0.002	0.000
2. M.LINE	CC	0.838[a]		−0.050	−0.110	0.116	−0.017	0.178	0.056	−0.006	−0.006	−0.185	0.152	0.370
	Sig.	0.000		0.232	0.008	0.005	0.692	0.000	0.183	0.893	0.895	0.000	0.000	0.000
3. VISLINE	CC	0.009	−0.008		0.032	−0.123	0.046	0.025	0.047	0.180	−0.030	−0.126	−0.012	−0.123
	Sig.	0.789	0.809		0.441	0.003	0.269	0.550	0.256	0.000	0.474	0.002	0.775	0.003
4. REARLINE	CC	−0.070	−0.086	0.032		−0.042	0.073	0.044	0.124	−0.070	−0.018	0.012	−0.448	0.149
	Sig.	0.042	0.012	0.441		0.311	0.078	0.295	0.003	0.093	0.662	0.772	0.000	0.000
5. VISPYL0	CC	0.092	0.101	−0.123	−0.042		−0.133	−0.106	−0.086	−0.376	−0.056	−0.328	0.076	0.005
	Sig.	0.008	0.003	0.003	0.311		0.001	0.011	0.040	0.000	0.178	0.000	0.069	0.896
6. VISPYL1	CC	0.014	0.001	0.046	0.073	−0.133		−0.055	−0.044	−0.194	−0.029	−0.169	−0.064	−0.059
	Sig.	0.676	0.978	0.268	0.078	0.001		0.191	0.289	0.000	0.487	0.000	0.125	0.156
7. VISPYL2	CC	0.142	0.158	0.025	0.044	−0.106	−0.055		−0.035	−0.155	−0.023	−0.135	−0.066	−0.007
	Sig.	0.000	0.000	0.549	0.294	0.011	0.191		0.399	0.000	0.580	0.001	0.113	0.873
8. VISPYL3	CC	0.044	0.040	0.047	0.124	−0.086	−0.044	−0.035		−0.125	−0.019	−0.109	−0.127	0.306
	Sig.	0.201	0.249	0.256	0.003	0.040	0.289	0.398		0.003	0.654	0.009	0.002	0.000
9. VISPYL4	CC	0.003	−0.020	0.180	−0.070	−0.376	−0.194	−0.155	−0.125		−0.082	−0.480	0.023	−0.016
	Sig.	0.928	0.558	0.000	0.093	0.000	0.000	0.000	0.003		0.048	0.000	0.575	0.702
10. VISPYL5	CC	−0.013	0.005	−0.030	−0.018	−0.056	−0.029	−0.023	−0.019	−0.082		−0.072	−0.050	−0.025
	Sig.	0.696	0.878	0.473	0.662	0.177	0.486	0.580	0.653	0.048		0.086	0.228	0.549
11. VISPYL6	CC	−0.167	−0.153	−0.126	0.012	−0.328	−0.169	−0.135	−0.109	−0.480	−0.072		0.029	−0.057
	Sig.	0.000	0.000	0.002	0.772	0.000	0.000	0.001	0.009	0.000	0.086		0.480	0.168
12. REARPYL0	CC	0.118	0.152	−0.012	−0.448	0.076	−0.064	−0.066	−0.127	0.023	−0.050	0.029		−0.170
	Sig.	0.001	0.000	0.774	0.000	0.069	0.125	0.113	0.002	0.575	0.228	0.480		0.000
13. REARPYL1	CC	0.266	0.266	−0.123	0.149	0.005	−0.059	−0.007	0.306	−0.016	−0.025	−0.057	−0.170	
	Sig.	0.000	0.000	0.003	0.000	0.895	0.156	0.873	0.000	0.701	0.548	0.168	0.000	0.
14. REARPYL2	CC	−0.057	−0.094	0.014	0.135	0.003	0.388	−0.038	−0.031	−0.096	−0.020	−0.077	−0.139	−0.042
	Sig.	0.100	0.007	0.731	0.001	0.947	0.000	0.356	0.455	0.021	0.624	0.066	0.001	0.317
15. REAPYL3	CC	0.037	0.036	0.033	0.087	0.013	0.090	−0.025	−0.020	0.005	0.122	−0.077	−0.089	−0.027
	Sig.	0.290	0.298	0.425	0.037	0.748	0.031	0.553	0.631	0.907	0.003	0.066	0.033	0.520
16. REARPYL4	CC	−0.167	−0.149	−0.065	0.266	−0.023	−0.051	0.006	0.104	−0.100	−0.040	0.122	−0.272	−0.082
	Sig.	0.000	0.000	0.119	0.000	0.584	0.224	0.890	0.013	0.017	0.335	0.003	0.000	0.049
17. REARPYL5	CC	−0.029	−0.104	−0.166	0.079	−0.073	−0.011	0.008	−0.032	−0.081	−0.021	0.168	−0.142	−0.043
	Sig.	0.401	0.003	0.000	0.056	0.081	0.793	0.848	0.442	0.051	0.614	0.000	0.001	0.304

(*Table continued*)

Table A3. *Continued*

		1	2	3	4	5	6	7	8	9	10	11	12	13
18. REARPYL6	CC	−0.101	−0.104	0.157	0.100	−0.039	−0.037	0.081	−0.050	0.114	0.073	−0.100	−0.605	−0.182
	Sig.	0.004	0.003	0.000	0.016	0.350	0.374	0.052	0.234	0.006	0.081	0.016	0.000	0.000
19. FORS	CC	−0.131	−0.109	0.051	0.111	0.107	−0.063	0.064	0.137	0.068	−0.010	−0.207	−0.246	0.061
	Sig.	0.000	0.001	0.223	0.008	0.011	0.131	0.124	0.001	0.103	0.819	0.000	0.000	0.141
20. FORSF	CC	0.054	0.026	0.096	−0.053	−0.171	−0.137	−0.071	−0.073	0.130	−0.010	0.148	0.114	−0.072
	Sig.	0.120	0.453	0.021	0.204	0.000	0.001	0.087	0.080	0.002	0.813	0.000	0.006	0.085
21. FORF	CC	0.022	0.028	0.058	−0.048	−0.062	0.273	0.019	−0.077	−0.196	0.033	0.126	0.143	−0.082
	Sig.	0.531	0.418	0.165	0.250	0.138	0.000	0.644	0.063	0.000	0.430	0.003	0.001	0.049
22. RORSC	CC	0.090	0.068	0.049	0.128	0.090	−0.046	−0.036	−0.029	0.021	−0.019	−0.045	0.232	−0.039
	Sig.	0.009	0.048	0.241	0.002	0.032	0.274	0.384	0.480	0.622	0.643	0.278	0.000	0.345
23. RORS	CC	0.159	0.164	−0.057	0.255	−0.096	0.153	−0.068	0.126	−0.073	−0.049	0.075	−0.067	0.403
	Sig.	0.000	0.000	0.171	0.000	0.022	0.000	0.101	0.003	0.082	0.241	0.071	0.106	0.000
24. RORSF	CC	−0.026	0.018	−0.010	0.071	−0.025	0.114	0.055	−0.040	−0.059	0.093	−0.009	−0.308	−0.024
	Sig.	0.454	0.599	0.815	0.088	0.556	0.006	0.188	0.338	0.154	0.026	0.825	0.000	0.558
25. RORF	CC	−0.253	−0.297	0.083	0.342	−0.019	−0.180	0.026	0.028	0.112	−0.016	−0.021	−0.394	−0.168
	Sig.	0.000	0.000	0.045	0.000	0.647	0.000	0.534	0.496	0.007	0.692	0.608	0.000	0.000
26. VALNOW	CC	0.184	0.177	−0.037	0.078	−0.001	0.012	0.093	0.074	−0.090	0.046	0.010	−0.008	−0.037
	Sig.	0.000	0.000	0.282	0.023	0.974	0.716	0.006	0.029	0.008	0.175	0.769	0.816	0.274

		14	15	16	17	18	19	20	21	22	23	24	25	26
1. M.PYL	CC	−0.067	0.038	−0.199	−0.042	−0.126	−0.148	0.042	0.029	0.061	0.198	−0.030	−0.299	0.226
	Sig.	0.108	0.359	0.000	0.318	0.002	0.000	0.320	0.491	0.145	0.000	0.467	0.000	0.000
2. M.LINE	CC	−0.109	0.034	−0.175	−0.114	−0.123	−0.123	0.015	0.029	0.039	0.201	0.008	−0.331	0.225
	Sig.	0.009	0.412	0.000	0.006	0.003	0.003	0.721	0.482	0.344	0.000	0.856	0.000	0.000
3. VISLINE	CC	0.014	0.033	−0.065	−0.166	0.157	0.051	0.096	0.058	0.049	−0.057	−0.010	0.083	−0.053
	Sig.	0.731	0.426	0.119	0.000	0.000	0.223	0.021	0.166	0.242	0.171	0.815	0.045	0.207
4. REARLINE	CC	0.135	0.087	0.266	0.079	0.100	0.111	−0.053	−0.048	0.128	0.255	0.071	0.342	0.096
	Sig.	0.001	0.037	0.000	0.056	0.016	0.008	0.204	0.251	0.002	0.000	0.088	0.000	0.021
5. VISPYL0	CC	0.003	0.013	−0.023	−0.073	−0.039	0.107	−0.171	−0.062	0.090	−0.096	−0.025	−0.019	0.001
	Sig.	0.947	0.749	0.584	0.081	0.351	0.010	0.000	0.138	0.032	0.022	0.556	0.647	0.977
6. VISPYL1	CC	0.388	0.090	−0.051	−0.011	−0.037	−0.063	−0.137	0.273	−0.046	0.153	0.114	−0.180	0.009
	Sig.	0.000	0.031	0.224	0.793	0.375	0.131	0.001	0.000	0.274	0.000	0.006	0.000	0.831
7. VISPYL2	CC	−0.038	−0.025	0.006	0.008	0.081	0.064	−0.071	0.019	−0.036	−0.068	0.055	0.026	0.107
	Sig.	0.357	0.554	0.890	0.848	0.052	0.124	0.087	0.644	0.384	0.101	0.188	0.534	0.010
8. VISPYL3	CC	−0.031	−0.020	0.104	−0.032	−0.050	0.137	−0.073	−0.077	−0.029	0.126	−0.040	0.028	0.088
	Sig.	0.455	0.631	0.013	0.443	0.234	0.001	0.080	0.063	0.481	0.003	0.338	0.496	0.035

9. VISPYL4	CC	−0.096	0.005	−0.100	−0.081	0.114	0.068	0.130	−0.196	0.021	−0.073	−0.059	0.112	−0.110
	Sig.	0.021	0.907	0.017	0.051	0.006	0.103	0.002	0.000	0.622	0.082	0.154	0.007	0.008
10. VISPYL5	CC	−0.020	0.122	−0.040	−0.021	0.073	−0.010	−0.010	0.033	−0.019	−0.049	0.093	−0.016	0.049
	Sig.	0.624	0.003	0.335	0.615	0.081	0.820	0.813	0.430	0.643	0.241	0.026	0.693	0.238
11. VISPYL6	CC	−0.077	−0.077	0.122	0.168	−0.100	−0.207	0.148	0.126	−0.045	0.075	−0.009	−0.021	0.020
	Sig.	0.066	0.066	0.003	0.000	0.016	0.000	0.000	0.002	0.279	0.071	0.826	0.608	0.640
12. REARPYL0	CC	−0.139	−0.089	−0.272	−0.142	−0.605	−0.246	0.114	0.143	0.232	−0.067	−0.308	−0.394	−0.006
	Sig.	0.001	0.033	0.000	0.001	0.000	0.000	0.006	0.001	0.000	0.106	0.000	0.000	0.892
13. REARPYL1	CC	−0.042	−0.027	−0.082	−0.043	−0.182	0.061	−0.072	−0.082	−0.039	0.403	−0.024	−0.168	−0.036
	Sig.	0.318	0.521	0.049	0.305	0.000	0.141	0.085	0.049	0.345	0.000	0.559	0.000	0.392
14. REARPYL2	CC		−0.022	−0.067	−0.035	−0.149	−0.135	−0.087	0.275	−0.032	0.313	−0.076	−0.077	−0.006
	Sig.		0.600	0.109	0.402	0.000	0.001	0.036	0.000	0.441	0.000	0.069	0.066	0.889
15. REAPYL3	CC	−0.022		−0.043	−0.022	−0.095	0.066	−0.020	−0.054	−0.021	0.028	0.008	0.035	−0.017
	Sig.	0.599		0.303	0.590	0.022	0.112	0.639	0.193	0.620	0.503	0.857	0.396	0.684
16. REARPYL4	CC	−0.067	−0.043		−0.069	−0.292	0.080	0.001	−0.080	−0.063	−0.072	0.039	0.215	−0.079
	Sig.	0.108	0.302		0.099	0.000	0.054	0.988	0.054	0.130	0.084	0.347	0.000	0.059
17. REARPYL5	CC	−0.035	−0.022	−0.069		−0.153	−0.122	0.090	0.063	−0.033	−0.084	0.103	0.076	0.110
	Sig.	0.401	0.590	0.099		0.000	0.003	0.031	0.128	0.429	0.045	0.013	0.067	0.008
18. REARPYL6	CC	−0.149	−0.095	−0.292	−0.153		0.242	−0.078	−0.163	−0.140	−0.154	0.275	0.311	0.038
	Sig.	0.000	0.022	0.000	0.000		0.000	0.060	0.000	0.001	0.000	0.000	0.000	0.361
19. FORS	CC	−0.135	0.066	0.080	−0.122	0.242		−0.659	−0.432	−0.165	−0.200	−0.007	0.311	−0.129
	Sig.	0.001	0.112	0.054	0.003	0.000		0.000	0.000	0.000	0.000	0.871	0.000	0.002
20. FORSF	CC	−0.087	−0.020	0.001	0.090	−0.078	−0.659		−0.320	0.119	−0.048	0.042	−0.042	0.100
	Sig.	0.036	0.638	0.988	0.031	0.060	0.000		0.000	0.004	0.251	0.313	0.311	0.016
21. FORF	CC	0.275	−0.054	−0.080	0.063	−0.163	−0.432	−0.320		0.083	0.282	−0.015	−0.303	0.047
	Sig.	0.000	0.193	0.054	0.128	0.000	0.000	0.000		0.047	0.000	0.721	0.000	0.264
22. RORSC	CC	−0.032	−0.021	−0.063	−0.033	−0.140	−0.165	0.119	0.083		−0.077	−0.093	−0.130	0.206
	Sig.	0.440	0.620	0.130	0.428	0.001	0.000	0.004	0.047		0.065	0.025	0.002	0.000
23. RORS	CC	0.313	0.028	−0.072	−0.084	−0.154	−0.200	−0.048	0.282	−0.077		−0.237	−0.329	0.067
	Sig.	0.000	0.502	0.084	0.045	0.000	0.000	0.250	0.000	0.065		0.000	0.000	0.107
24. RORSF	CC	−0.076	0.008	0.039	0.103	0.275	−0.007	0.042	−0.015	−0.093	−0.237		−0.400	0.145
	Sig.	0.069	0.857	0.347	0.013	0.000	0.871	0.313	0.720	0.025	0.000		0.000	0.000
25. RORF	CC	−0.077	0.035	0.215	0.076	0.311	0.311	−0.042	−0.303	−0.130	−0.329	−0.400		−0.147
	Sig.	0.066	0.396	0.000	0.067	0.000	0.000	0.311	0.000	0.002	0.000	0.000		0.000
26. VALNOW	CC	−0.010	−0.004	−0.055	0.088	0.032	−0.113	0.090	0.038	0.174	0.049	0.128	−0.126	
	Sig.	0.779	0.909	0.106	0.010	0.351	0.001	0.008	0.269	0.000	0.150	0.000	0.000	

Notes: upper quadrant = Pearson correlation coefficient; lower quadrant = Kendall's Tau_b; CC = correlation coefficient (significant at the 0.05 level, 2-tailed).
[a]High degree of correlation between variables; therefore, one variable will be excluded in the analysis.

Table A4. List of models

	Unstandardised coefficients *B*	Std. error	Standardised coefficients Beta	*t*	Significance (P)
Model 1. Property-specific characteristics (adjusted $R^2 = 0.567$)					
(Constant)	64 871.221	3201.072		20.265	0.000
FLAT	−19 772.600	4487.171	−0.133	−4.406	0.000
TERRACE	−20 082.639	3018.104	−0.217	−6.654	0.000
SEMI	−14 241.575	1411.684	−0.408	−10.088	0.000
N.BEDRM	3716.692	636.432	0.197	5.840	0.000
PARKING	4132.546	1340.436	0.117	3.083	0.002
PLOTSIZE	41.481	7.650	0.178	5.422	0.000
Model 2. Property and physical distance to power-line variables (adjusted $R^2 = 0.612$)					
(Constant)	51 929.688	3501.516		14.831	0.000
FLAT	−16 879.267	4298.441	−0.114	−3.927	0.000
TERRACE	−15 927.733	2931.680	−0.172	−5.433	0.000
SEMI	−13 106.089	1355.288	−0.375	−9.670	0.000
N.BEDRM	4833.273	624.955	0.256	7.734	0.000
PARKING	3285.762	1283.852	0.093	2.559	0.011
PLOTSIZE	44.345	7.309	0.191	6.067	0.000
METREPYL	36.927	4.886	0.208	7.558	0.000
Model 3. Property, power-line and view variables (adjusted $R^2 = 0.624$)					
(Constant)	48 571.046	5007.833		9.699	0.000
FLAT	−17 772.741	4356.520	−0.120	−4.080	0.000
TERRACE	−15 541.014	3136.142	−0.168	−4.955	0.000
SEMI	−12 802.819	1417.130	−0.367	−9.034	0.000
N.BEDRM	5058.290	650.620	0.268	7.775	0.000
PARKING	3590.370	1294.876	0.102	2.773	0.006
REARPYL1	−9582.136	2887.965	−0.119	−3.318	0.001
REAPYL3	−18 662.918	4158.334	−0.126	−4.488	0.000
REARLINE	3713.893	1354.318	0.102	2.742	0.006
VISLINE	−4760.825	2261.045	−0.071	−2.106	0.036
FORS	7664.502	3652.256	0.221	2.099	0.036
METREPYL	42.383	5.882	0.238	7.206	0.000
PLOTSIZE	44.652	7.464	0.192	5.983	0.000
Model 4. Stepwise regression using all variables (adjusted $R^2 = 0.616$)					
(Constant)	52 533.913	3467.715		15.149	0.000
SEMI	−13 590.296	1347.171	−0.389	−10.088	0.000
PLOTSIZE	43.063	7.239	0.185	5.949	0.000
N.BEDRM	4841.232	618.227	0.256	7.831	0.000
METREPYL	37.385	4.835	0.210	7.732	0.000
TERRACE	−16 487.370	2904.113	−0.178	−5.677	0.000
FLAT	−17 503.687	4255.548	−0.118	−4.113	0.000
REAPYL3	−14 165.791	3861.428	−0.096	−3.669	0.000
PARKING	3240.767	1270.083	0.092	2.552	0.011
Model 5: Stepwise regression using natural log transformed variables where possible (adjusted $R^2 = 0.624$)					
(Constant)	−37 551.010	11 905.619		−3.154	0.002
SEMI	−12 510.318	1400.466	−0.358	−8.933	0.000
LNPLOT	11 910.305	1743.489	0.245	6.831	0.000
N.BEDRM	4864.531	617.921	0.257	7.872	0.000
LNPYLON	8085.077	994.308	0.239	8.131	0.000
TERRACE	−12 549.848	3222.947	−0.136	−3.894	0.000
REAPYL3	−17 620.592	3895.431	−0.119	−4.523	0.000
FLAT	−11 989.621	4627.046	−0.081	−2.591	0.010

(Table continued)

Table A4. *Continued*

	Unstandardised coefficients *B*	Std. error	Standardised coefficients Beta	*t*	Significance (P)
PARKING	2928.512	1275.623	0.083	2.296	0.022
FORS	2580.067	983.108	0.074	2.624	0.009
REARPYL6	−2921.359	1019.418	−0.082	−2.866	0.004
REARPYL1	−5580.097	2305.102	−0.069	−2.421	0.016
REARLINE	2165.326	995.153	0.060	2.176	0.030
Model 6. Stepwise regression using severely encumbered property as a baseline for the calculation (adjusted $R^2 = 0.638$*)*					
(Constant)	44 468.436	3743.364		11.879	0.000
SEMI	−12 342.346	1361.400	−0.353	−9.066	0.000
PLOTSIZE	45.199	7.161	0.194	6.311	0.000
N.BEDRM	5186.208	609.017	0.274	8.516	0.000
METREPYL	43.778	5.307	0.246	8.249	0.000
TERRACE	−15 502.435	2927.376	−0.167	−5.296	0.000
FLAT	−17 533.934	4226.848	−0.118	−4.148	0.000
RORSC	8678.254	2817.667	0.085	3.080	0.002
REAPYL3	−14 531.840	3783.931	−0.098	−3.840	0.000
PARKING	3595.206	1266.464	0.102	2.839	0.005
FORS	2823.357	959.372	0.081	2.943	0.003
DISTPYL9	−6446.255	2559.200	−0.073	−2.519	0.012
REARPYL0	3323.950	1124.798	0.092	2.955	0.003
REARLINE	2523.825	1077.330	0.069	2.343	0.019

Appendix 4. Valuation questionnaire

Please tick the appropriate box or use the space provided

1. **Where is your business based?**____

2. **How long have you been a practising valuer?**
Less than 5 yrs ☐ 5 – 10 yrs ☐ 11 – 15 yrs ☐ More than 15 yrs ☐

3. **What type of property do you normally value?**
Commercial ☐ Residential ☐ Mixed ☐

4. **How much of your time is spent valuing residential property?**
None ☐ Up to 25% ☐ Up to 50% ☐ Up to 75% ☐ More than 75% ☐

5. **Have you ever valued residential property near power lines?**
Never ☐ Rarely ☐ Often ☐ Frequently ☐

6. **Have you found that the presence of overhead power lines near residential property?**

Please tick appropriate boxes	0 Never	1 Rarely	2 Sometimes	3 Often	4 Always
Increases residential property value					
Reduces residential property value					
Removes some potential buyers from the market place					
Increases the time it takes to sell a property					
Negatively affects the availability of mortgage finance					
Would not consider marketing this type of property					

7. **On average what is the effect on market value?**
No effect ☐ Less than 1% ☐ 2 – 3% ☐ Up to 5% ☐
5 –10% ☐ 10-20% ☐ Greater than 20% ☐

8. **What contributes to any negative value impact or increased marketing time?**

Please rank the degree of impact from 0 to 10 0=No impact 10=Very large impact	Reduces Value	Increases Marketing Time
Visual unsightliness		
Noise produced (buzzing / humming)		
Unsafe (fear of being electrocuted)		
Possible health risks (e.g. cancer)		
Concern over property value in the future		
Restricted land use (growing trees etc.)		
Birds nesting on lines		

8a.

Is marketing time increased by	
Months?	**Years?**

9. **Have you observed any changes in the way house builders have conducted development in the last 5-10yrs to offset any negative effects associated with power lines and pylons?**

Please tick appropriate box	0 Never	1 Occasionally	2 Sometimes	3 Often	4 Always
Proximate property had a larger plot					
Proximate property had a lower price					
Proximate property had a buffer or landscaping to hide the lines					
Low cost housing placed closest to the line					
Social housing placed closest to the line					
Power line corridors through a housing estate (sometimes used for parking, rubbish, or dog walking)					
Reject site for housing development					
Reject site completely					
Other please specify					

Thank you for completing this questionnaire