

**The 2003  
Pacific Rim Real Estate Society Conference  
Australia**

The Effect of Electricity Distribution Equipment on the  
UK Residential Property Market

Sally Sims & Peter Dent  
Oxford Centre for Real Estate Management, Oxford Brookes University,  
Headington, Oxford, England. [ssims@brookes.ac.uk](mailto:ssims@brookes.ac.uk)

**Abstract**

*The effect of electricity distribution equipment, in particular high voltage overhead transmission lines (HVOTLs), on the value of residential property in the UK remains relatively unexplored due, in part, to the lack of available transaction data for analysis. In addition, property tax bands are too wide to allow small changes in value to be apparent, therefore other methods of determining value impacts (if any) need to be explored.*

*The use of qualitative analysis as an alternative means of establishing any negative impacts is examined, revealing that depending on the methodology used, this type of study can result in surprisingly accurate results. Based on an analysis of literature spanning a wide range of interrelated subjects, a UK study was undertaken to determine the opinions of two groups of property professions; Chartered Surveyors and Estate Agents, towards the presence of distribution equipment in close proximity to residential property. This paper examines the relevant literature and presents the results of a perceptual study using simple visual simulation techniques and attitude surveys.*

**Introduction**

When carrying out an assessment of value, the actual price paid (the transaction price) whether for land, property or consumables, is no doubt the most accurate determinant of its value.<sup>1</sup> Any changes, or anomalies in the way the market behaves can be identified by analysing transaction data (quantitative data) over a period of time. However there are two fundamental problems with relying solely on quantitative data for a true analysis of the property market. Firstly, the quality and strength of the result will reflect the quality of the data used for an analysis; for instance, old data is unlikely to produce a reliable indication of current or likely future trends and it can often be a problem finding sufficient properties (cases) to be representative of the type of market you are studying (Mundy 1992; Syms, 1996) especially when the case study involves a detrimental condition.<sup>2</sup> Secondly, transaction data can only reveal the value differences between individual goods, it cannot explain, for instance, why a buyer will choose one property over another despite little or no apparent difference in style, function or quality. Qualitative analysis is the analytical tool used to determine these differences and explain why one item, location or environmental feature is preferred over another. It can also be used as an alternative method of establishing likely value impacts when no other data (i.e. transaction data) is available for analysis.

---

<sup>1</sup> Market value can only be a reliable indication of worth if this price is obtained in a market free from constraints. In other words that there is a willing buyer and a willing seller.

<sup>2</sup> A detrimental condition is anything that influences the market negatively for instance a leaking underground storage tank or a murder.

Transaction data has been used by property researchers to determine the impact (if any) from electricity distribution equipment on proximate land and property values. Research carried out in Canada, the USA and New Zealand where transaction data is available for analysis, has found that residential property in close proximity to high voltage overhead power lines (HVOTLs) and pylons often suffers from a loss in market value and (when using a robust methodology, such as regression analysis) that the loss in market value is, on average, between 2-10%, although a pylon can have a far greater impact. (Colwell,1990 Callanan & Hargreaves;1995; Bond & Hopkins,2000; Rosiers, 1998) In addition, marketing time is often increased by many months, which is also representative of a loss in value.

Due to the unavailability of transaction data, studies within the UK have, by comparison, focused on public and professional perceptions of the risks associated with distribution equipment in comparison to other environmental risks, rather than establishing actual value effects. (Syms, 1996; Gallimore & Jayne,1999; Dent & Sims, 1999; Jayne,2000) The results have suggested that both public and professionals attitudes are generally negative towards the presence of distribution equipment near residential property however participants were not asked to express this negativity in valuation terms.

As residential property continues to be built on land crossed by HVOTLs it has become apparent that there has been a change in the way this type of land is developed for residential use. Developers are now placing low cost and social housing nearest the line and pylon, or creating power line corridors similar to those found in the USA and Canada.. This suggests a belief on the part of the developer of an association between HVOTLs and value diminution. There is however no evidence to substantiate this. Therefore, an analysis of professional opinions towards the likely value effects from the presence of electricity distribution equipment in the UK could provide buyers and sellers of proximate property and property professionals with some indication of likely value impacts. To enable a considered approach to be given to a UK perceptual study, a literature review was carried which included a number of interrelated subject areas. This included literature on property related stigma damage; risk analysis; health effects linked to the electric and magnetic fields (EMF) produced by electrical distribution equipment; and previously conducted perceptual studies to determine public and property professional's attitudes towards HVOTLs and other distribution equipment.

## **The Literature**

### **Early Perceptual Studies**

Property professionals have used basic qualitative analysis techniques (attitude surveys) since the 1950's to determine the impact of high voltage overhead power lines (HVOTLs) on land and property values, particularly when awarding compensation in eminent domain cases.

Early studies 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 or 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 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. Despite some general criticism of the methodology used in these early studies and the problems of bias associated with Electricity Utility funded research, the general conclusions did indicate some negative attitudes (professional

and public) towards the presence of HVOTLs. There was also a tendency for low cost housing to be built nearest the line which reflected “a belief on the part of the developers for which no empirical evidence is known to exist...”(Kinnard *op cit*)

Kroll and Priestley (1992) undertook a comprehensive literature review of studies (value and opinion) conducted before 1990, for the Edison Electricity Company, giving them access to many previously unpublished papers and technical reports. They identified nine attitude studies (that they considered to be methodologically sound) which either focused specifically on the perceptions of property value effects (Thompson (1982)<sup>3</sup>; Kinnard *et al* (1984)<sup>4</sup>; Ball (1989)<sup>5</sup>, or looked at a wider range of effects on amenity. (Including property values, health, safety, and aesthetics. (Mitchell *et al* (1976)<sup>6</sup>; Boyer *et al.*, (1978)<sup>7</sup>; Market Trends, Inc (1988)<sup>8</sup>; Rhodeside and Harwell Ltd (1988)<sup>9</sup>; Economics Consultants Northwest (1990)<sup>10</sup> and Beauregard Consiel, Enr (1990)<sup>11</sup>. Attitude studies at this time were usually undertaken in conjunction with a valuation study and generally found that the population had either little or no knowledge of any possible health risks associated with living in proximity to HVOTLs. They concluded that despite variations in the type of property studied, the location for the study and the questionnaire design, it was possible to draw some conclusions about general attitudes towards HVOTLs. For instance; buyers who had purchased their property before the line was built, expressed greater negativity towards the presence of HVOTLs; screening was found to reduce negative attitudes and there appeared to be a general perception of negative value effects. However, attitudes towards the effect on value and marketing were often confused and appeared to be based on personal feelings rather than substantiated by fact. (Bigras, 1964; Boyer *et al.*, 1978; Carll, 1956)

The reliability of the public's response to attitude surveys was also questioned, due to the behaviour of the market participants which appeared to reflect factors such as the availability of substitute properties rather than the 'stated' depth of feeling towards the presence of HVOTLs. The dichotomy between public opinion and actual behaviour (what they say they will do and what they actually do) 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. In an effort to explain this behaviour, social scientist developed a new method known as psychometric testing, (Slovic 1992) to identify a number of factors or 'heuristics' that could account for some seemingly illogical public behaviour in response to certain risks. One such factor to influence the public's acceptance of risk was found to be “voluntariness of exposure...” (Krimsky & Golding, 1992;120). Other studies (Starr, 1969; Slovic,1992; Mundy,1992) have found that “ familiarity, control, catastrophic potential, equity and level of knowledge also influence the relationship between perceived risk, perceived benefit, and risk acceptance.” (Krimsky & Golding *ibid*). Slovic found that not only could 'a lack of knowledge' increase public fear towards exposure to EMFs from electricity power lines, but in a quote from Coy (1989) reveals that “...as research studying health effects of exposure to electric fields remains inconclusive but is discussed frequently in the news, perception of risk from these fields is rapidly increasing.” Even the way a risk is communicated to

---

<sup>3</sup> Prepared for his Master Thesis, University of Alberta

<sup>4</sup> Independent study

<sup>5</sup> Prepared for the Salt River Project

<sup>6</sup> Independent study

<sup>7</sup> Independent study

<sup>8</sup> prepared for the Arizona Utility

<sup>9</sup> Prepared for Virginia Power

<sup>10</sup> Prepared for the Bonneville Power Authority and others

<sup>11</sup> Prepared for Hydo-Québec

individuals, groups or institutions (TV, radio, press) can result in behaviour that reflects an increased concern towards low risk and low probability hazards or a reduction in concern over a high level risk that has a high probability of occurring. One study to demonstrate this effect was conducted by Morgan, *et al.*, (1995). He found that “the perceived risks associated with electric and magnetic fields from power lines and electric blankets were relatively low. However, when the respondents were given a supposedly non-alarming briefing about research on health effects of EMF fields (which stated that many studies had been done and that no adverse human health effects had been reliably demonstrated), their perceptions on subsequent retest shifted toward greater perceived risk.” (Krimsky & Golding, 1992:127)

Fischhoff (1985) found that ‘people tend to ignore evidence that contradicts their current beliefs, and to base their perceptions of relative risk on what they see in the news media’ Negative perceptions, fear, lack of knowledge and uncertainty, are all causes of property related stigma.

### Stigma

Stigma in relation to contaminated land or property has gaining acceptance as a cause of value diminution (Arens, 1997; Edelstein 1988; Kinnard & Worzala 1996; McClelland *et al* 1990; Roddewig, 1996;). However, according to Bell (1999) property stigma does not have to be directly related to, or caused by any form of environmental contamination to have a negative impact on value. In fact, property can be structurally sound, in a well-placed locality and yet be totally unmarketable. For instance, cultural beliefs such as *feng shui*<sup>12</sup>, murder or horrific events have all been established as a cause of property related stigma. In the early 1990 ‘fear of health risks from electric and magnetic fields’ (EMFs) produced by electricity distribution equipment, was identified as “one type of stigma that can influence the value of property negatively.”<sup>13</sup>The majority of attitude studies conducted since then have generally concluded that there is some degree of negativity towards HVOTLs which could translate into a value reduction for proximate property. The reason for this negativity and subsequent value diminution has largely been attributed to either, visual impact of lines in particular pylons or; fear of EMF related health risks leading to stigma damage (Mundy, 1992) One of the earliest studies to address the issue of potential adverse health effects was conducted by Priestley and Evans (1996)<sup>14</sup> who had included this in a general question on health and safety issues such as lines or towers falling down and possible electrocution. Respondents ranked their concerns in order of importance, listing health and safety concerns most often, followed by property values then aesthetics. Respondents showing the most concern were usually those who had lived in their homes before the line was built. This group also tended to have higher-status occupations and generally perceived the visual impact to be much greater, with 57% of the respondents overestimated how much of the line they could see.

---

<sup>12</sup> In Asian countries and cultures, property values and desirability rely more on the perception of good *Feng Shui* (an ancient system of beliefs governing the arrangement of physical living and working environments using the concept of harmony) (Bell 1999:Chapt.2) than on any other single factor. A survey undertaken in Southern California during the late 1990’s revealed that 70% of Asian purchasers considered *feng shui* and 25-30% consulted a *feng shui* master before buying property. Premiums are often paid for property considered to have a ‘good’ *feng shui*, whereas a property with bad *feng shui* (for instance having the number 4 in the address, which according to their beliefs means death) can suffer from longer marketing periods, lower prices and may not even be considered as a purchase option.

<sup>13</sup> Chalmers and Roehr 1993

<sup>14</sup> Data for this study was collected in 1987 before adverse health effects were widely publicised. It was reviewed in Kroll and Priestley 1992 and finally published in 1996

The overestimation of the lines proximity, was not found to be a problem by Bishop *et al.*,(1985). Their unusual study explored the use of visual simulation techniques to assess the degree of negativity towards HVOTLs. The study, undertaken in Melbourne, Australia used photographic techniques, computer generated images and graphic enhancements to establish whether or not there was any correlation between a variety of landscapes, pylon designs, public opinions and the socio-economic status of the participants. Analysis revealed that changes in the landscape had little affect on public opinion, however the "presence/absence of transmission line structures (pylons) accounted for approximately 90% of the variation..." in the participants assessment of HVOTLs (ibid:191)

#### Expert v Lay Opinions

Differences between expert (property professionals) and lay opinions (the general public) have occasionally been blamed for an exaggerated diminution in the value of proximate property. (Gallimore and Jayne.1999) Kinnard's 1984 study found that agents (90% of the respondents in his study) perceived a much greater negative effect than the owners of proximate property. However, in a later study Furby (Furby *et al.*,1988) found the complete opposite. His results suggested that lay people generally believed there was a "significant negative effect," whereas experts "often maintain that there is no effect at all." Delaney and Timmons (1992) looked at the views of two groups of professionals (those who had valued property near HVOTLs and those who had not) and found that appraisers who had not valued proximate property before "believe a greater negative value adjustment is warranted."

#### The Impact of Media attention:

By 1992 a number of peer reviewed and published epidemiological studies<sup>15</sup> had suggest that a variety of adverse health affects including cancer, appeared to be associated with exposure to EMFs from living close to electricity power lines. Media attention of these epidemiological studies, most notably by campaigning journalist Paul Brodeur in the USA, led to many other similar articles featured in both local and national tabloids,<sup>16</sup> and several Journals.<sup>17</sup> Brodeur reported these epidemiological findings and suggested that the Electricity Industry was involved in a major cover up of the health risks to the public. He published 3 major articles in the New Yorker "The Calamity on Meadow Street," July 9, 1990; "Department of Amplification," November 19, 1990; and "The Cancer at Slater School," December 7, 1992. which later went on to form the basis of his 2<sup>nd</sup> book in this area; 'The Great Power-line Cover-up.'(1993 *Little, Brown*) His arguments were very convincing, leading other tabloids to focus on this issue and to the screening of several television documentaries.<sup>18</sup> In 1995 he addressed the Natural Resource Committee of the Nebraska State Legislature, (8-2-1995) in connection with a proposed 96 mile 345,000 volt power lines. Part of his address stated that "... the epidemiological study list compiled by the National Library of Medicine shows that 31 of the 40 childhood and occupational epidemiological studies conducted over the past 15 years and published in the peer reviewed medical literature have found excess cancer either among children living in homes near high-voltage and high current power lines, or among workers exposed to power frequency electromagnetic fields on the job ..." (Taken from the transcript, which appeared in

---

<sup>15</sup> For instance: Perry S., 1979; Wertheimer N, & Leeper E, 1979 and 1982; Savitz. D., 1986 and 1988; Pechting & Ahlbom, 1992.

<sup>16</sup> For instance:- The Times; The Sunday Times; The Financial Times; The Guardian; The Observer; The Independent; The Independent on Sunday; the daily telegraph.

<sup>17</sup> For Instance:- New Scientist; British Medical Journal; Time Magazine; Environmental Health; Solicitors Journal; Estates Gazette; Property Week; New Zealand Valuers Journal.

<sup>18</sup> For Instance; BBC Panorama 31-1-1994

**Network News**, Special Spring 1995 Issue. and reprinted with permission, on the internet.)

Although his evidence was heavily criticised by a number of epidemiologists for its 'oversimplification' of the "science of health effects of power-frequency magnetic fields" and the fact that there were "errors and misrepresentations throughout his text,"<sup>19</sup>(Moulder ) his articles marked the beginning of the media's interest in this subject.

#### The Impact of Legal Issues:

Another possible cause for the "dramatic shift" in public perception highlighted by Delaney and Timmons (1992) may have been the success of several 'loss of property value' claims against the Electricity Utilities in the U.S.A. This followed a decision by the Florida Supreme Court in 1987 to allow fear of electromagnetic fields to be admitted "without independent proof of reasonableness" [*Florida Power and Light Co v Jennings* 518 So.2d 895 (Florida Supreme Court, 1987)]. This decision allowed compensation for loss of value to be based on a "calculated diminution of the present market value of the property as a result of the public fear of electromagnetic radiation." [*San Diego Gas and Electric Co v Daley*, 205. Cal.App.3d.1334, 1347,253 Cal. Rptr. 144 (1988)<sup>20</sup>. The combination of media attention and legal redress for loss of value compensation, would have almost certainly have increased the public's perception of risk (physical and financial) towards living near HVOTLs. It could also be argued, that as adverse publicity increased, so too would public feelings of 'mistrust' towards the electricity industry. However, whilst fear "... whether reasonable or not" may provide the motive, it is not "...a measure of the diminution in market value" (Kinnard & Dickey 1995:25).

The Kung and Seagle survey in 1992 found that the public was still generally unaware of any potential health risks and simply viewed HVOTLs as an eyesore. Their questionnaire produced some predictable responses, with 87% of homeowners who responded stating that if they had known about a link with health effects, the price they were "willing to pay for their home would have been adversely affected or they would have looked in other areas for comparable housing."(ibid:416) Despite earlier studies suggesting that what the public say they will do in a hypothetical situation and what they actually do are not necessarily the same, Kung and Seagle concluded that once the general public were aware of this association, concern over potential health risks "would probably have a profound effect on the real estate market for homes located in close proximity to power transmission lines".(ibid:413)

Whilst several more recent surveys have suggested that proximity to HVOTLs will remove certain buyers from the market, there is only limited evidence to suggest that this type of property will not eventually sell. (Rikon1996). The conclusions drawn by Kung and Seagle's attitude study were based on a small sample size; 80 participants, from 2 neighbourhoods, with a 57% (47 respondents) response rate, and their valuation study used transaction data from the sales of 2 case properties and 3 controls in one location and 2 cases and 4 controls in a second location. As such, the results might not be very representative of the market in general.

---

<sup>19</sup> J Moulder Ph.D. Professor of Radiation Oncology, Medical College of Wisconsin is the author of a large EMF data base which can be found on the internet [www.mcw.edu/gcrec/cop.html](http://www.mcw.edu/gcrec/cop.html)

<sup>20</sup> Cited in Jaconetty T. A. 1996 Stigma Phobias and Fear: Their Effect on Value *Assessment Journal* Feb 1996:62

Studies throughout the 1990s found a growing awareness of health risks. According to a public poll taken in 1993 by Cambridge Reports Research, 63% of all adult Americans were aware of the EMF issue, compared to only 31% in 1989 and nearly 50% responded that they were “extremely worried” about it. Some owners of property adjoining HVOTLs had even found their homes to be unsaleable at any price. (no evidence to support this statement has been found during interviews with Estate Agents in the UK, for the study in progress) Rikon (1996) suggested that “this ELF could be the next giant in environmental hazards,”<sup>21</sup> and stated that it was “entirely possible to conclude after an EMF market study that most parcels of EMF affected property will have a restricted resale value,” (ibid:90)

Kinnard and Dickey (1995) found that using results from a residential survey as a measure of likely market behaviour was often questionable because of the “sharp dichotomy between fear of health hazards by current and potential residents of an area and the market behaviour of buyers and sellers in that area,” and added that “it is both improper and misleading to confuse the two.” Analysis of transaction data over a period of time identifies “actual past and likely future behaviour of buyers in market areas identified as proximate to HVOTLs”. Opinion surveys only reflect the responses of interviewees to a hypothetical situation not necessarily the opinions of prospective purchasers in that location.

It was the inability of attitude studies accurately to predict market behaviour in terms of econometric effects that has been one of the major criticisms of the reliability of this type of research. The unreliability of such data was highlighted by the results of many attitudinal studies that had found respondents’ ‘perceived value impacts’ did not reflect actual behaviour in the market place. “although the degree to which this occurred had not been tested.” (Kroll and Priestley.1992:34) Another important consideration in the assessment of likely market behaviour was discussed by Jaconetty (1996) in his investigation into the impact of stigma, phobia’s and fear on property values. He stated that, to have a complete understanding of the “dynamics of the marketplace we must consider not only what the sales data and social science research might show, but also what subjectively and personally motivates market participants.”(ibid:52) In the case of EMFs associated with HVOTLs he found that the concern their presence induced in the public, “appear[ed] to be a good example of a subjective fear that will continue to play a significant role in the marketplace. “ His research into this area led him to the conclusion that no amount of scientific studies refuting any claims of adverse health effects would “overcome what people actually believe and fear” (ibid:57) In fact, attempts to disprove the link between EMFs and adverse health effects actually “increases belief that there is a problem” (Jayne 2000) Paradoxically, this would imply that as more research concludes EMFs are not a health risk the less confident people are likely to be about the possible risks. (Morgan et al 1985) “Due to the nature of scientific enquiry, conclusions are that, ‘ no such link has been found’. This is not the same as a statement that, ‘no link exists’. Consequently, it could be alleged that, even in the face of overwhelming evidence to the contrary, it is possible for some people to justify a statement that there may still be a link, but that it hasn’t yet been found.” (Jayne 2000) Kinnard observed that proof either way may make little difference to market participant behaviour as “*Buyers and sellers base their actions on their expectations and anticipations. If fear is a*

---

<sup>21</sup> Marx Ron D.1993 This ELF Could Be The Next Giant in Environmental Hazards *Econ the Environmental Magazine for Real Property Hazards* (Nov 1993):22 ) cited in Rikon M., 1996 Electromagnetic Radiation Field Property Devaluation *The Appraisal Journal* January 1996:87-90

*widespread influence, whether justified or not, it will affect value adversely. (Kinnard :1965:23)<sup>22</sup>*

From the mid 1990's attitude studies generally compared property professionals' attitudes and opinions (in particular valuers and agents) to those of homeowners, (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. For instance; 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 HVOTL's more negatively than the valuers." Interestingly, when asked to express their negativity in value terms both groups suggested a similar reduction of around 10%. This figure was less than expected, considering the negativity expressed by the residents and alluded to the possibility that the degree of negativity expressed by residents does not give an accurate assessment of their actual behaviour in the market, in other-words; negative opinion are not always reflected in lower property prices. This was confirmed by a parallel study of transaction data (Callanan & Hargreaves, 1995) for the same location. An analysis of transaction prices over a ten-year period suggested that the decline in value was, on average 10%, (similar to earlier assessments of value diminution found in other studies),<sup>23</sup> and that the greatest impact on value was caused by the pylon. Power lines, in this study, were not sited in a power line 'right of way' (ROW) but crossed over residential property in the same way as transmission equipment is sited in the UK.

The benefits of a ROW to an individual homeowner could 'cancel out' any inconveniences due to the "enlarged visual field, increased intimacy" that the ROW provided. In a study by Saint Laurent (1996) it was argued, that benefits such as increased privacy and a green corridor, can also outweigh concerns about possible health risks. Rosiers (2002) reached similar conclusions.

#### Visual Impacts on Value –v- Health Risk Concerns

Gregory and von Winterfeldt (1996) attempted to disentangle public concern of health effects from other possible impacts on value, (such as visual contamination) to assess the likely value diminution on proximate property. Whilst finding that the available evidence suggests a value decline of between 5 - 10% they stated that it "remained difficult to disentangle the EMF portion of that decline from other causes" (ibid:212) and suggested that even if there "truly are no adverse health effects, the fear of these effects may cause reductions in property values," and had already caused the possible stigmatisation of transmission lines" (ibid:202).

Due to the problems of trying to separate health effects from other effects on amenity Mitteness & Mooney (1998) chose not directly to address this issue in their attitude study, but to allow respondents to voice their own opinions on the causes of any negative effects. Their survey concluded that buyers of property near power lines in Minnesota and Western Wisconsin, perceived the greatest value diminution (7.6%). Appraisers and existing owners of property near HVOTL's perceived a similar loss in

---

<sup>22</sup> Cited in Furby *et al* 1988:79 Electric Power Transmission Lines, Property Values, and Compensation *Journal of Environmental Management* 27,69-83

<sup>23</sup> A later paper produced by Bond and Hopkins (nee Callanan) 2000, (The Impacts of Transmission Lines on Residential Property Values: Results of a Case Study in a Suburb of Welling NZ *Pacific Rim Property Research Journal* Vol 6, No 2:52-60) used an improved methodology to analyse the same data. The results were essentially the same.

value of approximately 4%. This perceived loss was lower than suggested by other previous studies. (Callanan & Hargreaves,1995; Gregory & Von Winterfeldt (1996) Interestingly, owners who were in the process of selling homes close to HVOTL's stated that value was reduced by only 3.3%. Marketing times were also found to be negatively affected, and results indicated that proximate property "w[ould] require an additional 62.1 days, on, on the market to achieve a sale." (ibid:12)

### UK Research

The Royal Institution of Chartered Surveyors (RICS) recognised the potential impact of perception on proximate property and in 1996 added Practice Statement 3.7 to the *Red Book*. This stated that whilst there was, "no clear evidence of adverse health effects...public perceptions may affect marketability and future value of property." However in the absence of a publicly available property transaction data base, it has not been possible to investigate whether the concerns expressed by the RICS have any foundation. Without available transaction data, UK property researchers have relied on perceptual studies to explain market behaviour. There have been no published valuation studies conducted in the UK to determine whether the value of property close to HVOTL's is negatively affected. Although there has been anecdotal evidence to suggest that developers and the Electricity Utilities may have carried out their own research.

Gallimore and Jayne (1999) attempted to test how far the perceptions of valuers influenced the attitudes of the purchaser. In other words, was the diminution of value due to professional valuation advice borne out of valuer caution to avoid professional negligence claims or was it due to genuine market perceptions? Both groups were asked to rank a number of everyday risks including HVOTLs. The results revealed that valuers appear to be slightly more concerned than the public. (the mean factor score for valuers was 1.42 which was slightly higher than the public's score of 1.16) Interestingly when both groups (valuers and the public) were asked to rank each others view of the risk from HVOTLs, the results were virtually the same; suggesting that both groups consider the view they hold to be the same as other people. They concluded that "if valuers' perceptions of this risk exceed the public's then there is the danger that valuers may amplify the public's level of fear in formulating their advice. "

Jayne returned to this issue in a study supported by the RICS Research Foundation (2000). After conducting a 'risk perception' analysis, he concluded that perceptions of HVOTLs risks varied broadly within the population although the results do show a "general sensitisation of the public to the risk of HVOTLs", however, he did not use valuation criteria to express a potential impact on house prices. Analysis revealed some possible determinates of probable market response; gender, age, second child and region, but not socio economic grouping. Other factors potentially influencing a buying decision; included "visual intrusion, local planning proposals and even the lending policies of funding institutions." He concluded that valuers might be helped when interpreting market behaviour by understanding "the nature of the public's perceptions of the risks of HVOTLs".

### **Background to the Study**

Despite numerous efforts since the 50's, to determine the effect of electricity distribution equipment, in particular HVOTL's on the property market, the overall effect on property values remains unclear. Valuation studies using transaction data and a robust methodology such as regression analysis, seem to indicate a general reduction in market value of between 2 and 10% for properties situated 'close' (usually within 50metres of the line). The presence of a pylon can have an even greater negative impact on value (as much as 27%). Studies using transaction data are undoubtedly the most reliable method of determining the likely effects on market

value of property near HVOTLs, particularly when the data is collected and analysed using either regression analysis or a micro-spatial approach. However, this is only possible when there is sufficient data available for such an analysis.

By comparison, perceptual studies rely on the personal experience and opinions of the participants and have recently proved capable of providing a reasonably accurate estimation of value effects. Bond and Hopkins (2000) In addition, perceptual studies have the ability to highlight, and measure the degree to which an individual variable contributes towards any negativity expressed by participants. However, care should be taken when relying on the results of past studies as an indicator of likely market reaction.

Results from many studies have proved to be somewhat misleading, due to the tendency of participants, buyers in particular, to express a great deal more negativity towards HVOTL's than appears to be reflected in the price they are willing to pay for proximate property. This dichotomy might be due, in part, to the questionnaire design, which generally failed to ask participants to express their negativity in value terms. The small number of robust studies to ask this question and then compare the results with actual transaction data for the same location, found close similarities between estimated value effects and actual value reductions.

#### Questionnaire Design

Questionnaire design raised the issue of circularity, (addressed by Gallimore and Jayne (1999) in their UK study to determine whether public and professional perceptions towards HVOTLs were the same.) The act of conducting a survey to establish the degree of negativity expressed by the public towards the presence of HVOTLs in close proximity to residential property may, in itself, be perpetuating the problem.

Some published studies included examples of the type of questions public (buyers, seller and residents of property 'near' and 'not near' HVOTLs) and professionals were asked in relation to their attitudes towards HVOTLs. These included some very direct questions towards specific issues that have been associated with HVOTLs, that individuals may have been unaware of until asked to participate in the survey. (for instance; attitudes towards the risk of adverse health effects or whether they had experienced any difficulty in obtaining a mortgage)

The use of psychometric testing can address this problem, however, it can also result in a fairly complex and long winded questionnaire. The number of questions in a postal survey has been found to have a negative relationship with the response rate and would probably result in a poor response rate from the general public. Personal interviews may provide more detail but are costly to undertake or may be considered too costly to conduct a large-scale study using personal interview techniques.

By comparison all Surveyors and Estate Agents in the UK should be aware of the issues associated with the presence of HVOTLs near residential property due to the concern expressed by the RICS when PS 3.7 was issued. Whilst their professional advice is likely to reflect personal perceptions to some degree, their response to a well designed questionnaire should provide a reasonable indication of the likely value effects without creating more negativity towards HVOTLs and increasing the risk of circularity.

#### Initial Investigation

This issue was initially approached indirectly in (1998) by conducting a survey of public and professional opinions towards a number of contaminants including HVOTLs

### Study Location

The study was conducted in an area known as the West Midlands, in the UK where there is one major city (Birmingham) and a number of smaller towns and suburbs. HVOTLs can be found directly above residential property on a number of housing estates within this area. Whilst some estates are predominately social and low cost housing, other newer estates (built or currently being built) situated in the suburbs close to rural land are usually a mixture of 2,3,4 bedroom, medium priced single family residences with a small percentage of social housing.

### The Survey

A questionnaire was sent to 360 members of Residents Associations in the West Midlands, with a 30% response rate (109 usable responses) and just under 400 Chartered Surveyors (we estimated that around 50% would be property surveyors) with a 24% response rate. The questionnaire listed eleven possible contaminants to avoid focusing specifically on power lines as the issue under investigation.

### Buyers response

Responses suggested that the public generally regard power lines and substation as a contaminant due mainly to the possible health risks. (table:1)

**Table1: Residents Response**

<b>Classed as a Contaminant</b>	<b>Yes</b>	<b>No</b>	<b>Visual</b>	<b>Noise</b>	<b>Health</b>
High Voltage Overhead Power-lines	87%	13%	48%	8%	72%
High Voltage Under-ground Power-lines	38%	62%	2%	3%	70%
Sub-Stations	73%	27%	38%	8%	73%

Predicably, when asked whether or not they would buy a house in close proximity to HVOTLs, under-ground lines and sub-stations, the majority of respondents said no. (88%, 57% and 77% respectively) and removing the HVOTLs from sight reduced the negative response by around 10%.

### Surveyors Response

Surveyors were given an extra variable (Pylon) to comment on and were also asked to indicate whether or not the presence of various contaminants within 200m, 100m, or 50m would affect the value and marketability of residential property. (table 2,3,4)

**Table 2: Surveyors Response**

<b>Classed as a contaminant</b>	<b>Yes</b>	<b>Noise</b>	<b>Vibration</b>	<b>Health</b>	<b>Visual</b>
Substation	63%	2%	5%	40%	42%
H/Volt overhead power lines	88%	5%	2%	56%	2%
H/Volt underground line	28%	-	-	21%	2%
Pylon	23%	-	-	47%	74%

**Table 3: Impact Value**

<b>Negatively affect value</b>	<b>Within 200m</b>		<b>Within 100m</b>		<b>Within 50m</b>	
	<b>Yes</b>	<b>Only if Vis</b>	<b>Yes</b>	<b>Only if Vis</b>	<b>Yes</b>	<b>Only if Vis</b>
Substation	9%	14%	23%	16%	47%	16%
H/Volt overhead power lines	28%	21%	47%	23%	72%	14%
H/Volt underground line	5%	2%	7%	-	14%	-
Pylon	23%	23%	42%	23%	70%	9%

**Table 4: Impact Marketing**

<b>Negatively affect marketing</b>	<b>Within 200m</b>		<b>Within 100m</b>		<b>Within 50m</b>	
	<b>Yes</b>	<b>Only if Vis</b>	<b>Yes</b>	<b>Only if Vis</b>	<b>Yes</b>	<b>Only if Vis</b>
Substation	12%	16%	21%	19%	47%	16%

H/Volt overhead power lines	35%	35%	51%	26%	70%	7%
H/Volt underground line	4%	-%	9%	-	16%	-
Pylon	35%	30%	47%	30%	70%	9%

All electricity distribution equipment was classed as a contaminant by varying numbers of respondents. HVOTLs were considered to be a contaminant by 88% of the respondents with 56% suggesting that this was due to health risks. 63% said that substations were a contaminant due to a combination of visual (42%) and perceived health risks (40%) (table 2)

Opinions towards possible value (table 3) and marketing (table 4) impacts varied however, there was a positive relationship between proximity and the number of respondents who perceived negative market impacts

Overall, comparison between group attitudes suggested that whilst both residents and surveyors view 'visible' electricity distribution equipment (HVOTL's and substations) as an environmental contaminant, residents were more concerned about the visual impact and the possible health risks from living close to electricity distribution equipment than surveyors.

### Second Surveyors Questionnaire

A second study was, conducted 12 months later, with a small sample of surveyors (51) from the Midlands and surrounding area. This time pylons were excluded and Radio/TV transmission masts and Mobile phone base stations included to establish whether negative attitudes existed towards other sources of EMF. This produced 45 useable responses.

### Results

Surprisingly, all variables producing electric and magnetic fields (EMFs) were classified as a contaminant. HVOTLs produced the greatest response (88% in the 1<sup>st</sup> survey and 90% in the 2<sup>nd</sup> survey) and were also perceived to have the greatest impact on property value (table 6) and marketability. (table7) There was also a small increase in the number of respondents who considered substations to be a contaminant. Underground lines, by comparison produced an increased response from 4% to 26%. (table 5) This increase either suggested that the group sample had an over-representative number of surveyors with negative attitudes towards this issue (due to sampling error) or that there had been a general attitude shift within the population. The increase in the number of respondents siting health risks as the reason why these variables should be classed as a contaminant suggests the latter.

Mobile phone base stations were also viewed negatively due to their visual impact and possible association with health risks from EMFs. However, at the time this survey was undertaken, mobile phone base stations were only just beginning to attract media attention and few were sited in residential areas. (A similar survey conducted now would probably produce very different results)

**Table 5: Surveyors response 'Classed as a contaminant'**

<b>Classed as a contaminant</b>	<b>Yes</b>	<b>If Yes... then why</b>			
		<b>Noise</b>	<b>Vibration</b>	<b>Health</b>	<b>Visual</b>
Substation	68%	18%	8%	54%	22%
H/Volt overhead power lines	90%	6%	-	72%	46%
H/Volt underground line	26%	-	-	22%	-
Radio/TV Mast	54%	-	-	14%	42%
Mobile Phone Aerial	38%	-	-	32%	32%

**Table 6: Value Impact**

Negatively affect value	Within 200m		Within 100m		Within 50m	
	Yes	Only if vis	Yes	Only if vis	Yes	Only if vis
Substation	8%	12%	6%	14%	38%	24%
H/Volt overhead power lines	24%	16%	36%	22%	76%	8%
H/Volt underground line	2%	-	2%	-	18%	-
Radio/TV Mast	8%	30%	12%	32%	36%	28%
Mobile Phone Aerial	6%	20%	16%	26%	30%	26%

**Table 7: Impact on Marketing Time**

Negatively affect marketability	Within 200m		Within 100m		Within 50m	
	Yes	Only if vis	Yes	Only if vis	Yes	Only if vis
Substation	10%	12%	14%	16%	32%	26%
H/Volt overhead power lines	28%	10%	22%	12%	78%	10%
H/Volt underground line	4%	-	48%	2%	10%	2%
Radio/TV Mast	6%	30%	8%	36%	42%	28%
Mobile Phone Aerial	8%	24%	20%	28%	36%	30%

Although the methodology used to analyse the results of this study considered only frequencies as an indication of the strength of opinion towards electricity distribution equipment, the results generally supported those found in other recent studies, (Bond & Hopkins, 2000, Jayne 2000) where a more robust methodology (regression analysis) was used.

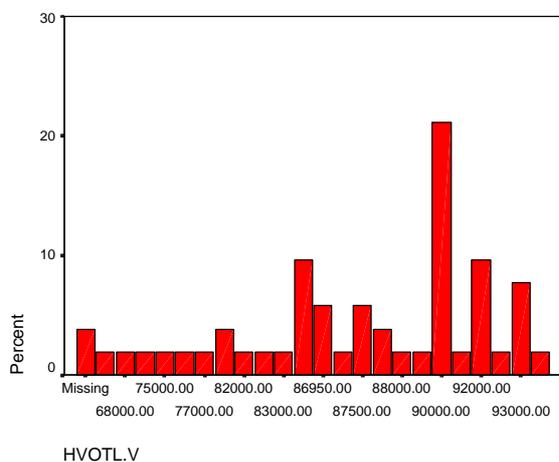
### Visual Simulation

To establish an indication of the likely impact on the value of proximate residential property, a visual simulation experiment involving two groups of valuers (Chartered Surveyors and Estate Agents) was conducted. 50 members from each group were asked to participate in a hypothetical valuation and were sent the marketing details of a four bedroom house in a mid price range suburb with an 'on the market value' of £96,950. This was accompanied by four alternative views of the same property with the inclusion of a HVOTL over the property; a pylon situated behind the property; a substation next door and; an underground line running under the pavement in front of the house. Both groups were asked to re-value the property with the inclusion of each new variables.

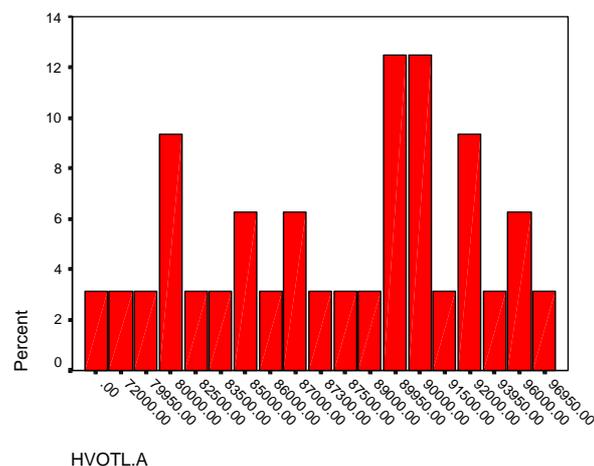
### Results

50 useable responses were received from the surveyors group. 37 Agents responded with 32 Agents completing the exercise and 5 stating that they were unable to complete the survey due to lack of professional experience in this area.

**Figure 1: Surveyors Perceptions**



**Figure 2: Agents Perceptions**



**Table 8**

	N	Min £	Max £	Mean	Std.Dev
Agents	32	00	96950.00	85060.90	16452.90
Surveyors	50	00	95000.00	85283.00	13617.49

Figures 1 and 2 show that:-

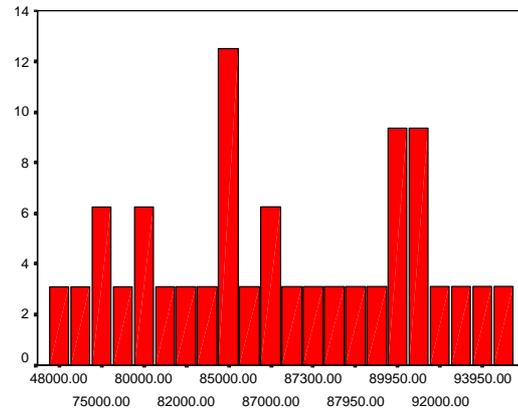
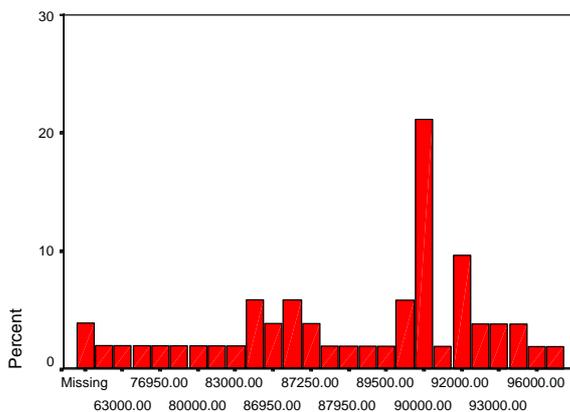
The presence of a line (HVOTL) over the top of a house might:-

- reduce value between 18-30% according to 15.5% of Agents and 13.3% of Surveyors
- reduce value between 10-16% according to 46.5% of Agents and 45.6% of Surveyors
- reduce values by up to 5% according to 6.2% of Agents and 11.4% of Surveyors and
- 2 respondents suggested that this type of property would not be considered marketable at any price. (Table 8 shows the mean value for both groups and the standard deviations)

**Figure 10:-Surveyors Perceptions**

PYLON

**Figure 11: Agents Perceptions**



PYLON.V

PYLON.A

**Table 9**

	N	Min £	Max £	Mean	Std.Dev
Agents	32	48000.00	94950.00	84475.00	8939.50
Surveyors	50	00	96950.00	86291.90	13866.31

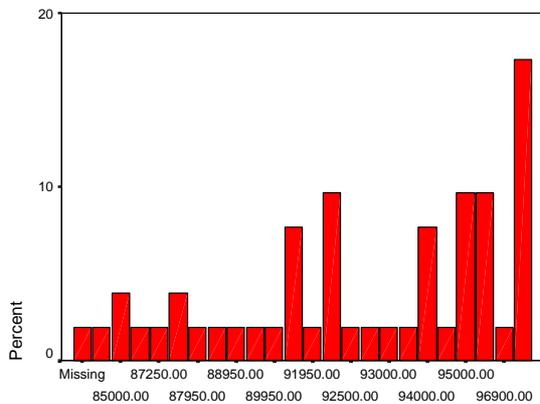
Figures 10 and 11 show that the presence of a Pylon might:-

- reduce value by 28-30% according to 6.2% of Agents and 3.8% of Surveyors
- reduce value between 14-23% according to 40.3% of Agents and 15.2% of Surveyors
- reduce value between 5-10% according to 40.3% of Agents and 47.5% of Surveyors
- reduce value up to 5% according to 9.3% of Agents and 15.2% of Surveyors
- 2 respondents suggested that this type of property would not be considered marketable at any price. (Table 9 shows the mean value for both groups and the standard deviations)

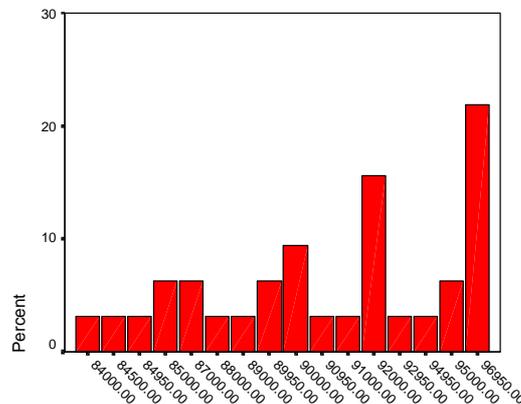
**Figure 12:- Surveyors Perception**

SUBSTATION

**Figure 13: Agents Perception**



SUBST.V



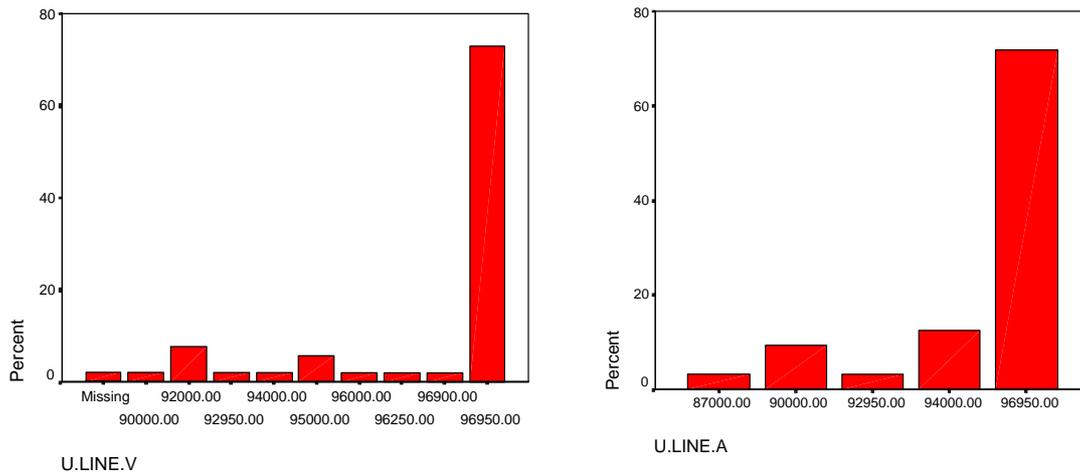
SUBST.A

**Table 10**

	N	Min £	Max £	Mean	Std.Dev
Agents	32	84000.00	96950.00	91339.06	4214.43
Surveyors	51	77000.00	96950.00	92555.88	4156.08

Figure 12 and 13 show that the presence of a Substation next to a house might:-  
-reduce value by 10% according to 21.7% of Agents and 7.6% of Surveyors  
-by 5 & 10% according to 46.5% of Agents and 28.5% of Surveyors.  
-between 1 & 5% according to 12.4% of Agents and 36.1% of Surveyors.  
The maximum reduction suggested was 21%.(Table 10 shows the mean value for both groups and the standard deviations)

**Figure 14:-Surveyors Perceptions UNDERGROUND LINE Figure 15: Agents Perception**



**Table 11**

	N	Min £	Max £	Mean	Std.Dev
Agents	32	87000.00	96950.00	95493.75	2705.18
Surveyors	50	90000.00	96950.00	96141.18	1734.67

Figure 14 and 15 show that Underground lines have no impact on property value according to 68.2% of Agents and 76% of Surveyors. However value would be reduced by:-  
- 5 -10% according to 12.4% of Agents and 9.5% of Surveyors and  
-between 3 & 5% according to 15.5% of agents and 3.9% of Surveyors.  
-The maximum reduction suggested was 10%  
(Table 11 shows the mean value for both groups and the standard deviations)

Other comments suggested that a house close to either a power line or pylon would not be considered as suitable security for a lending company.

Despite the simplicity of the survey, the results suggest that there are differences in the perceptions of Surveyors and Agents regarding the impact of transmission equipment on residential property values. With the exception of HVOTLs, Surveyors appear less willing to offer larger discounts and generally reduce value by up to 10%. These results correlate with the findings from a number of other studies including Colwell (1990); Gregory von Winterfeldt (1996); Rosiers (2002); Mitteness and Mooney (1998).

New Zealand studies (Callanan and Hargreaves, 1995; Bond 1995; Bond and Hopkins, 2000) were of particular relevance due to the similarity with the UK market where HVOTLs can be found running directly over residential property and pylons are situated close by. The studies were conducted in the same location so that attitudes towards value impacts could be compared with transaction data for the study area, revealing surprising accurate perceptions of value diminution.

## **Professional Valuation Survey**

The findings from these investigations and other studies discussed in the literature review, provided the focus for a more in-depth study to determine the likely impact of HVOTLs on the market value of residential property in the UK. To reduce the size of the questionnaire and therefore increase the likely response rate, only HVOTLs were investigated (as this had produced the most negative response) rather than including all the variables used in previous investigations

Using similar survey techniques to Prestley and Kroll,(1992) Mittness and Mooney (1998) Bond and Hopkins (2000) a questionnaire was designed to test the opinions of two groups of UK property professionals towards the impact of HVOTLs on residential property values. The focus of this study was to determine:

- The opinions of valuers and agents towards the effect of HVOTLs and pylons on residential value and marketing time.
- What aspect of HVOTLs had the greatest impact on value
- What step builders and developers are taking to mitigate any perceived value loss.
- How opinions towards this type of property differ between the two groups of professions involved in the valuation and marketing of residential property

### **Methodology**

There are two large bodies in the UK whose members are recognised as being qualified to undertake property valuations. One is the Royal Institution of Chartered Surveyors (RICS ) whose members are 'professionals whose academic qualification and training have been approved by the RICS and [who] are required to follow a strict code of ethical conduct.' ([www.ricsonline.org](http://www.ricsonline.org)) The other group are the National Association of Estate Agents (NAEA) who are 'the country's leading professional body for residential estate agency'. ([www.naea.co.uk](http://www.naea.co.uk)) In addition, there are a large number of independent Estate Agents who are neither members of a recognised valuers association nor hold any professional qualification.

Participants were selected using a stratified random sample from members of both groups and where necessary from Estate Agents holding no professional qualification of affiliation to a recognised professional body.

Chartered Surveyors usually undertake a large variety of professional services including residential property valuation. Such instruction tends to be undertaken when a potential buyer is considering placing an offer on a property and will take into consideration structural defects and external environmental factors that may impact on future value or marketability. Estate Agents are arguably more familiar with the residential property market as, by the nature of their work, they deal with property transactions and marketing on a daily basis. This produced two hypotheses:

- 1) Surveyors would perceive a greater negative impact on value than Estate Agents due to PS 3.7 (RICS Red Book) cautioning them that negative public perceptions may affect the future and value and marketability of property near HVOTLs)
- 2) Surveyors and Agents who had no experience of valuing this type of property would perceive a greater value diminution.

### **Sample selection**

It was decided that a sample size of 1000, 500 from both groups should produce a suitable response for a meaningful analysis which could be considered representative of the opinions and perceptions of the typical professional valuer and Estate Agent in the UK

### Group 1: RICS Members

A random sample of 500 professionals was selected from the UK RICS Member list. This included member who were not property valuers or who had no experience of valuing property in proximity to electricity distribution equipment

### Group 2: NAEA / Estate Agents

A members list for the National Association of Estate Agents (NAEA) was available, but at a prohibitive cost. Member's names were also available free of charge on the NAEA web site (and were catalogued by region and electoral ward throughout the UK.

To achieve a random sample, members were selected from cities and towns according to population size using information from the Government's statistics web site. ([www.statistics.gov.uk](http://www.statistics.gov.uk)) 2 categories of location were selected; group a) cities or towns with a population greater than 100,000 and group b) larger areas with a population of more than 200,000. Names were randomly selected from a list of members on the NAEA web pages within each location. Where necessary this list was supplemented using information from Yellow pages..

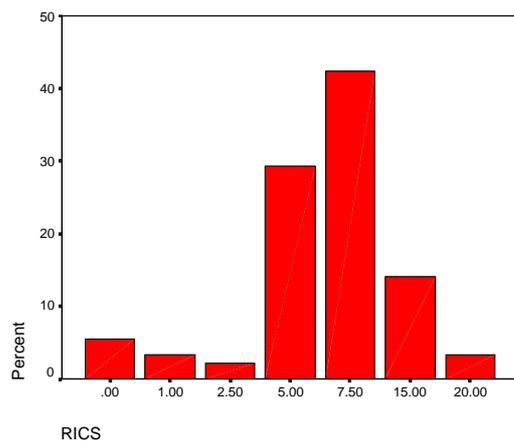
### Distribution

Each individual selected from both groups received the same questionnaire and covering letter. Each envelope was coded to allow for a more detailed analysis and more importantly, to enable those who had not responded to be identified and contacted rather than repeating the entire exercise.

### Results

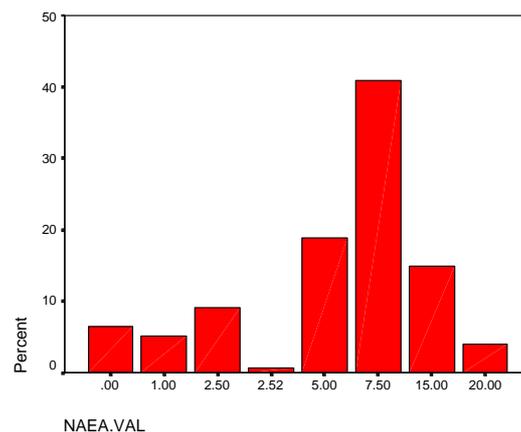
The majority of surveyors and agents reduced value by between 5-10 % with a greater number of agents suggesting larger value reductions than surveyors. Converting the results into a percentage of the within group respondents revealed that surveyors opinions of value reduction tended to cluster around the 5-15 %, whereas agents views were slightly more varied. (Fig 16,17)

**Figure 16:** Group 1:Surveyors (RICS)



n=92  
mean=7.504  
stdev=4.4804

**Figure 17:** Group2: Agents (NAEA)



n=155  
mean=6.9387  
stdev=4.507

The 1<sup>st</sup> hypothesis to be tested is that surveyors perceive the presence of HVOTLs in close proximity to residential property will have a greater negative impact on value than perceived by estate agents. The consequent null hypothesis is that the mean

factor score of surveyors is less than or equal to the corresponding agents score. The mean factor scores are 7.55 for surveyors (n=92) and 6.94 for agents (n=155) This hypothesis can therefore be rejected (t value .952: two tailed p=.342). Surveyors based on this test, perceive that the impact HVOTLs have on the value of residential property is greater than that perceived by Estate Agents.

The 2<sup>nd</sup> hypothesis tested whether or not Surveyors and Agents who rarely valued property near HVOTLs would perceive a larger negative impact on value, than professionals who frequently valued this type of property. Respondents were asked 'how often they valued property near HVOTLs. The results were then compared with their opinion of value diminution. (table 13 and 14)

With the exception of a small number of agents who often or frequently valued this type of property, the majority of respondents irrespective of the number of HVOTL proximate property they had valued reduced value by 5-10%. Agents who 'often' valued this type of property, although representing a small number of respondents suggested the greatest value diminution.

**Group 1: Valuers (RICS)**

**Table 13** Comparison of Percentage value reduction and number of properties (shown as a % of the within group respondents) valued near Power lines

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.	3.7	27.8	44.4	11.1	3.7
Often	4.2	-	-	33.3	37.5	20.8	4.2
Frequently	-	-	-	50	50	-	-

**Group 2: Estate Agents (NAEA)**

**Table 14:** Comparison of Percentage value reduction and number of properties (shown as a % of the within group respondents) valued near Power lines

	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	-

The results for all respondents showed that those who 'never' or 'rarely' valued HVOTL property reduced value by a mean score of 5.78 (n=158) compared to those who 'often' or 'frequently' valued HVOTL property who had a mean score of 7.96 (n=11). Therefore the null hypothesis was accepted. Based on these results, the more often surveyors and agents value HVOTL proximate property, the greater is their perception of value diminution.

Other impacts on the property market

Following several interviews with Estate Agents and Valuers the following variables were identified as being associated with the presence of power lines near residential property. (tables 15-16) Respondents were asked to identify how often they had encountered each variable in association with this type of property in their professional experience. Interestingly Surveyors 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.

**Table 15: RICS respondents**

	Inc Value	Red Value	Remove Buyers	Inc Sale Time	Reduce Mortgage Availability	Not Marketable
<b>Never</b>	96.8	5.1	2.1	4.2	18.0	52.7
<b>Rarely</b>	3.2	6.1	6.3	11.6	31.5	29.7
<b>Sometimes</b>	-	40.8	34.4	36.8	37.1	12.2
<b>Often</b>	-	33.7	45.8	36.8	9.0	1.4
<b>Always</b>	-	-	11.5	10.5	4.5	4.1

**Table 16: NAEA respondents**

	Inc Value	Red Value	Remove Buyers	Inc Sale Time	Reduce Mortgage Availability	Not Marketable
<b>Never</b>	96.3	33.7	1.8	1.2	15.6	68.2
<b>Rarely</b>	2.5	6.8	4.9	5.5	36.4	17.2
<b>Sometimes</b>	1.2	35.2	35.6	35.0	32.5	7.0
<b>Often</b>	-	30.9	37.4	41.7	13.0	3.2
<b>Always</b>	-	23.5	20.2	16.6	2.6	4.5

Which aspects associated with HVOTL's caused the greatest impact

Respondents were asked to rank each variable between 0 and 10 (0= no impact-10=vary large impact) according to the degree of negative impact 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 17) However after conduction a stepwise regression analysis it was found that 'future value', 'health concerns,' and 'noise' (buzzing from lines) had the greatest relationship with the degree of value reduction. (Table 18)

Factors found to affect marketing were also health concerns, followed by the visual impact and then the future value of the property (table 19), although conducting a stepwise regression analysis using marketing time as the dependant 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 20).

**Table 17 :Factors affecting Value**

		Visual Impact	Noise/Buzzing	Unsafe	Heath risk	Affect future value	Restrict landuse	Birds nesting on line
N	Valid	236	237	230	239	227	198	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 18 :Stepwise regression (Dependent Variable= percentage value reduction)**

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
1	(Constant)	2.369	.210			11.256	.000
	Future value	.198	.031	.411		6.352	.000
2	(Constant)	2.063	.230			8.971	.000
	Future value	.123	.039	.255		3.127	.002
3	Health concerns	.115	.038	.246		3.012	.003
	(Constant)	1.951	.234			8.332	.000
	Future value	9.784E-02	.041	.203		2.394	.018
	Health concerns	9.899E-02	.039	.212		2.565	.011
	Noise from line	6.876E-02	.033	.154		2.116	.036

**Table 19: Factors affecting Marketing**

	Visual Impact	Noise/Buzzing	Unsafe	Heath risk	Affect future value	Restrict landuse	Birds nesting on line
N Valid	216	203	203	207	198	191	196
Mean	6.07	5.41	3.83	6.37	5.90	2.34	1.08
Mode	5	5	0	5	5	0	0

**Table 20: Stepwise regressions (Dependent Variable= Increase in marketing time)**

Model		Unstandardised Coefficients	Std. Error	Standardized Coefficients	t	Sig.
1	(Constant)	5.365	.886		6.054	.000
	Future marketability	-.539	.132	-.321	-4.087	.000

### 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 Surveyors and Agents interviewed before the survey was undertaken. Low cost housing, social housing and the presence of a buffer zone were sited most often with all other variables encountered 'sometimes'.(table 21)

**Table 21: 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	.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

### Conclusions

The findings suggest all visible electricity transmission equipment may have an impact on residential property values. Regarding HVOTLs specifically, value appears to be reduced by an average of 7.5%. Marketing time is increased, possibly due to a reduction in the numbers of willing buyers. Agents and Surveyors opinions are slightly different which may be representative of the differences within their professions however, there is no evidence to suggest that professionals having little experience with property near HVOTLs overestimate the impact on value.

The assessment of value diminution appears to reflect the findings of other (non-UK) studies that have benefited from the availability of transaction data. This indicates that perceptual studies may have the ability to estimate the impact of HVOTLs on residential property values where transaction data is unavailable.

The value implication from the presence of HVOTLs in close proximity to residential property, in addition to other types of transmission equipment including TV/Radio transmitter and mobile phone base stations clearly warrants further investigation.

### **References:**

**Alden, Alec.(Sept, 1998)** Electromagnetic fields: are they dangerous? *Chartered Surveyors Monthly*, "public perception is quoted by many as the main reason why EMF is still an issue." p.38 – 9.

**Arens, Scott, B. (1997)** The Valuation of Defective Properties: A Common Sense Approach

*The Appraisal Journal,*

**Ball T. (1989)** The Study of the Economic Effects of High Voltage Electrical Transmission Lines on the Market Value of Real Properties *Prepared for the Salt River Project* cited in **Kroll and Priestley 1992**

**Beauregard Consiell Enr (1990)** unpublished report prepared for Vice President Environment. Hydro Quebec. Reviewed in **Kroll and Priestley 1992**

**Bell, Randall. (1999)** Real Estate Damages: An Analysis of Detrimental Conditions.

**Bigras R.(1964)** Real Estate Value Unaffected by High Power Lines *Right of Way* October 1964 pp11-16

**Birmingham Post (3<sup>rd</sup> July 1998)** Residents battle over power pylon blight. P.3.

**Bishop et al (1985)** Visual Simulation and Assessment of Electricity Transmission Towers *Landscape Australia*

**Bond Sandy & Hopkins Judith (2000)** The Impact of Transmission Lines on Residential Property Values: Results of a Case Study *Pacific Rim Property Journal Vol 6, No 2*

**Bond, Sandy. (Sept, 1995)** The Impact of Transmission lines on Property Values *New Zealand Valuers' Journal*

**Boyer J.C. et al (1978)** The Socio-economic Impacts of Electric Transmission Corridors: A Comparative Analysis. *University of Waterloo, Royal Commission on Electric Power Planning.* Reviewed in **Kroll and Priestley, 1992**

**Bryant James. A and Epley. Donald. R (1998)** 'Cancerphobia: Electromagnetic fields and Their Impact in Residential Loan Values' *Journal of Real Estate Research* Vol 15, No 1 / 2 pp115-29

**Callanan J. & Hargreaves B. (June, 1995.)** The Effects of Transmission Lines on Property Values *New Zealand Valuers' Journal,*  
Cancer *American Journal of Epidemiology* Vol. 109, No3:273-284

**Carll, Cloice D. (1956)** Valuation of a Power line Right Of Way *The Appraisal Journal* vol.24, April pp. 248-265

**Chalmers, J.A. Roehr, S.A. (1993)** Issues in the Valuation of Contamination Property *The Appraisal Journal,* vol. 7(1) 1993 p.28 – 41.

**Chartered Surveyor Monthly (May 1999)** Fear in the community is a material planning issue p. 34 A planning appeal decision relating to the reclamation of Round 'O' Quarry , Skelmsdale, Lancashire. The principle of this is derived from the High Court test case in *West Midlands Probation Committee v Secretary of State for the Environment.* [20<sup>th</sup> September 1996]

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

**Coy P. (1989)** Radiation fro VDTs, Power Lines Raises Fears *Register –Guard* (Eugene, OR), December 3, 11C. Cited in **Krimsky & Golding 1992**

**Delaney C.J, Timmons D. (1992)** High Voltage Power Lines: Do they affect Residential Property Values? *The Journal of Real Estate Research* Vol 7 No 3 pp315-329.

**Dent, P. Sims, S. (1998)** Public and Professional Preceptions Of The Effects Of High Voltage Power lines And Sub Stations On The Value Of Residential Property. *Paper presented at the 1998 IAHS World Housing Congress, Portugal.*

**Dent, P. Sims, S. (1999)** *Paper presented at the 1999 IAHS World Housing Congress, San Francisco*

**Economics Consultants Northwest (1990)** report submitted to the Facility Siting Bureau of the Energy Division of the Montana Department of Natural Resources and Conservation and the Bonneville Power Administration. Reviewed in **Kroll and Priestley 1992** Edelman 1988

**Edelstein M (1988)** Stigmatising Effects of Toxic Pollution *Unpublished manuscript cited in Krinsky Golding 1992*

**Feychting, M. & Ahlbom, A. (1993)** Magnetic fields and cancer in children residing near Swedish high voltage power lines. *American Journal of Epidemiology*, 138, 467- 481.  
Feychting & Ahlbom 1992

**Fischhoff B (1985)** Managing Perceptions of Risk *Issues in Science and Technology*. Fall 1985

**Florig K. (1992)** Counting the Cost of the EMF Problem *Science*. Vol 257. 24 July 1992: 468 – 92

**Furby et al (1988)**Electric Transmission Lines, Property Values and Compensation *Journal of Environmental Management* 27, pp 69-83

**Gallimore, P. & Jayne, M. (March, 1999)** High Voltage Overhead Transmission Lines and Public Perception of Risk. *Report produced with the aid of RICS Education Trust Fund*

**Gregory & von Winterfeldt (1996)**

**Jaconetty T. (1996)** Stigma, Phobias, and Fear: Their Effect on Valuation Assessment *Journal*. January/February 1996.pp 51-67

**Jayne M. R. (2000)** High Voltage Overhead Lines and Public Perceptions of Risk *A report produced with the aid of the RICS Research Foundation*

**Kinnard & Dickey (1995)** A Primer on Proximity Impact Research: Residential Property Values near High Voltage Transmission Lines *Real Estate Issues* 20:1 pp23-29

**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

**Kinnard, W.H. Jr., (1967)** Tower HVOTLs and Residential Property Values *The Appraisal Journal*, Vol. 35, April p.269-284.

**Kinnard, W. H. Jr., et al (1984)** An Analysis of the Impact of High Voltage Electric Transmission Lines on Residential Property Values in Orange County, New York. Storrs, Connecticut. *Real Estate Counseling Group of Connecticut*. May

**Krinsky, S. Golding, D. (1992)** Social Theories of Risk. *Praeger Publishers*

**Kung Hsiang-te & Seagle Charles. (1992)** Impact of Power Transmission Lines on Property Value: A case Study *The Appraisal Journal* July 1992, pp. 413-418

Li, Theriault and Lin Adult Cancers *Occupational Environ Med* 53(8):505-510,1996

**Linnet, M.S., et al., (1997)** Residential exposure to magnetic fields and acute lymphoblastic leukaemia in children. *New England Journal of Medicine*, 337, 1-7.

**McClelland et al (1990)**

**Mittiness & Mooney (1998)** Power line Perceptions: Their Impact on Market Time Presented at ARES Annual Meeting 1998

**Mitchell B et al (1976)** The Long-term Socioeconomic Impact of an Electrical Power Transmission Corridor on the Rural Environment: Perception and Reality. Cited in **Kroll and Priestley 1992**

**Morgan M. et al (1985)** Power Line Frequency Electric and Magnetic Fields A pilot study of risk perception *Risk Analysis* 5(2) 139-149

**Mundy, B. (1992).** Stigma and Value *The Appraisal Journal*

**Perry, S. et al (1979-published 1981)**Environmental Power Frequency Magnetic Fields and Suicide *Health Physics* Vol. 41 August pp267-277

**Verkassalo P., Eero Pukkala, Jaakko Kaprio, et. al (1996).** Magnetic fields of high power lines and risk of cancer in Finnish adults: nationwide cohort study. *British Medical Journal* 313 (26-Oct 1996):1047-51

**Planning Journal (16<sup>th</sup> Feb 2001)** Health fears justify two mast refusals. p. 1, 17, 19. By Lee Baker. Two land mark decisions by the Planning Inspectorate who have endorsed Thurrock Council's and London Borough of Harrow decision to refuse planning permission for Orange to erect transmission masts.

**Priestly T & Evans G. (1996)** Residents Perceptions of a Nearby Electric Transmission Line *Journal of Environmental Psychology* Vol16. No 1

**Sobel E,(1998)** Southern California Medical School, Los Angeles Neurodegenerative Diseases and EMF Exposure 1998 EMF Meeting Bristol University.  
Reiter R.J. 1997 Antioxidant Actions of Melatonin *Advances in Pharmacology* 38:103-107

**Rhodeside and Harwell Incorporated (1988)** Perceptions of Power Lines: Residents Attitudes. Prepared for Virginia Power Cited in Kroll and Priestley 1992

**Rikon (1996)** Electromagnetic Field Property Devaluation *The Appraisal Journal* 64:1.pp87-90

**Roddewig R J. (1996)** Using the Cost of Environmental Insurance to Measure Contaminated Property Stigma *The Appraisal Journal* July 1997

**Rosiers F. D. (1998)** The Impact of High Voltage Power Lines on Housing Prices. Paper presented at the American Real Estate Conference, Monterey, California. April 15-18 cited in Bond and Hopkins (2000)

**Rosiers F. D. (2002)** Power Lines, Visual Encumbrance and House Values: A microspatial Approach to Impact Measurement *Journal of Real Estate Research* Vol 23, No 3, 2002

**Royal Institute of Chartered Surveyors (RICS)** Practice statement 3.7 August 1996 'Public perception that higher than normal electromagnetic fields may effect health is likely to affect marketability and future value. Consideration should be given to further investigation prior to exchange of contracts'

**Savitz D, Wachtel H, Barnes F, John E, Tvrdik J. (1988)** Case Control Study of Childhood Cancer and Exposure to 60Hz Magnetic Fields *American Journal of Epidemiology* Vol 128, No, 1

**Slovic Paul (1992)** Perceptions of Risk: Reflections on the Psychometric Paradigm, reproduced in **Krimsky S & Golding D (eds )1992** Social Theories of Risk Preager,

Westport, Connecticut pp 117-152. Originally published as an article in *Science* vol. 236, April 1987. pp 280-6

**Sobel, E., et al., (1996)** Electromagnetic field exposure may cause increased production of amyloid beta and may eventually lead to Alzheimer's disease. *Neurology*, 47, 1594 - 1600.

**Sobel, E., et al.,(1995)** Occupations with exposure to electromagnetic fields : a possible risk factor for Alzheimer's disease. *American Journal of Epidemiology*, 142, 515-524.

**St Laurent J. (1996)** Cited in **Rosiers F. D. (2002)** Power Lines, Visual Encumbrance and House Values: A microspatial Approach to Impact Measurement. *Journal of Real Estate Research* Vol 23, No 3, 2002

**Starr, C. (1969)** Social Benefits Versus Technological Risks; What Is Our Society Prepared To Pay For Safety? *Science* 165:1232-1238

**Syms, Paul. (1996)** Perceptions of risk in the appraisal of contaminated real estate. *Paper RICS Cutting Edge. Estates Gazette*, 26<sup>th</sup> Oct 1996. issue 9643. p148

**Thompson R. (1982)** The Impact of High Voltage Electric Transmission Lines on Agricultural land Valuation in Alberta. *Master of Science Thesis, Dept of Rural Economy, University of Alberta* Reviewed in **Kroll and Priestley 1992**

**Werthiemer Nancy. Leeper Ed. 1979** Electrical Wiring and Configurations and Childhood