Electric Power Transmission Lines, Property Values, and Compensation

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The effects of electric power transmission lines on property values is a controversial issue, and conventional compensation procedures appear to be a major source of public discontent over the siting of transmission lines. This article reviews and critiques current methods of determining transmission line impacts on land values and current practices in compensating property owners for losses associated with powerlines. Relevant theoretical issues regarding property rights, the nature of property value, and the meaning of just compensation are discussed. Empirical studies of the effect of transmission lines on property values are reviewed, and the relation between different types of assessment procedures and measures of economic value are explored in some detail. Particular attention is paid to the distinction between objective and subjective measures of values and to its relation to public attitudes toward transmission lines.

Keywords: transmission lines, electric power, property values, eminent domain, compensation

1. Introduction

Concern over planning procedures employed in the siting of transmission lines has increased substantially over the past decade (Furby et al., in press), and the effect of overhead lines on alternative uses of the land base has frequently emerged as a controversial and significant topic. One result of this interest has been a marked increase in concern over the impact of transmission lines on land values and the welfare implications of conventional compensation procedures. This article discusses the theoretical considerations underlying these issues, reviews the relevant empirical data, and outlines directions for further research.

2. Property values

2.1. The role of property rights

Basic definitions in real property law, established practices and precedents in the law of eminent domain, and relevant regulatory processes define the context for land value effects of transmission lines. “Property” is a general term which refers to a range of

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entitlements that enable an individual to enjoy the benefits of an asset. Property rights generally permit specified uses of a physical asset, such as land or associated structures, while providing safeguards against harmful intrusions by others.

However explicitly they are stated, property rules can provide only guidelines concerning entitlements and cannot address or reconcile all disputes. At times, for example, property is wanted for competing uses, and each of these will have some degree of entitlement. Similarly, whenever an action generates externalities (i.e., unintentional effects of an activity on third parties, who may as a result enjoy unpriced benefits or suffer uncompensated losses), there is an implicit conflict over competing property rights. Disputes may also arise in those cases where private and social uses of a resource are not in agreement, and here decisions must be made regarding the extent to which one entitlement is either protected against or must yield to another right.

The siting of transmission lines provides a classic example of a potential conflict between private and public uses of property, where that property may be land, physical structures, or an amenity (such as a landscape). Usually, the utility or governmental agency operating the line obtains easement rights from individual land owners (in the case of private property) or from the relevant land management agencies (in the case of publicly held land). A lump sum payment is typically made, which enables the seller to continue using a specified portion of the property while granting the utility (or operating agency) the right to construct, maintain, and operate the transmission line and/or associated access roads in accord with mutually accepted procedures. Thus, an easement transfers a portion of the property rights to the grantee. The nature of the agreement with the owners is constrained by statutory land use controls which specify permissible designs for the proposed line or access routes in terms of physical, technical, or social objectives to be met prior to issuing a construction permit (Fridriksson et al., 1982).

Representatives of the utility or other designated governmental agency can acquire property through negotiation with the owner or, if an agreement cannot be reached, by compulsory acquisition. In the latter case, the power of “eminent domain” enables property to be expropriated when negotiation fails to bring agreement. The economic argument for this power is that individuals in the path of a railroad, highway or transmission line would have undue power and the ability to demand exorbitant compensation (Posner, 1977). Property owners’ protection against unjust seizure is grounded in the Fifth Amendment to the United States Constitution which asserts “... nor shall private property be taken for public use without just compensation”. Similar provisions exist in the constitutions of nearly all states. As a result, compensation must be paid so long as physical “taking” occurs, in the sense that a space or good which was previously considered to be under private ownership is thereafter occupied or otherwise used in the public interest (Michelman, 1967). Establishing the proper amount of compensation is a judicial responsibility, based on evidence submitted by the property owner and the testimony of the agency acquiring the easement rights (Munch, 1976).

Because most easements burden a property with an encumbrance rather than take it entirely, just compensation has typically been interpreted as the difference between the fair market price of the land with and without the encumbrance. Owners are entitled to compensation for any decreases in the market value of the parcel for which an easement has been obtained, but owners of adjacent land are generally not entitled to damages even if certain uses (and hence the market value) of their land are adversely affected.

2.2 DETERMINING TRANSMISSION LINE IMPACTS ON PROPERTY VALUE

Theoretically, transmission lines could either increase or decrease people’s evaluation of
a property's worth. Thus, some individuals might pay less for properties proximate to a powerline because they fear adverse health effects (related to electrical discharges or magnetic fields), dislike the visual impairment, are bothered by possible interference with radios or other electrical equipment, or worry about accidents involving fallen towers or downed wires. Other people, however, may be attracted to the increased access, extra space and light, or the additional distance from neighbors associated with property near powerlines (a result of the fact that developers sometimes increase the size of lots in closest proximity to powerlines).

In practice, appraising the impacts of transmission lines is fraught with difficulties and has long been a source of expense, trouble, and ill will for the utilities (Crawford, 1955). There are at least three different methods for evaluating the value of a property (Knetsch, 1983): (a) an income approach, based on the discounted stream of income expected to be received from a property over the relevant period; (b) a replacement cost approach, reflecting the anticipated cost of replacing improvements removed from a property; (c) a market data or comparable sales approach, based on actual market sales of similar properties.

The comparable sales approach is typically the basis for estimating the effect of electric transmission lines on property values. However, in practice, it is usually impossible to identify closely comparable land sales. As a result, the judgment of an appraiser is required.

Standard procedure in residential property appraisal has been for appraisers to consider separately the neighborhood, the lot's site within the neighborhood, and improvements on the site. With respect to both the neighborhood and the site descriptions, hazards and nuisances (such as heavy traffic, airport noise, and high tension wires) are supposed to be considered explicitly (Bloom & Harrison, 1978). Although appraisers are routinely instructed to describe these variables in their reports, it is not clear exactly how they enter into the final assessment which reflects appraisers' own judgments of probable market activity.

Industry studies (Bonneville Power Administration, 1977) report that county tax assessors rarely reduce assessed value when right-of-way easements are acquired for transmission lines on a piece of property. Similarly, professional appraisers almost uniformly maintain that transmission lines rarely reduce the value of properties they cross or lie near (Carrell, 1956; Holt, 1983; Meyer, 1982; Miller, 1982). This is not inconsistent with property value appraisals involving different but analogous property hazards or nuisances, such as earthquake hazards (Palm et al., 1983).

Another solution to the lack of comparable land sales is to identify the value related characteristics of a property (i.e., size, improvements, road access, etc.) and then to obtain regression estimates of the effect of each of those characteristics on property values. Such analysis requires fairly extensive and current data on land sales and on a large number of independent descriptor variables which are used to predict selling price. Sometimes known as “hedonic price” estimation, this procedure necessarily reflects past market behavior and hence need not represent current or future market values.

Another issue that has been only partially addressed in the literature is the effect of a line on the general market value of an area. A property's fair market value should reflect its economic worth when employed in the “highest and best use” (defined as “the most profitable likely use to which property can be put”, Albrighton, 1979) for which it is suited. Any change in the range of possible use options, therefore, may affect the assessment of a property's economic worth. Appraisers typically employ the term “obsolescence” to describe any changes that alter the range of possible uses. For example, properties within a vacation area which previously enjoyed a wilderness image
Electric transmission lines

might experience a widespread decrease in land values following the construction of a
highly visible transmission line. Such marketwide effects are particularly difficult to
demonstrate empirically because they might not be reflected in regression studies based
on the relative values of specific properties within that market. In agricultural areas,
farm efficiency may be affected (see Mitchell et al., 1976), since reductions in farm
efficiency due to such things as land loss, crop damage, and weed control, can be
expected to devalue the land. Easements may also restrict individuals' range of
potential development options. Whether these effects—or others related to concerns
about potential health and safety impacts of transmission lines—significantly affect
market values is frequently a matter of intense debate.

Additional issues with implications beyond individual properties arise when a project
(like a transmission line) alters an area's tax base or when one area experiences a loss of
productive capacity in order to allow electricity to reach another (perhaps competing)
region. Such distributional questions are complex and require case-by-case analysis. In
Oregon, for example, a transmission line's impact on an area's tax base depends on who
operates the line. A federal government agency, like BPA, does not pay property taxes,
whereas a private utility's land is taxed, albeit in a complex manner.

Transmission lines are included with distribution facilities in the rural wire plant value, which
is a residual value left after generating plant and "situs" properties (such as substations) are
valued and apportioned separately (Arrowsmith, 1982). The wire plant residual value, which
is not a true value of all transmission and distribution facilities, is then apportioned to taxing
districts through a mechanical formula based on wire miles (U.S. Department of the Interior, 1983,
pp. 3-72).

Transmission lines can also alter an area's future development options. Communities
as a whole have sometimes opposed a line, fearing that it would adversely affect the
character of the community and its growth (BisSaw, 1979; McAllister, 1980), or at least
alter the geographical direction of growth (Yankton, 1981). In some cases, the concern is
that the transmission line will stimulate development, for example by providing access
roads into wilderness areas (Nell, 1982). Several case studies have concluded, however,
that transmission lines had very little effect on the development of a community (Biggs,
1964; Brehmer, 1973; Story, 1968). The literature on transmission lines and land use
development is discussed in more detail in Priestley's (1983) review and in Butler's (1983)
annotated bibliography.

2.3 Market Value Studies

A thorough review of empirical studies pertaining to the effect of transmission lines on
property values was recently completed by Mountain West Research (Fridriksson et al., 1982). They identified 27 "key" studies, defined as the most frequently cited in the
literature and meeting certain methodological criteria. Of these, ten found that transmission
lines had no significant effect on land values, ten were inconclusive, and five
concluded that the overall effect of transmission lines on land values was negative.

Mountain West Research concluded that nearly all of these key studies were
methodologically suspect for one reason or another. Sample sizes were frequently too
small to permit adequate statistical tests, and many of the studies used subjective
judgments (e.g., interviews with developers) rather than objective measures of value. The
studies often failed to control for differences in such important determinants of market
value as lot size and land use. Furthermore, in many cases, they failed to distinguish
between asking prices and eventual selling prices. Comparisons of properties with and without transmission lines rarely controlled for absolute value of the parcel, proximity to town or village, quality and size of improvements, and proximity to highways. Nearly all of these studies ignored other potentially important aspects of market value such as date of sale and market absorption rate. Researchers also differed with regard to how they summarized their results and rarely included statistical tests of significance. For example, some treated a 5–10% drop in values as within the bounds of experimental error, whereas others reported it as a meaningful change. Fridriksson et al. (1982) attribute the poor quality of these studies to researchers' belief that land value effects would be very obvious, thereby obviating the need for tight methodological controls. Finally, many of the 27 studies were conducted at a time when the public's perception of transmission line effects, their attitudes toward technology, their feelings regarding their social and legal rights, and their willingness to accept biological and environmental risks were quite different from what they are today.

All in all, these methodologically flawed studies have not produced very useful data. The only possible exceptions to this conclusion are two recent studies which Mountain West Research found to be relatively more sound methodologically. Significantly, both of these studies concluded that the construction and operation of transmission lines adversely affected land values. The first, by Colwell and Foley (1979), investigated the impact of a 138 kV line on property values in two central Illinois neighborhoods between 1968 and 1978. The selling prices of 200 properties were predicted on the basis of 10 variables, including proximity to the transmission line, characteristics of the property (e.g., square feet of living area), and aspects of the transaction (e.g., the month of sale). The regression analysis demonstrated a significant negative relation between selling price and proximity to the transmission line for properties within 200 feet of the line. The second study, conducted by the University of Waterloo (Boyer et al., 1978), examined more than 1000 agricultural property sales in eastern Canada between 1967 and 1977. Per acre values near transmission lines were found to be 16–29% lower than those of similar properties without easements. The adverse effects of proximity were largest with smaller properties.

A follow-up study, conducted in response to some criticisms of the Mitchell study, reported that the effect was most applicable to areas with residential potential, but weaker for agricultural land (Gordon, 1981). However, this study incorrectly assumed that multiple regression analysis could be used to correct for differences between properties impacted by the line and control properties in the same area which were not impacted (see Cronbach and Furby, 1970). Furthermore, their order of entering variables into the regression equation did not conform to that required for evaluating transmission line effects (namely, transmission line variables being entered last).

A number of studies of the impact of transmission lines on property values have been carried out by utility companies or private consulting firms; these often have remained as in-house publications which are not widely distributed. Boyer et al. (1978) summarized the results of approximately 15 such studies. The same methodological weaknesses are evident in these studies as have already been discussed above.

Although empirical studies deal primarily with evaluations of properties for which easements have actually been granted, mention of decreases in the value of adjoining properties is common in the literature. Obstruction of favored views, for example, or simply the presence of man-made structures in a natural environment, may lead to decreases in the selling price of properties other than those for which easements are required. However, in most cases, properties other than those which are physically diminished by the taking have not legally been eligible for compensation.
2.4. THE DETERMINATION OF COMPENSATION

Market value is widely employed as the best estimate of property value, and hence of appropriate compensation for its loss (e.g., to transmission lines). Theoretically, market value is "the price at which a willing seller would sell and a willing buyer would buy, neither being under abnormal pressure" (American Institute of Real Estate Appraisers, 1978, p. 23). The latter condition is crucial. It explicitly eliminates both "an arbitrary figure which a seller might demand" as well as "a figure which the property might bring at a forced sale which an owner might be required to make because of adversity" (Menchine, 1960, p. 76). Using actual market data to estimate land value to any particular owner can present problems, for reasons rooted in the non-market benefits of properties which the selling price approach ignores. Many properties have a special value to the owner, above and beyond what others would pay for it. These might be related to environmental amenities (such as a particular view), personal associations (such as family memories), social ties, or the maintenance of specific lifestyles. Such unmarketed values may be found in agricultural as well as residential property. In Minnesota, for example, farmers angrily opposed the construction of a transmission line upon land that represented a family history and achievement, which gave it a value independent of its current economic productivity or objective development possibilities (Casper and Wellstone, 1981).

Whether or not others agree with owners' evaluations, these "extra" values make as real a contribution to owners' welfare as do those from any other sources. As a result, properties of equal market value will rarely be equally desirable to all individuals, and the unpriced value (or consumer's surplus, i.e., the difference between what a person is willing to pay for a good or service and the amount that must actually be paid to obtain it) associated with an existing entitlement may be both large and vulnerable to a "fair" trade. Because formal markets for these values do not exist, there is no direct way to assess this surplus for an individual other than asking what amount represents a fair value to that individual.

Economists recognize two principal measures of consumer surplus: one is based on the maximum amount a person would willingly pay to avoid a loss, and the second reflects the minimum compensation that would be demanded to willingly accept it. According to the conventional interpretation of the Pareto criterion (i.e., the concept that a policy represents an unambiguous improvement in social welfare only if it makes no one worse off and at least one person better off), compensation demanded is the conceptually appropriate measure of perceived losses. However, measures of individuals' willingness to pay are more commonly employed since, in theory, there should only be a negligible difference between them (resulting from the slight increase in personal wealth associated with the recognition of the entitlement for the compensation demanded case). Yet several recent studies have found substantial disparities between payment and compensation measures (Knetsch and Sinden, 1984; Rowe et al., 1980), with the assessed value of a good being two to five times larger on the basis of a compensation demanded approach.

This observed disparity in responses with the two methods suggests that property values may vary substantially depending upon whether the evaluation is based on market-supported expected selling prices or on the compensation payment that an owner would demand to willingly sell. Where the courts have intervened to reconcile conflicting views (Kennedy, 1981), they usually have accepted market selling prices as the measure of value for the loss of a clear entitlement. On the other hand, when an owner suffers an activity which is expressly prohibited (e.g., trespassing), the injured
party is generally entitled to the full level of compensation that they would demand to accept the loss voluntarily. The intent of the law seems to be to protect an individual’s well-being, which again suggests that an adverse change in status be measured by a person’s maximum compensation demanded to willingly accept the new circumstances. An important distributional issue arises whenever owners receive compensation that is less than the (subjective) value that the property has for them. In such cases those individuals shoulder more than their fair share of the costs for social projects (Knetsch, 1983).

The term “reservation value” refers to the minimum sum that would entice an owner to sell a property voluntarily. An unwilling seller is, therefore, one whose reservation price exceeds the offered price, due to unmarketable values such as “sentimental attachments”. In practice, utilities sometimes acknowledge such values in the course of negotiations with owners. However, such payments (rarely exceeding a 10% premium) are regarded as disguised bribes and rarely disclosed, in part to avoid letting owners of similar properties know that they have received unequal awards, and presumably also because the upper limit of any discretionary payments may prove difficult to restrain.

Knetsch (1983) reports that the “value-to-the-owner” principle was “until fairly recently the legal basis for determining compensation throughout Canada”, and was intended to protect the pre-transaction economic welfare of former owners. However, in its 1949 ruling on the principle, the Supreme Court of Canada interpreted “value-to-the-owner” to mean the amount that “...a prudent man [would] ... pay for the property rather than be ejected from it”. This is basically the same as a fair market value compensation principle (since if a person can be ejected from the property, it’s not his or hers to willingly sell). England’s influential Scott report of 1918, which also favored the market value as the basis of compensation, stressed that one of the duties of private ownership was a willingness to surrender entitlement to the higher interests of the community. Nevertheless, “disturbance” costs (removal expenses, costs of seeking substitute property, etc.) have always been compensated in England (but not in the U.S.) (Denyer-Green, 1982). Interestingly, the Australian Land Reform Commission has recently recommended compensating owners for intangible losses and costs when their property is confiscated. Its recommended criteria for determining payment include such factors as the inconvenience caused the claimant and the duration of an owner’s residence (see Knetsch, 1983). Although such procedures stop short of openly acknowledging the owner’s reservation price, they clearly attribute some legitimacy to compensation demanded as a basis for establishing the value of an expropriated property and imply that equal treatment (in a welfare sense) may require paying different amounts of compensation for land parcels of equal market value.

Rights to compensation remain less clear in those situations where the entitlement to what is taken is either ambiguous or (in a legal sense) non-existent. For example, if a nearby transmission line decreases a person’s sense of privacy or safety but does not directly cross his or her property, then something of value has definitely been lost even though any claim for compensation is unlikely to be recognized. Perhaps the most common instance of such indirect diminution of value has concerned transmission lines’ effect on scenic beauty. In some cases proximity damages may be granted, and a few court decisions have granted compensation for visual damages (Kellough, 1980). But compensation for aesthetic losses is usually denied, based on the claim that such payments would constitute an unfair burden to taxpayers (or ratepayers). Decisions that endorse this principle attribute no value to the losses of those whose property is not confiscated, and if those losses are greater than zero, they thereby understate the social
costs of a particular use of public property. In so doing, they result in economic inefficiency, by definition, and undermine the concern for social welfare that is used to justify the power of eminent domain.

One situation in which reductions in the value of non-confiscated property are recognized arises when part of a property is taken and severance damages are occasioned by a loss in value to the remaining property. In a review of 240 condemnation cases in Indiana involving five different utilities, Crawford (1955) reported that such severance damages amounted to $232,859 (in addition to the fair market value easement awards of $368,068). A small amount was also awarded for construction damages in these cases, for a grand total of $663,291, whereas total compensation offered by the utilities was $226,143. The concept has also been extended to adjoining properties. In Oregon, for example, a recent court decision involving a 500 kV line (U.S. Department of the Interior, 1983) awarded 12% of fair market value to property that was not within the right-of-way but which was contiguous and under the same ownership as the parcel encumbered by the transmission easement. However, in most cases the amount of compensation has been limited to depreciation in the market value of the retained land. Even such direct losses as the increased costs of working a farm split by a transmission line are not always compensated. One response to the possibility of such (welfare) losses has been legislation (in several New England states) requiring purchase of all of a property if any part is expropriated. Yet here too, the price is figured on the basis of the property's fair market value, and compensation is limited to those suffering a direct physical loss.

The legal and ethical status of compensation for the loss of ambiguous entitlements has provoked considerable academic controversy. Of particular note is Ackerman's (1977) *Private Property and the Constitution* which raises, without definitely answering (see Epstein, 1978; Kornhauser, 1977; Krier and Schwartz, 1978; Soper, 1979), the questions: "When does an interest qualify as private property? Under what conditions should the state be said to have 'taken' the interest? When does justice demand compensation and how is the adequacy of payment to be assessed?" (p. 6.) Ackerman notes that inadequate answers to these questions lead not only to injustice, but also to the perception of injustice, resulting in "citizen disaffection" (p. 48). Applying these analyses to transmission line rights-of-way valuation suggests that much public resistance might be avoided if those whose property is affected were handled in a way that satisfied them that they had indeed been adequately compensated. Insofar as there is considerable legal and philosophical ambiguity regarding which interests qualify as private property and what level of compensation is adequate, then there is a reasonable basis for property owners to disagree with the utility, the regulators, or even the courts.

In the U.S., ultimate authority for defining just compensation resides with the judiciary (unlike England, for example, where it resides with the legislature). The resulting diffusion of decision making lends unpredictability to these determinations with different courts relying upon different professional appraisers. To the extent that these appraisers are attuned to the full range of factors influencing how people value property, their intervention may eventually bring settlement in line with property owners' expectations, thereby reducing the historically increasing perception of injustice. Professional appraisers began recognizing this possibility in the late 1960s:

With age and maturity, the amenities of ownership become more important and have come to mean, among other things, those peculiar and intangible benefits accruing to an owner, such as the satisfaction, security, joy, pride, prestige, material comforts and conveniences arising from the right of use and ownership of such a property. Many appraisers say you cannot value
or pay for conveniences embodying the foregoing attributes and that the courts will not permit interjection of such testimony in the eminent domain suits, proving the value of property. This bothers me. For, although the courts take a detached attitude and say it would let down the bars to accept such testimony, buyers and sellers are aware of these hidden values and premium prices for such property are the rule rather than the exception. Since the willing buyer is essential for every sale, it is his decision which establishes the realty market. As I see it, the judges of the courts should follow the advice of expert appraisers who determine market value and they should not delete items from testimony which create value or cause damages, regardless of how imaginary they may seem (Haley, 1969, p. 67).

In the vast majority of instances, the amount of compensation is determined by negotiations between the property owner and the acquiring agency. These are inherently difficult, with landholders seeking to maintain their entitlement and the acquirer asserting that the public interest is better served if at least a portion of the property is put to some other use. In some cases, an owner may refuse to sell at the price which the utility has offered (presumably the fair market value) and holds out for a higher bid. This may be a bargaining strategy, in which case the issue is greed, or it may represent a genuine difference in perceptions of the property's true value. In other cases, an owner may refuse to sell at any price because compensation, in any form, is unacceptable.

The utility's appraiser has traditionally been instructed to provide prices that "must be sufficiently correct to acquire 90% of the right of way", i.e., they must represent an amount that will result in 90% of the landowners accepting voluntary settlement (Crawford, 1955; Patrick, 1964). It is commonly reported that the right of way agent attempts to negotiate the lowest possible price (Moses, 1964); the figures provided by the appraiser simply represent a maximum price that the agent should offer. However, because utilities wish to avoid compulsory purchases, they have offered more when pressed, often seeking to limit the acquisitions requiring expropriation to no more than five per cent (Reid, 1967; Rogers, 1964).

Compulsory purchases are not popular. Condemnation procedures are not only lengthy and expensive, but the resulting compensation rate can be higher than a negotiated one (Gamble, 1967). In New Hampshire, for example, owners may appeal any compulsory purchase for a period of up to 10 years, so long as written notice of their dissatisfaction is received within 30 days of the taking. Appeals may then be made through the courts, with a final settlement in many cases subject to a jury's decision. With jury members generally more sympathetic to non-market values, and with the long appeal period allowing for additional commercial or residential development, public authorities are usually eager to settle with an owner and are willing to pay a modest premium to achieve this objective. Yet, throughout North America, both parties know that the individual property owner's entitlement is clearly subservient to the public interest. Negotiations regarding a selling price of easements are doubtless colored by this knowledge (see, for example, Young, 1973). The ordinary market option—whereby sellers can simply decline to offer their properties for sale—is not available.

An interesting counterpoint to the treatment of property loss compensation in the U.S. is that common in Japan. Traditionally, the Japanese accepted a small fraction of the market value loss as constituting reasonable compensation, apparently viewing it as a symbolic gesture of benevolence and sympathy to the injured party. To appreciate how small the sums involved are, consider the 1959 case of mercury poisoning in Minamata where the victims of this incurable and totally disabling disease accepted a settlement proposed by a mediation committee of $280 annually for each adult victim ($83 annually for each child). More recently, however, with the adoption of Western-oriented economic ideas, the Japanese have become embroiled in conflicts over land use and just
compensation to such an extent that the country has been described as "littered with construction projects halted in midstream" (Bosselman, 1977, p. 13).

The U.S. has also seen shifts in cultural values and assumptions regarding compensation. The economic situation of farmers has changed dramatically over the last five or six decades. The 1920s and 1930s were a period of low land values and depressed grain markets. Farmers were heavily in debt and were glad to sell easements for badly needed cash. By the 1950s, the average farmer was under much less financial pressure. Land values had increased, and farmers were much less anxious to sell easements. In recent years, small farmers' prosperity has declined and they are once again in debt. Private land is no longer cheap, and minimal compensation for easements is simply not acceptable.

Such historical changes may help to explain the apparent disparity between the common belief that transmission lines significantly devalue property and the empirical studies that generally find no such effect. The latter necessarily reflect land values over some given time period in the past. As Crawford (1955) emphasized, "it is highly desirable when developing an appraisal method for present day use, that the factors important to the land owner be plainly recognized." We believe that failure to recognize these changes in value and the accompanying reliance on obsolete market values (by utilities, regulatory agencies, and judicial decision makers) are a major source of the conflicts over siting and compensation (see Furby et al., in press).

3. Priority topics for future research

A key issue in determining the effect of transmission lines on property values is the identification and evaluation of perceived losses. This area is largely unexplored, except for the indirect evidence from studies of property values and political conflicts. There are at least two major issues here for which further research is needed.

3.1. Empirical studies of market value

The first is developing a generally accepted procedure for determining compensation on the basis of a property's fair market value. As discussed above, it is generally agreed that good empirical data regarding the effect of transmission lines on actual sale values is required but presently does not exist. Not only would good empirical information greatly benefit both planning agencies and judicial decision makers, but it would help the utilities themselves to develop improved siting proposals:

[Utility] Management is responsible for establishing the negotiating price. Why not provide Management with more facts to aid in decision making? ... Management depends upon the Staff Appraiser for accurate reports and for accurate review of independent appraisals. Why not provide the Staff Appraiser with a good tool? ... In most cases [the property owner] has absolutely no prior experience with a right of way. It's only natural that he will believe the worst ... Don't we have an obligation to furnish the property owner with factual data concerning the effects of a right of way? ... How about the Right of Way Agent who is out on the firing line? He certainly needs factual data that cannot be disputed. Then there is the attorney who handles the condemnation cases. Why not provide him with some factual data and exhibits to present as evidence in place of opinion? (Alleman, 1965, p. 19)

Experience has shown that land value studies that are limited in resources typically produce ambiguous results. A major effort is therefore needed, involving the careful
selection of comparison samples both with and without transmission line sitings. These comparisons should differentiate between property characteristics, including various types of land in different geographical locations. The number of individual property sales within each comparison should also be large enough so that statistically significant conclusions can be drawn on the basis of recent sales data.

3.2. THE PERCEPTION OF LAND VALUES

Sound land value studies would clearly be informative and useful. However, they touch upon only part of the problem. Research must also address the attitude and reactions of participants in the residential real estate market toward powerline rights of way. As Kinnard (1965, p. 23) observed,

It really does not matter that they may be uninformed or inaccurate judgments, at variance with the “facts” of the market. Buyers and sellers base their actions on their expectations and anticipations. If fear is a widespread influence, whether justified or not, it will affect value adversely.

A study of subjective values associated with transmission lines could proceed in at least two complementary ways. One approach would examine the role of attitudinal factors in determining people’s perception of land values. Any of the factors that affect people’s attitudes toward transmission lines, such as health and safety effects, aesthetics, invasion of one’s home territory or loss of control, are likely candidates for determinants of their perceptions of land value. If, for example, a person considers transmission towers unsightly, we might reasonably expect that person to feel that land with such towers is worth less than identical land without towers. Similarly, if a person is convinced that transmission lines have negative health effects, we might expect that person to think that land with transmission lines is less valuable than land without. Although these seem likely hypotheses, they need to be evaluated empirically. To date, no such empirical work has been done.

Particularly useful would be studies of the perceptions of individuals who have no personal investment in siting decisions. Unlike studies of land sales, these studies would provide information on people’s disinterested perceptions of land value, without the constraints of potentially coercive condemnation proceedings and without the temptation to exploit the utility’s need for land. Both of these factors reduce the interpretability of the perceptions revealed in actual owners’ stated reservation prices.

A study of attitudinal factors affecting disinterested parties’ perceptions would provide information as to what taxpayers and ratepayers consider to be reasonable compensation for land encumbered by lines. By showing exactly how attitudinal factors affect land value perceptions, such studies would also suggest what might be done to minimize the negative effects. For example, if aesthetics play a significant role in the perception of the value of land with transmission lines, additional efforts could be directed toward ameliorating their visual impact.

3.3. RESERVATION PRICES

Carefully conducted studies can capture people’s perceptions of the effects that transmission lines have on property value, when those effects are fairly prevalent in the population at large. However, they are less suited to study such unique or subjective effects as attachment to land which one’s family has homesteaded, a feeling of invasion
of one's home when a transmission line is installed on the property, or the emotional difficulty if one's children are required to change schools. Such factors might be very important yet only become salient once one is actually faced with the imminent threat of a transmission line installation. The degree to which they are compensated for may be a major determinant of an individual's attitude toward the line and of the amount of social conflict which results.

Empirical studies are needed to identify these subjective factors and their value to the property owners. One possibility would be to survey property owners not currently involved in transmission line siting and see what compensation they would require before agreeing that a line be put on their property. Their compensation demands could be analyzed as a function of characteristics such as their age, length of property ownership, number of children, job mobility, etc., and compensation demanded could then be examined. The resulting relationships would help utilities to know as early as possible how much the property really means to the owner and what might eventually be perceived as an acceptable level of compensation. Such early understanding would stabilize the negotiation process, enabling the utility to minimize the costs of delay and court cases, as well as significantly decreasing the possibility of violent confrontations. Such studies would be useful regardless of whether the utility was willing to accept the property owner's (fully informed) reservation price, since by giving a clearer picture of the owner's motivation, such studies would help a judge or mediator to evaluate the validity of the respective claims.

In addition to eliciting compensation demands by the procedures described, other approaches could help assess the validity and generality of the results. One would involve bidding for the route. For example, respondents would be told that several possible corridors are being considered and asked how much they would have to be paid to sell their right of way under the assumption that the corridor with the lowest bid would get the transmission line. This process is similar to that used in competitive bids to lease oil- or gas-producing properties, and could build on a substantial literature dealing with the economics of auction mechanisms and incentives for accurate price revelation. The competitive context might help people think about realistic values, that is, ones high enough that they would feel justly compensated but not so high as to decrease their chances of receiving that compensation. Like actual siting processes, this technique would have to cope with some individuals who are unwilling to sell at any price. By revealing that percentage in advance, it would facilitate planning.

As mentioned above, it also would be useful to examine actual cases where decisions were and were not made to have transmission lines put underground. Such studies would look at the decisions of individual homeowners who have the option of burying that portion of the line traversing their private property, either at the time of initial construction or after installation (usually called "conversion" to underground transmission). Such studies should also look at the decisions of entire geographic areas (e.g., neighborhood, development, town) regarding their willingness to pay for a preferred placement of transmission lines. In both contexts, utility records would probably provide the most complete and accessible data. These records would have to be analyzed with an eye to how underground pricing is established and how multi-owner decisions are made (e.g., petition, majority vote).

Such historical studies could be supplemented by interviews with owners who have overhead lines, asking how much they would pay to have them put underground (if that were an option), and with property owners who already have lines crossing their property underground, asking how much they would have to be compensated to have
them put above ground (e.g., for ease of repair). Since the conversion is not a foregone conclusion, this would be similar to a bidding procedure.

3.4. EXPERT VS. LAY JUDGMENTS OF PROPERTY VALUE EFFECTS

Studies we have reviewed elsewhere (Furby et al., in press) reveal a clear discrepancy between what laypeople and experts think about the effects of transmission lines on property values. The former generally believe there is a significant negative effect, whereas the latter often maintain that there is no effect at all. Making sense of this discrepancy is not an easy task. Quite possibly, professional appraisers are aware of those studies of market sales that have purported to show no effect of transmission lines on property values (and thus their property value judgments reflect research that the general public does not have). On the other hand, the discrepancy between what the studies claim to show and what people (representing potential clients) claim to think is so large that it is hard to believe that professional appraisers would uncritically accept the studies. As one appraiser put it: “If I were offered the choice between two houses, identical in detail and location, but one having no powerline and the other having such a line, would this single difference have any monetary significance for me? The answer is yes. Then, am I wiser than the market? Am I a rare phenomenon? Does no substantial part of the homebuying public think such towers unsightly?” (Reese, 1967, p. 560)

One way to clarify these differences is to study experts’ perceptions of the effect of transmission lines on property values in the same ways as described for lay people above. They could also be asked if they think that their clients (both buyers and sellers) think lines affect value (even if they as professionals do not).

3.5. A MULTINATIONAL STUDY OF TRANSMISSION ROUTE SELECTION AND COMPENSATION

It could be very informative to look at the practices of other countries with respect to transmission line siting, compensation, and public reaction to lines in those countries. In this review, we briefly referred to some interesting differences between England, Australia, Japan, and the United States. However, a more thorough examination of how other countries handle these complex issues might reveal some creative and effective techniques which could be put to good use in our own country. Simply looking at the variety of responses would help establish the extent to which responses to the problem are driven by the technology, and the extent to which they might be subject to social manipulations.

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