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ELECTRIC TRANSMISSION LINE EFFECTS
ON LAND VALUES: A CRITICAL REVIEW
OF THE LITERATURE

REVISED DRAFT WORKING PAPER

Prepared for:

The Bonneville Power Administration
U.S. Department of Energy
Portland, Oregon

Prepared by:

Gunnar Fridriksson
Michael MacFadyen
Kristi Branch

Mountain West Research, Inc.
Billings, Montana

March 1982

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FOREWORD

This report presents a critical review of the literature concerned with the effects of high-voltage transmission line right-of-way easements on the market value of land. The objective of the review was to identify sound, general conclusions in the literature that would be applicable to the socioeconomic impact assessment component of the Garrison-Spokane 500-kV Transmission Project revised EIS being prepared by the Bonneville Power Administration (BPA).

While the preparation of this document was sponsored by the Bonneville Power Administration, Mountain West Research, Inc., is solely responsible for its content. The authors wish to acknowledge the invaluable editorial assistance of BPA's Dan Bisenius, Judy Montgomery, and Gary Stark. Kristi Branch, Michael MacFadyen, James Moore, and Janice Von Vogt of Mountain West Research, Inc. contributed to the organization and text of the report. In addition, Dr. James Chalmers and Dr. Robert St. Louis provided valuable information and comment.

ABSTRACT

During public hearings or meetings on proposed projects such as the Garrison-Spokane 500-kV Transmission Project, local residents have expressed concern about the impact of transmission lines on land values and about the fairness of compensation processes. This report focuses on key studies which have addressed those issues, summarizes their conclusions, evaluates their methodologies, and discusses policy implications for the Bonneville Power Administration.

Of the twenty-seven key studies identified, twelve concluded that transmission lines had "no effect," or "no significant adverse effect," on land values. Another eleven studies were inconclusive or internally contradictory. Five of the studies concluded that transmission lines did have adverse effects on land values. The studies were conducted between 1959 and 1981, used several different methodologies, and presented their results in varying levels of detail. These differences were of sufficient magnitude to limit the comparability of the research, leaving many of the key relationships in question and leaving the exact nature of transmission lines effects on land values unclear.

In the course of reviewing the literature, it became evident that assessment and prediction of land value effects required a more explicit statement and understanding of the factors actually causing the effects. Generally, these factors were related to restrictions on land use and control, effects on the productivity of land and workers, health and safety effects, and visual effects. In evaluating these causal factors, the studies exhibited several methodological weaknesses which include the lack of a conceptual framework, nonrigorous determination and confirmation of sales prices, inadequate sample sizes, and lack of statistical controls for other factors that may have affected land values. In future research, all of these weaknesses need to be eliminated in order to determine relationships among the various factors that influence transmission lines' land value effects and to develop data that will facilitate prediction of future lines' land value effects.

Because the key studies exhibited contradictory conclusions and methodological weaknesses, and because they focused on cases in the eastern and southwestern United States, they do not provide the type of evidence upon which forecasts regarding the potential land effects of the BPA Garrison-Spokane 500 kV Transmission Project can reliably be based. When combined with the public concern about the lines' potential land value effects, this lack of evidence highlights the need for BPA to be very sensitive in conducting right-of-way negotiations in the area. In addition, the inconclusiveness of the literature also highlights the need for more research on the causal relationships between transmission lines and property characteristics, such as land use type and distance from the line.

1. INTRODUCTION

1.1. Environmental Context

The environmental movement of the late 1960s and early 1970s brought political pressure on all levels of government to consider the environmental consequences of their programs. The major legislative impetus for the government was the National Environmental Policy Act (NEPA) of 1969 and subsequent guidelines issued by the Council on Environmental Quality (CEQ). In the case of energy developments, this legislation required an evaluation of both the need for and the likely environmental impacts of a proposed project at its preferred as well as its alternative locations (Casper and Wellstone 1981; Young 1973).

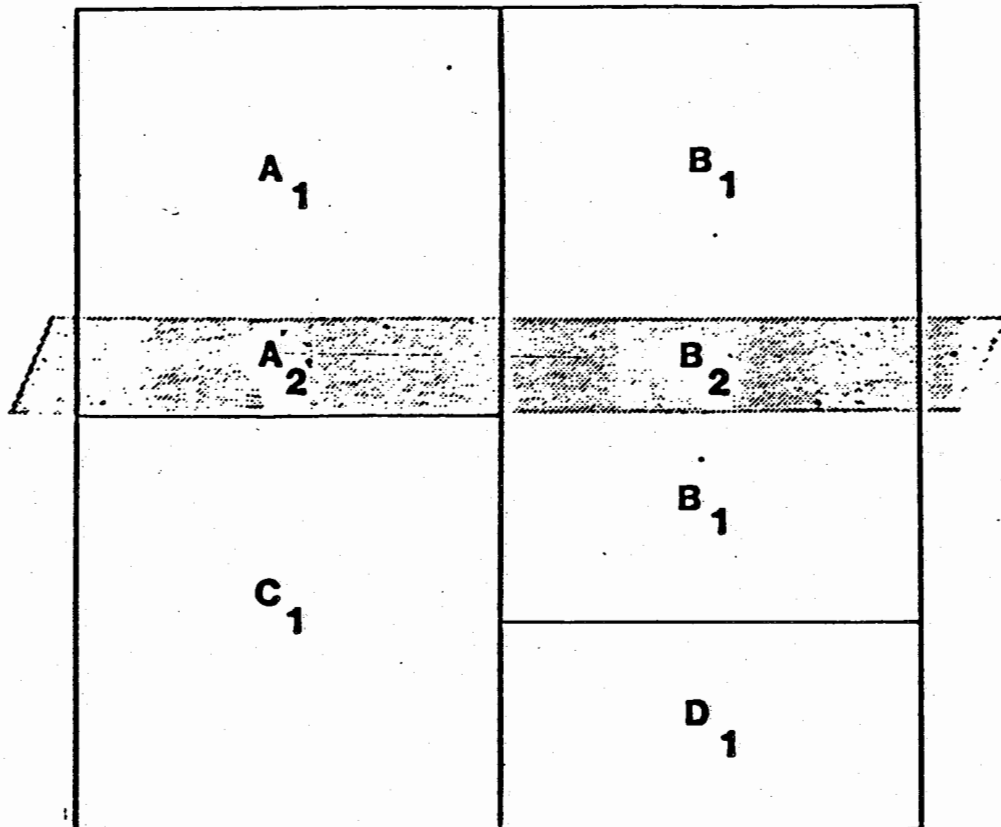
Once the need for a transmission line is established and after a siting decision is made, the sponsoring utility can either utilize previously acquired rights-of-way or acquire new land and/or easements through negotiation or condemnation. Transmission line easements acquired through condemnation have often become controversial because of forced takings and because of sentiment that "just compensation" has not been paid. In addition, during public hearings or meetings on proposed projects such as the Garrison-Spokane 500-kV Transmission Project, there have been local expressions of concern about the impact of transmission lines on proximate as well as encumbered properties.¹ Figure 1-1 provides a graphic definition of these property relationships.

Just compensation is defined as the difference in fair market price between a parcel of land without the transmission line easement and the same parcel of land with the easement (and the line). Historically, compensation has usually been limited to payment for the property within the easement itself. Just compensation has typically been determined by

¹proximate in this context refers to properties which are near and sometimes contiguous to right-of-way easements but are not encumbered by an easement.

FIGURE 1-1

Terminology Used in this Report
to Describe Land Relationships



Each letter represents a separate owner.

Encumbered land = $(A_1 + A_2)$, $(B_1 + B_2)$

Easement area^a = A_2 , B_2

Adjacent land = A_1 , B_1

Proximate land = C_1 , D_1

Source: Mountain West Research, Inc., 1981.

^aAlso referred to as the right-of-way or "taken" land.

appraisers, based upon their estimates of the fair market value of the property taken. Challenges to appraisers' methods of determining fair market value have been raised in court, as well as by researchers, on the grounds that the appraisal methods utilized have not adequately incorporated a variety of indirect economic, visual, and biological impacts alleged to increase the transmission line's adverse effect on the entire parcel's value. Furthermore, the justness of the legal structure which does not admit compensation for these types of impacts has also been challenged.

1.2 Purpose of the Report

Concerns regarding possible land value effects were raised at public meetings held as part of the environmental assessment for the Garrison-Spokane 500-kV Transmission Project. As a result, the Bonneville Power Administration authorized Mountain West Research, Inc. to critically review the literature on land value effects and to determine the implications, if any, for the Garrison-Spokane EIS. This report focuses on the literature which addressed the possible measurable effects of extra-high-voltage (500-kV to 750-kV) overhead transmission lines and right-of-way easements on the market values and sales prices of properties encumbered by and proximate to the easements. In this review, the research methods used in previous studies, their conclusions, and the factors identified as contributing to any land value effects received primary attention. In particular, factors which limited the validity of previous studies or their applicability to the Pacific Northwest were examined.

In brief, the objectives of the study were to:

- 1) Identify and critically review the pertinent literature
- 2) Present and analyze the results of the key studies
- 3) Identify and discuss the factors postulated to be causally associated with land value effects
- 4) Provide guidance and a conceptual framework for conducting or evaluating research on land value impacts in the Pacific Northwest

- 5) Identify and evaluate the policy implications of the study's conclusions for the Bonneville Power Administration

1.3 The Review Process

In order to identify the relevant literature, a broad range of sources were identified and reviewed. The strategy involved an extensive search of the literature of the social and physical sciences, including computer-assisted searches of national technical and legal data bases.¹ The literature associated with numerous professional interest groups, such as right-of-way, professional appraisal, and agricultural protective associations, was also searched. This effort was augmented by contacts with organizations and individuals active in the field.

The literature search uncovered 118 references from the social science, physical science, and legal literature, several of which were from other countries. From these, twenty-seven were identified as key studies meriting intensive review. The following criteria were used to identify key reference works:

- 1) The degree to which the study addressed the specific question with which this review is concerned
- 2) The presence of a conceptual framework and empirical research and analysis, with results that could be used to derive generally applicable conclusions
- 3) The frequency and authority of references to the study in the related literature

As shown in the summaries of the twenty-seven key studies that are included in Appendix A, the pertinent literature reported contradictory results and conclusions. Although the bulk of the literature concluded

¹Computerized data bases consulted include the U.S. Department of Commerce's National Technical Information Service; the Commercial Engineering Index, File No. 8, Compendix; File One of the U.S. Department of Energy Data Base; the Lexis Legal Decisions File; and the Public Affairs Information Services (PAIS).

that transmission lines have no adverse effects on land values, a few of the key studies concluded that transmission lines do have an adverse effect on land values. The twenty-seven key studies were conducted over a time period that extended from 1959 to 1981 and were further differentiated by their study areas, which included examples from both urban and rural areas throughout the United States and Canada. Because of this lack of consensus, this review has emphasized evaluating and comparing the conceptualization, statement of issues, methodology, analytic technique, and evidence presented in each of the key studies.

1.4 Structure of the Report

This report consists of six chapters. Chapter 2 develops a meaningful context for understanding the land value issue by familiarizing the reader with the concept of just compensation as it has been established in the courts. Chapter 3 identifies and summarizes the characteristics and conclusions of twenty-seven key studies. Chapter 4 discusses four major causal factors which the literature postulates could influence transmission lines effects and land values. Chapter 5 uses the results of Chapters 3 and 4 to address pertinent methodological issues associated with the design of research on land value effects. Chapter 6 summarizes the results of the literature review and discusses the implications for the Bonneville Power Administration. Appendix A presents individual summaries for each of the twenty-seven key studies, and Appendix B presents an in-depth bibliography of the works included in the literature review.

2. THE LEGAL CONTEXT

2.1 Introduction

In order to properly identify the issues related to the assessment of the potential land value effects of transmission lines and easements, it is necessary to understand the legal context of the problem. Basic precedents in real property law and the law of eminent domain, along with established regulatory processes, have set the parameters within which the courts will consider land value issues. This chapter presents a brief summary of the major elements of this legal context, emphasizing those methods for determining land value effects that have an established legal precedent.

2.2 The Legal Origins of the Land Value Issue

The siting of major industrial facilities has been subject to governmental regulation since the mid-1920s. Statutory land use controls have been used by governmental agencies to regulate the design and location of major facilities through the issuance of construction permits. Issuance of such permits has been based on evaluation of the project's compatibility with existing land use patterns and the physical, technical, and economic suitability of the project and the site.

Site suitability assessments have been conducted with increasing frequency since the implementation of the National Environmental Policy Act of 1969. They focus on the physical characteristics of the project and the site (e.g., soil stability, seismic activity, etc.) in relation to a range of environmental, economic, social, and technical engineering parameters (Hamilton 1979).

The selection of a route and the acquisition of a right-of-way easement and/or land parcels are prerequisites for the construction of a transmission line. In the right-of-way acquisition process, the utility or government agency that will operate the transmission line obtains

specified access road and/or line easements from the land owner or land managing agency. These easements give the operating utility or agency the right to enter, construct, maintain, and operate the electric transmission line.

Easement rights are obtained only for the land needed for the access roads and/or line and not for the total land parcel which is to be crossed. The easement rights are acquired through a mutually negotiated purchase, or in the event that a mutual agreement cannot be reached or that a clear title to the right-of-way cannot be obtained, through an eminent domain action. In an eminent domain proceeding, a court determines just compensation based on evidence presented by the landowner and by the utility or agency seeking easement rights.

Although eminent domain is used only when a negotiated agreement cannot be reached, it is important to note that the utility or government agency's power to exercise eminent domain can affect the negotiation process and influence easement prices. This effect can occur when landowners who desire to avoid the eminent domain process do so by accepting a negotiated price for the easement which is below the value they believe is just compensation. In these cases the utility or government agency's right of eminent domain can put the landowner at a disadvantage in the negotiation process.¹

When eminent domain is used, property values cannot be determined through the natural operation of the market place, where land and easement buyers and sellers can decide whether they wish to complete a transaction at a particular price. Rather, eminent domain proceedings focus on the determination of just compensation, which is required by the Fifth Amendment of the United States Constitution when private

¹It can also affect the market mechanisms by forcing transactions on owners who do not wish to sell. However, it should also be that higher prices may be paid by utilities/agencies wishing to avoid the politically sensitive exercise of eminent domain.

property is acquired for public use. In these circumstances, just compensation for the land or easement is determined through legally-sanctioned procedures. Challenges to the validity of the procedures used to appraise the value of the easement have resulted in a complex set of precedents regarding accepted methods of appraisal, the factors allowed to be considered and the weights assigned to them, and valuation standards (Interagency Land Acquisition Conference 1973). Nevertheless, the establishment of just compensation has continued to pose many problems requiring legal resolution.

The next section provides a brief description of methods used to determine just compensation. More complete descriptions of these appraisal practices and of land acquisition procedures are presented in U.S. Department of Justice, Land and Natural Resources Division, A Procedural Guide for the Acquisition of Real Property by Governmental Agencies, and in Interagency Land Acquisition Conference, Uniform Appraisal Standards for Federal Land Acquisition.

2.3 Determination of Just Compensation

2.3.1 Fair Market Value

Established law has determined that the criterion for just compensation is the fair market value of the property at the time of the taking. In the case of easements, which result not in the purchase of the entire parcel but the burdening of the property with an encumbrance, the criterion has been the difference between the fair market price of the parcel without the encumbrance and its fair market price with the encumbrance.

When an easement or servitude over land is condemned for the public use, the appraisal should be in the amount of the difference between the fair market value of the land before and the fair market value immediately after the imposition of the easement. Full consideration should be given to and due allowance made for the substantial enjoyment and beneficial ownership remaining to the owner, subject only to the interference occasioned by the taking and exercising of the easement. In the case of easements such as those acquired for domestic electric...

lines, where there is an established going rate per pole and per line mile, such transactions may be considered among market data. In the absence of better evidence of market value, the "before and after" method should be employed. (Interagency Land Acquisition Conference 1973.)

"Fair market value" is defined as the amount in cash, or in terms reasonably equivalent to cash, for which in all probability the property would be sold by the knowledgeable owner willing but not obliged to sell to a knowledgeable purchaser who desires but is not obligated to buy. Under this definition, consideration should be given to all matters that might be brought forward and reasonably given substantial weight in bargaining by persons of ordinary prudence, but no consideration should be given to matters not affecting market value. While the law recognizes that appraisal is inexact and that it is difficult to compute an estimated value in an exact dollar amount, it does require that a specific dollar amount be determined.

The law predicates that fair market value incorporates all important considerations and that no consideration should be given to any sentimental or other special value of the property not directly reflected in the market value. Congress has established "...a uniform policy for the fair and equitable treatment of persons displaced as a result of federal or federally-assisted programs in order that such persons shall not suffer disproportionate injuries as a result of programs designed for the benefit of the public as a whole" (Uniform Relocation Assistance and Real Property Acquisition Policies Act 1970).

Fair market value as a standard of valuation must be applied to an entire property, a whole parcel or tract. Improvements and natural resources found on the property are considered to the extent that they enhance the market value of the property as a whole. The value of property must be appraised at or as near to the time of taking as possible. Physical changes that occur after the taking which lead to changes in its value may not be reflected in the appraised value.

Fair market value determination must include consideration of the highest and best use for which the property is suited. Under normal circumstances, the law predicates that because of existing economic pressures, the existing use constitutes the highest and best use. Nevertheless, determination of the highest and best use of the property requires consideration of: (1) the supply and demand for properties with similar characteristics, (2) conformity of a particular land use with land uses on adjacent or neighboring properties, (3) the size of the property and its potential as a location for different types of sizes and improvements, and (4) local zoning regulations.

Partial takings (such as easements for transmission lines) leave remainders, the values of which are largely governed by the highest and best use of the remainder after the taking. If the taking causes the remainder of a single tract to change in value, then compensation must reflect this change.

The law holds that when the United States acquires only part of a single tract or parcel that is under one ownership (such as parcels A or B in Figure 1-1), if the taking diminishes the value of the remainder, then the owner is entitled to compensation for any loss in the value of the remainder as well as for the taking itself. A crucial point is that all tracts separate from those containing the partial taking (such as parcels C and D in Figure 1-1) are excluded from consideration for compensation. It is well established that "damages may not be awarded for injury to remaining land which, even in the same ownership, is a different tract from the land condemned" (Interagency Land Acquisition Conference 1972).

2.3.2 Methods for Determining Fair Market Value

A number of methods have been developed to determine Fair Market Value. Those most commonly used are described in the following section.

2.3.2.1 Land Value in Prior Sales of the Identical Property

Since market value determines compensation, prior sales of the identical property, which are reasonably recent and not forced, have been considered the best evidence of market value. Data on the recent sale of the condemned property (as well as data on all sales of the property within ten years of the taking), adjusted for changed market conditions, have formed the basis of the preferred method for determining a property's current market value.

2.3.2.2 Value Estimated by Market Method (Comparable Sales)

When data on prior sales are unavailable, the law holds that transactions involving lands in the vicinity of those taken and occurring at about the time of taking are the best evidence of market value. This approach compares sales transactions for comparable properties to the property being

appraised utilizing six elements:

- 1) The interval between the date of sale and the appraisal date
- 2) Factors motivating the sale
- 3) The property's location, including its proximity to roads, schools, etc.
- 4) Similarity of highest and best use positions, including intensity of that use
- 5) Physical similarities and dissimilarities
- 6) Economic similarities and dissimilarities

Since this approach reflects the balance of supply and demand in actual trading in the market place, it is capable of developing acceptable and convincing evidence of the property's fair market value.

The cost approach entails adding the fair market value of the bare land to the depreciated replacement cost of the improvements to arrive at a valuation of the property. Comparable sales are always the basis for determining the value of the land (bare and subject to improvement), while the current cost of labor and materials for construction (minus

all forms of depreciation) is the basis for determining the replacement cost of the improvements.

2.3.2.3 Value Estimated by Income Method

Investment properties which produce income may be more accurately valued by the income approach than by the comparable sales method. The capitalization of income approach considers the income which the property itself will produce, not the income produced from the business enterprise conducted on the property. However, the income approach is time-consuming and complicated because it requires the comparison of rates from comparable investments.

2.3.3 Limits on the Fair Market Value Concept

Compensation normally does not include future loss of profits, the expense of moving removable fixtures and personal property from the premises, loss of the goodwill which inheres in the location of the land, or other losses which would ensue from the sale of property, although the owner would take all these factors into account in determining whether and at what price to sell under market conditions. The courts have generally held that these factors are not to be accounted for in the determination of compensation. It has been established that the United States is obligated to pay only for what it takes, not for opportunities which the owner may lose. As the U.S. Supreme Court put it, "frustration and appropriation are essentially different things" (Omnia Commercial Co. v. U.S., 261 U.S. 502 (1923)).

3. NET LAND VALUE EFFECTS: RESULTS OF THE KEY STUDIES

3.1 Introduction

Based on the review process described in Chapter 1, twenty-seven studies were identified as the key literature relevant to the questions concerning the existence and magnitude of land value effects due to transmission lines and right-of-way easements. This chapter presents a description of these twenty-seven studies and discusses their conclusions regarding the effects of transmission lines on the sales price of land.

3.2 General Characteristics of the Key Studies

As shown in Table 3-1, the twenty-seven key studies were conducted over a period that extended from 1959 to 1981. Seventeen of the twenty-seven key studies were conducted by professional appraisers. Seven were carried out by individuals associated with universities, and one was conducted by a management consultant. In two of the studies, the authors' affiliation was not specified.

Eighteen of the twenty-seven key studies were sponsored by the utility industry. These studies had generally been precipitated by controversy over a particular transmission line's effect on land values. Although many of the other studies were conducted by individuals associated with universities, the exact sponsors of these studies were not specified.

The studies were conducted between 1959 and 1981. They were based primarily on case histories of property sales and on interviews with residential developers. The case histories of property sales occurred at a wide variety of locations throughout the United States and Canada and included examples of urban commercial, urban residential, rural residential, and agricultural land use types.

Summary of Key Studies' Characteristics and Conclusions

Study Number	Author(s)	Year Published	Author's Profession		Sponsor of Study		Conclusion			
			Appraiser	Other or Unknown	Utility	Other or Unknown	No Effect	No Significant Adverse Effect	Inconclusive or Internally Contradictory	Adverse Effect
<u>Adverse Effect Studies</u>										
	Ball	1979	X			X				
	Bremner	1963	X		X			X		
	Everhart	n.d.	X		X			X		
	Everhart	1977	X		X			X		
	Everhart-Everhart	1977	X		X			X		
	Francy	1974a		X	X			X		
	Francy	1974b		X	X		X			
	Francy	1974c		X	X		X			
	Layton	1961		X	X		X			
	New England PSC	1963	X		X			X		
	Rhodes	1970	X			X		X		
	Smith	1965	X		X		X			
<u>Inconclusive Studies</u>										
	Canadian REFC	1973	X			X			X	
	Clark	1972	X			X			X	
	Clark/Treadway	1972	X			X			X	
	Hansen/Peterson	1961	X		X				X	
	Lamb	1963	X		X				X	
	Layton	1960		X	X				X	
	Manley	1959	X		X				X	
	Reeves/Swan	1960	X		X				X	
	Woods Gordon	1981		X					X	
	Zundel	1959	X		X				X	
<u>Adverse Effect Studies</u>										
	Colwell/Folwey	1979		X		X				X
	Kellough	1980	X			X				X
	Kinnard	1967		X	X					X
	Kinnard/Stephens	1965		X	X					X
	Univ. of Waterloo	1978		X		X ^a				X

Source: Mountain West Research, Inc., 1981.

Note: More complete descriptions of each study are presented in Appendix B.

^a University of Waterloo study sponsored by the Canadian government.

3.3 Conclusions Regarding Net Land Value Effects

Twelve of the key studies concluded that transmission lines had "no effect" or "no significant adverse effect" on land values. Hereafter, these studies will be referred to as the "no adverse effect" studies. Ten studies were either inconclusive or relied on data that implied contradictory conclusions. These studies will be referred to as the "inconclusive" studies. Five of the key studies concluded that transmission lines did have adverse effects on land values. These five studies will be referred to as the "adverse effect" studies.

When evaluating and comparing the results of the no adverse effect, inconclusive, and adverse effect studies, it is important to note that they were conducted during a time period (1959 to 1981) in which concern about social and intangible effects was rapidly increasing. The earlier studies typically relied on more simple methodologies which used realtors selling price as a measure of land value and did not control for the effect of other factors (such as lot size or house characteristics) which could have influenced land values. Some of the later studies have recognized the importance of controlling for the other factors and developed more rigorous analytical frameworks and elaborate research designs. As a consequence, the twenty-seven studies' methodological differences are often so confounding that they prohibit meaningful comparison of the studies' results.

3.3.1 No Adverse Effect Studies

The no adverse effect studies can be divided into two subgroups:

- 1) Those which conclude that transmission lines have no effect on property values
- 2) Those which conclude that transmission lines have no significant adverse effect on property values

Of the twelve studies in this group, the five which concluded that transmission lines have no effect on property values were by Ball (1979), Francy (1974b), Francy (1974c), Layton (1961), and Smith (1965). The seven studies which found no significant adverse effects on property

values were conducted by Brennan (1963), Everhart/Everhart (1977), Everhart (n.d.), Francy (1974a), New England Power Service Company (1963), and Rhodes (1963). Several of these studies merit additional attention.

Thomas A. Ball's Arizona study of transmission line effects on residential properties (1979) obtained data through interviews with fourteen residential developers. Of the fourteen, all but one felt that residential sales were unaffected by transmission line easements. However, in evaluating the results of this study, it is not clear whether developers and the market evaluate the impacts of transmission line easements in a similar manner. Sales data would be required to determine the market evaluation of the impact.

Two of Robert E. Francy's studies of rural land sales in Arizona (1974b, 1974c) concluded that transmission lines had no measurable effects on the sales prices of subdivided and other rural land in close proximity to the easement. Neither of the two studies had adequate sample sizes or made attempts to control for other factors that could have affected land values.

Charles W. Layton's study of subdivision land values near Detroit, Michigan (1961) concluded that lots proximate to transmission line easements sold for the same price and just as quickly as lots which were not proximate to the easements. The study did not control for lot size and house characteristics or other factors that could also have affected land values.

Marion and David Everhart's 1977 study in Scottsdale, Arizona concluded that transmission lines crossing parallel to commercially zoned lots had no effect on the per square foot lot value when compared to similar sized lots not crossed by a transmission line. Although this study did control for lot size, it did not specify the sample selection or appreciation adjustment methods used.

3.3.2 Inconclusive Studies

The ten studies which reported results that were inconclusive or internally contradictory were the Canadian Real Estate Research Corporation, Ltd. (1973), Clark (1972), Clark and Treadway (1972), Hansen and Peterson (1961), Lamb (1963), Layton (1960), Manley (1959), Reeves (1960), Woods Gordon Management Consultants (1981), and Zundel (1959). Two of these studies (Layton 1960; Clark 1972) reported that the data would not support any firm conclusions; one (Hansen 1961) was inconclusive; one (Reeves 1960) concluded that the impacts would be "small, if any;" another (Manley 1959) held that the effect would not adversely affect community development; two (Lamb 1963; Zundel 1959) presented the conclusion that the effects would be minimal, although their data clearly showed that adverse effects were occurring; and one (Woods Gordon 1981) concluded that there would be no effects on agricultural land but significant adverse effects on residential land. Another study (Canadian Real Estate Research Corporation, Ltd. 1973) included several case studies in which the results were split between no effect and adverse effect. Several of the inconclusive studies merit closer attention.

Although Layton (1960) indicated that the intent of his study of land value effects near Detroit for the Detroit Edison Company was to generate a valid data base rather than to draw definitive conclusions, his data indicated that lots proximate to the transmission line either sold for less or were larger than nonproximate lots. The problem of controlling for lot size will be addressed in more detail in a later section.

John T. Hansen and David Peterson's study of land value effects in the Paradise Valley near Phoenix for the Arizona Public Service Company (1961) concluded that there were no apparent trends in transmission line effects on property values. However, it was noted that there was a tendency for adverse impacts to result from transmission lines in areas

of higher-priced lands. The study did not inspect property, confirm sales prices, or control for property size.

In his study for the Pennsylvania Power and Light Company (1959), R.C. Zundel contended that prospective purchasers of residential lots were willing to pay approximately the same price for land in close proximity to a transmission line as for land in other sections of a development. However, his data showed that sales prices for lots in close proximity to a transmission line were about 6 percent lower than for lots in other sections of the development. Similarly, appraiser Robert B. Lamb, who conducted a study of residential property sales for the Southern California Edison Company (1963), concluded that the factors which devalued land prices were confined to the easement alone and did not affect adjacent areas. This conclusion was made despite testimony by a developer that he discounted lots proximate to transmission line easements by \$1,000 and despite the study's own data which showed that lots proximate to transmission line easements were larger than the "comparable" lots more distant from the easement. This report concluded that when a transmission line easement is taken on undeveloped land, the value of the rest of the property may be adversely affected if the reduction of the property's size has decreased its development potential.

The Canadian Real Estate Research Corporation, Ltd. (1973) concluded that the presence of high voltage transmission lines had no appreciable impact on adjoining or nearby properties. However, since two of the four case studies in this report indicated a 3 to 4 percent difference in price for property along the transmission line easement, the study has been categorized as showing contradictory or inconclusive results.

The Woods Gordon Management Consultants' study of six rural areas for Ontario Hydro (1981) concluded that while transmission lines did not appear to affect the value of land in agricultural areas, they did appear to lower (by 10 to 15 percent) the selling price of properties in areas where real estate development was likely to occur.

3.3.3 Adverse Effect Studies

Five of the twenty-seven key studies concluded that transmission lines had significant adverse effects on property values (Colwell and Foley 1979; Kellough 1980a; Kinnard 1967; Kinnard and Stephens 1965; University of Waterloo 1978). The findings of these studies are briefly described below.

Kinnard and Stephens' report (1965) summarizing case studies of forty-two residential subdivisions in the Hartford, Connecticut area concluded that transmission line effects were not evident on most residential property but were occasionally evident in higher-income subdivisions. Although the sample-size in this study was adequate, it did not use a theoretical model for analysis. Despite the reports assertion that statistical techniques would be applied to the data, the interpretation of results was intuitive and impressionistic. The study did not control for other factors that might have affected property values.

Kinnard's subsequent 1967 article in The Appraisal Journal used data from his 1965 study and concluded that any negative effects experienced immediately after construction or when a new subdivision is established next to an existing line could be expected to diminish with time. Because it relied on the same data used by Kinnard and Stephens (1965), this article was subject to the methodological flaws noted above.

Kellough's 1967 article in Right of Way reviewed existing Canadian literature and concluded that transmission line easements have reduced property values by as much as 15 to 30 percent. Kellough concluded that the effects depended on the size and type of the property unit. The study was based on a large sample, but neither the sample selection process nor the type of statistical controls was disclosed.

The University of Waterloo study (1978) examined long-term social and economic impacts of transmission lines in eastern Canada. The study concluded that per-acre property values near transmission lines were 16 to 29 percent lower than similar properties elsewhere. Furthermore, the

study noted that the percentage differences were more significant for smaller properties than for larger properties. The study examined 1,007 property sales over the 1967-1977 period, confirmed sales and prices, and controlled for other factors that could have affected property values.

Colwell and Foley's 1979 study examined 200 single family housing unit sales in Decatur, Illinois and concluded that transmission lines had an adverse effect on sales prices. The study, which controlled for time of sale and six other types of house and lot characteristics that could have affected property values, found a statistically significant relationship between proximity to transmission lines and sales prices. The results of the study indicated that between 1968 and 1978, an average house (1,600 square feet, 2 baths, on 9,785 square feet of property) sold for approximately \$45,600 when the center of the property was located 50 feet from the transmission line. Sales prices for the same average house rose as distance from the line increased to about \$48,200 when the center of the property was 200 feet from the line. Although a difference of \$2,600 was shown to exist in selling prices between 50 and 200 feet, very little difference was shown to exist between 200 and 400 feet. Hence, although the study found a significant reduction in selling price relative to proximity, the differences were found to decrease as distance to the line increased.

3.4 Summary and Conclusions

To summarize, the twelve key no adverse effect studies included five works which found "no effect," and seven which found "no significant adverse effect." Ten key studies were either inconclusive or internally contradictory. The five adverse effect studies, which relied on four sets of data, concluded that transmission lines have adverse effects on property values and that the adverse effects were more likely to occur (1) in higher-income subdivisions, (2) as proximity to the line increased, (3) when lot sizes were small, and (4) immediately after the line was constructed, but tended to diminish over time.

When evaluated by current standards, all three groups of studies included works whose methodologies were flawed. In most cases, the flaws in the earlier studies are understandable, as the researchers (1) expected that land value effects would be clearly evident if they existed at all, and (2) were less concerned with controlling for effects from other factors that could also influence land values.

In the late 1970s and early 1980s, a few studies utilized more careful research designs which avoided the flaws evident in earlier studies. Of these later studies, only two (University of Waterloo 1978; Colwell and Foley 1979) had adequate sample sizes, used actual sales prices, and implemented statistical controls to remove the effects of other factors that could influence land values. Both studies concluded that transmission lines had adverse effects on land values. However, despite their methodological soundness, these two studies present results only on land value effects for specific types of land uses in Illinois and Canada. Hence, they are not sufficient enough by themselves to support an adverse effect conclusion for other types of land uses in other regions.

The above discussion demonstrates that although numbers may be useful in identifying and describing the conclusions of the key studies, they should not be used to generalize transmission lines' effects on land values or as evidence to support either the "no adverse effect" or "adverse effect" positions. The studies were conducted over a time period when methodologies for quantification of intangible effects were changing. They were conducted in a wide variety of locations throughout the United States and Canada and included several different types of land uses. And finally, the studies described their methodologies, data, and results in varying degrees of detail. When combined, these differences were sufficiently great that they left many of the key relationships between transmission lines and land values in question. Subsequent sections of this report summarize the causal factors that may influence these relationships and suggest methodologies that could be used to investigate and account for them in future research.

4. MAJOR CAUSAL FACTORS

4.1 Introduction

In the course of reviewing literature, it became evident that to properly assess the adequacy of the key studies and to develop the ability to predict or assess proposed transmission lines' land value effects requires a more explicit statement and understanding of the factors actually causing the land value effects than was formulated in the literature. Although few studies explicitly addressed the issue of why or how transmission lines affects land values, the review of the literature identified four factors which have been implicitly or explicitly postulated as causal agents. These include:

- 1) Restrictions on land use and control
- 2) Effects on the productivity of land and workers
- 3) Concern about health and safety effects
- 4) Visual and aesthetic effects

This chapter discusses each of these four factors and their postulated causal relationship with land value effects.

4.2 Causal Factors

4.2.1 Restriction on Land Use and Control

The establishment of a transmission line easement on a property places encumbrances on the property which give use rights to the easement's holder and which place specific restrictions on the parcel's owner. These restrictions and rights exist whether or not the easement is utilized for a transmission line, and can limit the freedom of the parcel's owner to control and utilize the land. The importance of such restrictions would appear to vary according to the location of the easement on the property, and on the actual or planned land use of the affected property. For instance, the restrictions' effects on residential land could be very different from their effects on cropped-, range-, or forested-land.

4.2.2 Productivity

The literature gives substantial attention to the indirect economic effects of transmission lines and easements. Much of this has been focused on transmission lines' effects on agricultural production. Four types of transmission line impacts on productivity have been identified:

- 1) Short-term crop losses during the construction period
- 2) Long-term crop losses under tower bases
- 3) Economic costs of operating around the tower bases
- 4) Economic effects of workers' and/or animals' reluctance to work or graze near the lines

The first and second of these effects are acknowledged, and utilities generally compensate landowners for short- and long-term crop losses associated with these effects. The remaining two types of effects are recurrent, less tangible, and not easily quantifiable. Consequently, these effects are less often specifically accounted for in compensation negotiations. As a result, many landowners have claimed that one-time right-of-way acquisition payments are not adequate compensation for these longer-term and less tangible effects.

4.2.3 Concern about Health and Safety Effects

Although none of the twenty-seven key land value studies have incorporated potential health and safety effects into their research, several of them mentioned that residents who live near transmission lines have expressed concern about the lines' health and safety effects. When evaluating the role of concern about health and safety effects as a causal factor in land value impacts, the most important question is not so much whether the effects exist or not. Rather, the question is whether people's concern about health and safety effects is great enough to be reflected in the price they are willing to pay for property located near transmission lines.

Hence, the difficulty in determining whether health and safety effects are a causal factor in the relationship between transmission lines and land values stems first from the general public uncertainty

regarding the existence of health and safety effects. And second, even if public concern about transmission lines' health and safety effects could be quantified, it would still be difficult to relate these concerns to economic behavior in making land purchase decisions.

4.2.4 Visual and Aesthetic Effects

visual and aesthetic effects may be defined as a perceivable change in the visual landscape, involving the addition and/or removal of landscape elements which result in a negative human response (University of Guelph 1974). This negative response has been postulated as a factor which would cause a reduction in property value. The visual/aesthetic changes associated with transmission lines include the addition of towers, conductors, and substations and the alteration or removal of ground cover and man-made structures. The effects of the changes depend on the nature of the surrounding landscape and on the perceiving distance, among other factors. Kellough (1980a), Hamilton (1977), the University of Guelph (1974), and the Minnesota Department of Health (1977) noted that significant portions of the public react negatively to the imposition of transmission lines onto the landscape.

Several reasons for the strength of this effect have been suggested:

- 1) The presence of a transmission acts as a symbol of the pervasiveness of emerging technological society, which people may oppose.
- 2) The construction of transmission lines across unspoiled land is an event that is generally aesthetically undesirable, particularly to naturalists and environmentalists.
- 3) The visual presence of the line can serve as a continuous reminder to viewers of their other concerns about the lines.

Several studies in the literature reviewed addressed the visual effects of transmission lines and their relationship to land values. Kellough (1980a) concluded that when a transmission line is constructed, local landowners are usually affected by the structures and that this effect translates into a reduced market value for those lands. Kellough strengthened his argument by citing court decisions which have granted compensation for visual damages.

Mitchell (1978) attached great significance to visual impact. He claimed that properties located one to two miles from the easement had market values higher than those comparable properties closer to the easement. The study of residential property values conducted by Colwell and Foley (1979) confirmed the general findings of the Mitchell study. Colwell and Foley analyzed sales data for residential subdivisions that had been built after the transmission line was constructed. They found that transmission lines had little impact at distances beyond 200 feet, but that substantial differences in selling price existed for land located between 50 and 200 feet from the transmission line.

The above studies demonstrated that both the nature of the surrounding landscape and the distance at which an object is perceived are important variables in determining the visual impacts of transmission lines. Canada's Solandt Commission (1974, 1975) defined a comfortable viewing distance for a tall object to be about three times the height of the object. At this distance, a transmission line tower was thought to blend into the surrounding environment well enough to minimize visible intrusion. However, as Kellough (1980a) noted, such a rule of thumb is less than satisfactory when the objects viewed are multiple towers and cables in a rural setting. By comparison, the University of Guelph study (1974) suggested that a critical perceiving distance for transmission lines was between one and two miles in most landscapes. At this distance, they argued, the towers tend to neither dominate nor contrast with the landscape.

5. METHODOLOGICAL ISSUES

5.1 Introduction

This section addresses the pertinent methodological issues associated with the design of research on the land value effects of transmission lines. When evaluated by current standards, a number of methodological weaknesses were found in the key studies that limited their usefulness. Although many of these weaknesses can be understood in light of the research conditions that prevailed at the time the studies were undertaken, they must be corrected if the results of future research is to yield generalizable conclusions about transmission lines' effects on land values. This chapter briefly identifies the methodological issues identified in the literature, and, whenever possible describes potential solutions. Among the principal methodological issues are the lack of a comprehensive, rigorously developed conceptual framework, nonrigorous determination and confirmation of selling prices, inadequate sample sizes, and lack of statistical controls for other factors that may have affected land values. As indicated in the previous section, several factors need to be controlled in order to quantify the relationships among the various factors that influence transmission lines' effects on land values and to develop the data that would allow prediction of a proposed line's effects on land values.

5.2 Conceptual Framework

Much of the land value effects research has been done without benefit of a comprehensive formulation of the theoretical and practical issues or a concise and rigorous problem statement. From a scientific perspective, such a formulation is a prerequisite for the design of an analytical framework that will yield valid evidence concerning land value effects. In brief, to design or assess a land value study, it is necessary to identify and control for the factors which determine the effect of overhead transmission lines on the selling price of the land

encumbered by the right-of-way easement as well as on the selling price of land in the proximity of the alignment.

5.3 Units of Analysis

As discussed in Chapter 2, the established measure of the value of real property is its fair market market price. When measuring the value of residential properties encumbered by or in the vicinity of transmission lines, several studies used developers' original selling prices. Although a very convenient and inexpensive way of ascertaining property values, this measure has two major weaknesses. First, it reflects the developer's evaluation of a property's value and not the market's evaluation, as reflected in the actual price paid for the property at the time of sale. Second, developers sometimes intentionally do not price properties at their fair market value. Developers have been known to underprice less desirable properties and overprice more desirable properties within subdivisions to expedite total sales and still maintain an acceptable profit margin. Such a practice could introduce bias into the analyses of transmission lines' effects on proximate properties' desirability and market value.

Several other studies have recognized these weaknesses and avoided them in two ways. First, when using a newly-constructed subdivision as an example, they have confirmed actual sales prices rather than the developer's asking prices. And second, several studies used only resale prices which were paid by individual buyers to individual sellers. This practice was more likely to have captured the market's evaluation of land values and avoided developer-introduced biases.

5.4 Sample Design and Size

Given the number of factors thought to be causally related to land value effects, sample design and sample size play an important role in the validity of the data and the confidence that can be placed in the results. Whereas the sample sizes used in many of the case studies may have been large enough to justify conclusions on an intuitive basis,

they were not large enough to support the statistical significance of the results. Inadequate sample sizes constitute a weakness because they allow extraneous variables and measurement errors to account for perceived differences in the effects being measured. Properly designed experiments should use samples which are large enough to reduce these undesirable effects' proportion of the total effect to five percent or less. Of course, in designing any experiment, a balance must be struck between precision gained by increasing the sample size and the added cost of obtaining such information.

5.5 Statistical Controls

In order to adequately control for and separate out the individual effects of the four factors identified in Chapter 4, the sample of properties examined must be designed to allow statistical control of those line and property characteristics that would affect the magnitude of the land value effects.

5.5.1 Transmission Line Characteristics

5.5.1.1 Size (Voltage)

Because of the postulated relationship between the size of the line and actual and/or perceived health and safety effects, it is important that the research design control for this factor.

5.5.1.2 Tower Design and Placement

Although tower design is closely associated with line voltage, there is evidence that tower design is related to the visual and aesthetic effects of the line. The physical placement of the towers on the parcel and in the scenic environment has also been identified as an important variable influencing the lines effects on agricultural productivity, control and use of the land, and the line's visual/aesthetic effects. Consequently, unless they are controlled, these characteristics can introduce ambiguity in the data.

5.5.1.3 Project Phase

Although most of the studies appear to have accounted for the effects of inflation on land values, very few of them controlled for the phase of the transmission line project at the time of sale. The planning, siting, construction, and energization phases of a transmission line project typically occur over a period of several years. To ensure that this factor does not create ambiguity in study findings, land sale data could be grouped and analyzed according to the time of sale relative to the phases of transmission line installation.

5.5.2 Property Characteristics

5.5.2.1 Relationship to the Easement

One evident characteristic of property that has a clear bearing on the analysis of transmission line effects is the relationship of the easement to the property. Because the presence of an easement places an encumbrance on the entire parcel of land, not just on the easement area, the relationship of the land to the easement is potentially an important factor in the analysis and must be carefully controlled.

A number of the key studies failed to make clear whether distinction was made between parcels that abutted the easement and those that included the easement. Thus, they created an ambiguity in their results that could have been avoided by adequate control of this variable.

5.5.2.2 Type of Land

The majority of the key studies examined transmission line effects on residential land. A few considered agricultural land. None, however, specifically explored the relationship between transmission line effects and land use type. Transmission lines frequently cross land used for a variety of purposes. Since the available evidence indicates that land use characteristics could influence the nature and magnitude of transmission line effects, it is essential that the research design provide a basis for examining and controlling for this variable.

5.5.2.3 Distance from Line

If transmission lines do affect land values, it seems likely that their effects would be inversely related to distance from the lines. Omission of this variable could bias the results of the study either in favor of or against the adverse effect conclusion, depending on the nature and location of the sample. A few of the studies compared the price of the same parcel of land before and after a transmission line was constructed in the area. However, in constructing their sample and analyzing their data, the studies' researchers did not account for the distance of the lots from the transmission lines. Consequently, the results of these studies remain ambiguous, a problem which could have been alleviated through more complete analysis of the distance variable.

6. SUMMARY AND IMPLICATIONS FOR THE BONNEVILLE POWER ADMINISTRATION

The legal origins of the land value issue stem from industrial siting regulations, which have been present in many states since the 1920s; from site suitability assessments, which have been required for many projects since 1969; and from the legal procedures which have been established to guide right-of-way acquisition processes. In the right-of-way acquisition process, the utility or government agency that will operate the transmission line obtains property or easements, which give them the right to enter, construct, maintain, and operate the transmission line and/or access roads. The utility or government agency attempts to obtain the right-of-way first through negotiation, and then if necessary, by exercising its right of eminent domain.

In both negotiation and eminent domain proceedings, the central issue is the determination of just compensation or "fair market value" of the property taken for the easement. Because neither procedure allows fair market value to be determined through natural market forces (where a knowledgeable owner willing but not obliged to sell negotiates with a knowledgeable purchaser who desires but is not obligated to buy) several methods for determining just compensation have been developed. These methods incorporate all important considerations that are reflected in market value. However, despite their apparent objectivity, the law still recognizes that appraisal is inexact and that it is difficult to compute an exact dollar value of the property or easement being taken.

The review of the literature identified a number of studies which addressed the issue of net land value effects. Twenty-seven key studies were reviewed in detail and were categorized into three groups based on their conclusions.

Twelve of the key studies concluded that transmission lines had no adverse effects on land values. Ten were inconclusive or were

internally contradictory. When evaluated by current standards, most of these studies exhibited methodological weaknesses in the form of unclear or nonexistent problem statements, use of developers' sales prices, inadequate sample sizes, and lack of statistical controls for other characteristics that could have affected land values.

The five remaining key studies concluded that transmission lines had adverse effects on land values. Three of the key adverse effect studies exhibited methodological weaknesses similar to these noted above. However, the other two adverse effect studies (Colwell and Foley 1979; University of Waterloo 1978), were judged to be methodologically sound. Both of these studies reported a statistically significant inverse relationship between selling price and the distance of residential properties from a transmission line.

Despite the substantial amount of literature on the subject, the exact nature of transmission lines' effects on land values remains unclear. The efforts to quantify transmission line effects on land values have been complicated by the complexity of the relationships involved and by changes that have occurred in transmission line characteristics and the human environment over the past decade. Increased concern about environmental quality has led to claims that high-voltage transmission lines cause a variety of visual, health and safety, indirect economic, and quality of life effects that are reflected in long-term changes in land values, but which have not been adequately quantified in most of the key studies.

Because of the methodological weaknesses and contradictory conclusions of the existing land value studies, the literature reviewed does not provide the type of evidence upon which forecasts regarding the potential land value effects of the BPA Garrison-Spokane 500-kV Transmission Project can reliably be based. Even if more of the studies were methodologically sound and reached mutually supporting conclusions, the preponderance of case studies carried out in the eastern and southwestern United States would have left questions about the applicability

of their findings to a transmission line projects in the Garrison-Spokane area. The questions could be expected to arise not only because of geographical differences, but also because of the unique landscape and aesthetic values which characterize the area through which the Garrison-Spokane line would pass.

When combined with the public concern about the line's potential land value effects, the inconclusiveness of the literature highlights the need for BPA to be very sensitive in conducting right-of-way negotiations in the area. It also highlights the need for more careful studies on land value effects in this region and/or quantification of the causal relationships between the various transmission line, property, and ownership characteristics. More details on the type of research required to determine land value effects in the Garrison-Spokane and BPA service areas are provided below.

Because future transmission lines in the BPA service area would cross significant amounts of nonresidential land, an adequate assessment of land value effects should address transmission lines' effects on a variety of land use types, including irrigated and nonirrigated agricultural, recreational, and commercial/industrial lands. This assessment should address transmission lines' effects not only on parcels of land encumbered by the easement but also their effects on parcels of land located at various distances from the lines. Effects on land that is encumbered by an easement are important to BPA because these effects can legally be considered in the determination and payment of just compensation. However, the potential land value effects or landowners whose properties are located in the vicinity of (but not encumbered by) proposed easements are also important because of federal regulations which require BPA to include them in their Environmental Impact Statement processes.

An adequate assessment of transmission lines' effects on land values would need to control for transmission line characteristics. If land value effects occur, their magnitude could be influenced by line voltage and tower design, two transmission line characteristics that are highly

correlated. In addition, land value effects might also be affected by the phase of transmission line installment in which the land's valuation occurred. Hence, if sales prices are used as a measure of land value, it would be important to note whether the sale took place during the planning, construction, or operations phase of the project.

APPENDIX A:
SUMMARIES OF KEY STUDIES

Ball, Thomas A.

1979 The Economic Effects of Power Lines Adjacent to Residential Properties in Phoenix and Tempe, Arizona. Phoenix, Arizona: Thomas A. Ball, MAI.

Summary:

This Phoenix, Arizona case study examined the effects of high-voltage electric transmission lines on the value of residential properties located proximate to them.

Conclusion:

This study concluded that transmission line easements had no effect on proximate properties. Only one out of fourteen developers interviewed (or 7 percent) said that sales were affected by the easement; none reported giving discounts for lots proximate to an easement.

Methodological Evaluation:

Developers may have spread costs over all of the lots in a subdivision. There is no assurance that the developer and the market evaluate the impact of transmission line easements in the same manner. Sales data is required to determine the market evaluation of the impact.

Comments:

This study was sponsored by the author to assist him in making decisions when appraising similiarly situated properties.

Brennan, P. F.

1963 A Study of the Effects of Transmission Line Rights of Way On
Adjacent Residential Property. Los Angeles, California: P.
F. Brennan, Property Appraiser.

Summary:

This Los Angeles, California, case study examined the effect of transmission line easements on the value of proximate residential properties.

Conclusion:

This study concluded that developers did not discount lots located proximate to transmission line easement, and their lots sold faster than those that were not proximate to a line.

Methodological Evaluation:

A very large sample was selected. Only developers' sales prices were gathered. No explicit attempt was made to control for lot size or distance from the transmission line.

Comments:

This study was sponsored by the Southern California Edison Company.

Canadian Real Estate Corporation

1973 High Voltage Electric Transmission Lines and Property Values. Toronto, Canada: Canadian Real Estate Corporation, Ltd.

Summary:

This Canadian study examined four areas to determine the effect of transmission lines on the value of proximate and neighboring properties.

Conclusion:

The presence of high-voltage transmission lines had no appreciable impact on the value of adjoining and approximate property. However, two of the four areas studied indicated a 3 to 4 percent difference in price for adjoining properties.

Methodological Evaluation:

The sample size was large, but other factors that could have affected sales prices were not controlled for.

Comments:

The sponsor of this study is not known.

Clark, Louis E., Jr.

1972. Electric Transmission Lines and Real Property Values.
Chattanooga, Tennessee: Tennessee Valley Authority.

Summary:

This report reviewed several studies on the effect of on value of properties proximate to the transmission line easements in Tennessee.

Conclusion:

The study concluded that the only reliable method for measuring damages consists of assessing the value of the tract with and without the easement. This is best done by examining a very small number of comparable properties.

Methodological Evaluation:

Existing methodologies are reviewed, but they are not evaluated critically from a statistical point of view.

Comments:

This study was conducted for the American Right-of-Way Conference; its sponsor is unknown.

Clark, Lewis E., Jr. and F.H. Treadway, Jr.

1972 Impact of Electrical Power Transmission Line Easements on Real Estate Values. Chicago, Illinois: American Institute of Real Estate Appraisers.

Summary:

This study analyzed several Illinois cases of transmission lines' effects on values of properties located proximate to the lines.

Conclusion:

Unless the easement affects proximate land uses, damages are limited to the easement.

Methodological Evaluation:

Both the case studies and the sections on methodology ignore statistical controls for other factors which could affect property values.

Comments:

This study was conducted for the American Institute of Real Estate Appraisers and sponsored by Clark and Treadway.

Colwell, Peter F., and Kenneth W. Foley

1979 Electrical Transmission Lines and the Selling Price of Residential Property. The Appraisal Journal 47:490-99.

Summary:

This study analyzed the effect of high-voltage transmission lines on residential property values in two urban areas, with a sample of 200 single family housing sales representing over a decade of transactions.

Conclusion:

This study concluded that proximity to a transmission line is associated with decreased property value and that value decreases with proximity to the transmission line. There is a large and statistically significant effect of proximity to transmission lines on the selling price of houses. The size of the estimated coefficient indicated that a house located 50 feet from the transmission line would sell for \$2,600 less than the same house located 200 feet from the line.

Methodological Evaluation:

Careful review of this article finds it to be one of the most sound pieces of research done on this question to date. A sample of 200 sales is used, and the month of sale and six characteristics of the house and lot are controlled for.

Comments:

This study was sponsored by Colwell (University of Illinois) and Foley (Illinois Power Company). It casts doubt on the conclusions of previously published studies. Nevertheless, it is only a single study, and its results will have to be replicated in other areas before more general conclusions can be drawn.

Everhart, Marion E.

1977 A Land Economic Study of Transmission Lines and Land Value:
Mead-Liberty 345-kV, Maricopa County, Arizona. Phoenix,
Arizona: M.E. Everhart, MAI.

Summary:

This study examined the effect of the 345-kV Mead to Liberty transmission line on land values in Maricopa County, Arizona.

Conclusion:

This study concluded that transmission line easements did not depress land values.

Methodological Evaluation:

The sample selection process was not explained. Although the study statistically controlled for some other factors which could have affected property values it did not control for lot sizes.

Comments:

This study was sponsored by the Salt River Project (a utility).

Everhart, Marion E.

n.d. A Land Economic Study of Transmission Lines and Land Values,
Prescott-Mesa 230-kV, Maricopa County, Arizona. Scottsdale,
Arizona: M.E. Everhart, MAI.

Summary:

This study examined the Prescott to Mesa 230-kV transmission lines effect on land values in Maricopa County, Arizona.

Conclusion:

This study concluded that transmission line easements crossing acreages or lots have no depressing effect on unit values of property.

Methodological Evaluation:

The study did not control for other factors which could have affected property values.

Comments:

Study was sponsored by the Salt River Project (a utility).

Francy, Robert E.

1974a Study of Powerline Effects, Buyer Resistance; Blue Hills Farm, Yavapai County. Phoenix, Arizona: R.E. Francy.

Summary:

This study examined the relationship between the presence of a high-voltage transmission line and the hypothesized resistance of prospective buyers to purchasing residential lots proximate to the transmission line. The study examined Blue Hills Farm subdivision in Yavapai County, Arizona.

Conclusion:

The study concluded that prospective buyers did not exhibit resistance to purchasing lots proximate to the transmission line.

Methodological Evaluation:

The report did not disclose whether lot sizes or distance from the transmission line were controlled for.

Comments:

This study was sponsored by the Salt River Project (a utility). Since no buyer resistance was exhibited, the report infers that the transmission lines did not affect land values.

Francy, Robert E.

1974b Study of Powerline Effects on Rural Land Sales, Buckeye Area, Maricopa County. Phoenix, Arizona: R.E. Francy.

Summary:

This study examined a transmission line's effect on the sales of rural properties located proximate to the line in the Buckeye area of Maricopa County, Arizona.

Conclusion:

The study concluded that the existence of a transmission line and its structures had no meaningful effect on the sale price of rural lands.

Methodological Evaluation:

The sample size was too small to be reliable and no explanation was given for the selection of this particular sample. Minimal attempts were made to control for factors such as: (1) time of sale, (2) presence or absence of utilities (e.g., water and electricity), (3) road conditions, and (4) other land characteristics.

Comments:

This study was sponsored by the Salt River Project (a utility).

Francy, Robert E.

1974c Study of Powerline Effects on Rural Subdivisions in Yavapai County. Phoenix, Arizona: R.E. Francy.

Summary:

This case study examined the effect of a high-voltage transmission line on the sales of proximate subdivided rural properties in Yavapai County, Arizona.

Conclusion:

The study concluded that the existence of a transmission line easement and its structures had no measurable effect on either the sale price or marketability of proximate land.

Methodological Evaluation:

The sample size was too small to be reliable, and no explanation was given for the selection of this particular sample. No attempt was made to control for other factors which might have affected property values.

Comments:

This study was sponsored by the Salt River Project (a utility).

Hansen, John T., and David N. Peterson

1961 A Study of the Effect of an Electric Transmission Line on Property Values in Paradise Valley North of Phoenix, Arizona. Phoenix, Arizona: J. Leslie Hansen & Son, Appraisers.

Summary:

This study examined the effect of a high-voltage transmission line on the value of proximate properties in the Paradise Valley north of Phoenix and Scottsdale, Arizona.

Conclusion:

The study identified no clear-cut trend in property value impacts. However, it concluded that in areas of higher-priced land, transmission lines have had adverse effects on property values.

Methodological Evaluation:

The study did not appear to inspect property, confirm sales prices, or control for lot size.

Comments:

This study was sponsored by Arizona Public Service (a utility).

Kellough, W. R.

1980a Impact Analysis of Electrical Transmission Line: Part I.
Right of Way 46:50-55.

Summary:

This article reviewed the existing literature. It reviewed evidence concerning the effects of 500-kv lines in Canada and reported on results obtained in other studies which indicated that transmission lines have had significant adverse effects on land values.

Conclusion:

The study concluded that transmission line easements have had significant adverse effects on land values. The effect has ranged from 15 to 30 percent, depending on the size and type of property.

Methodological Evaluation:

The sample size was large, but the sample selection process was not presented. Types of statistical controls were not specified.

Comments:

This study was sponsored by Kellough.

Kinnard, William N., Jr.

1967 Tower Lines and Residential Property Values. The Appraisal Journal 35:269-84.

Summary:

This article highlighted the results of forty-two case studies performed by Kinnard and Stephens the Hartford, Connecticut area. The case studies addressed transmission lines' effects on subdivided residential properties.

Conclusion:

The study concluded that those transmission line effects on property values which occur immediately after construction of the line or after a new subdivision is established next to an existing line could be expected to diminish with time.

Methodological Evaluation:

For the most part, this study is methodologically sound. Although lot size, square footage, time of sale, and other factors were all controlled in some manner, it is not possible to adequately assess the methodology used.

Comments:

This study was conducted for the Institute of Urban Research of the University of Connecticut and sponsored by the Connecticut Light and Power Company and the Hartford Electric Light Company.

Kinnard, William N., Jr. and G.R. Stephens
1965 Transmission Line Rights-of-Way and Residential Values,
Volume I: Text. Storrs, Connecticut: Institute of Urban
Research, University of Connecticut.

Summary:

An important work in its field, this report is a compendium of citations from forty-two case studies concerning the effect of transmission lines on land values. The case studies addressed land value effects in residential subdivisions around Hartford, Connecticut. They examined twelve hypotheses about the impact of transmission lines.

Conclusions:

The study concluded that:

- 1) The value of most residential property was adversely affected by being proximate to or intersected by transmission line rights of-way.
- 2) Adverse effects were present in the form of larger lots near the lines, which sold for the same price as smaller lots away from the line.
- 3) Higher-income subdivisions were more likely to have experienced adverse effects on property values. In these subdivisions, substantially larger lot sizes were common close to the right-of-way. Although it was not conclusive, the study supported the hypothesis that the "costs" of transmission lines may be dependent on residential landowners' income levels.
- 4) The report contains some evidence that sales price differentials decrease over time.

Methodological Evaluation:

These studies have no basic theoretical model for analysis; the general approach is intuitive and the interpretation of the results is impressionistic, despite the report's assertion that simple t-tests and certain nonparametric techniques would be applied to the data. Also, no attempts were made to statistically control for factors affecting sales price, and the experimental controls that were used may not have been adequate.

Comments:

This study was conducted for the Institute for Urban Research of the University of Connecticut and financed by the Connecticut Light and Power Company and the Hartford Electric Light Company.

Lamb, Robert B.

1963 Effects of Transmission Lines on Adjacent Lands. Ventura,
California: Robert B. Lamb, Appraiser.

Summary:

This southern California study examined transmission lines' effects on residential property values.

Conclusion:

The study concluded that transmission line effects were confined to property in the easement. However, proximate properties may be adversely affected if their size is reduced to the point where their utility is reduced.

Methodological Evaluation:

The above conclusions were reached despite the fact that the data showed lots proximate to transmission line easements were usually larger and despite a developer's testimony that he had discounted proximate lots by \$1,000. The data was not analyzed in a rigorous manner, and developer's opinions were given more weight than actual sale prices.

Comments:

The study was sponsored by the Southern California Edison Company.

Layton, Charles W.

1960 A Study of Land Values Adjacent to Steel Tower Transmission
Line Easements. Detroit, Michigan: Detroit Edison Company.

Summary:

This study generated a data base on the value of properties located proximate to transmission line easements near Detroit.

Conclusion:

The study did not draw conclusions. However, the data indicated that lots proximate to the transmission line either sold for less or were larger than nonproximate lots.

Methodological Evaluation:

The sample size was too small to support conclusions. Furthermore, it presented lot prices asked by developers rather than actual sales prices. The data base did not include information on other factors that might have affected sales prices.

Comments:

This study was sponsored by the Detroit Edison Company.

Layton, Charles W.

1961 Subdivision Values Unaffected by Tower Lines. Detroit,
Michigan: Detroit Edison Company.

Summary:

This study used the data base established in 1960 to determine transmission lines' effects on the value of subdivided residential properties near Detroit, Michigan.

Conclusion:

The study concluded that lots proximate to transmission line easements sold for the same price and just as quickly as lots which were not proximate to the easements.

Methodological Evaluation:

Failure to consider resale data precluded accurate determination of impacts on land values. Controls for lot size and house characteristics were not utilized.

Comments:

This study was sponsored by the Detroit Edison Company.

Manley, Francis E.

1959 The Community Aspect of a Utility Right-of-Way. Nyack, New York: Orange and Rockland Utilities.

Summary:

This study examined utility easements' effects on community development planning.

Conclusion:

The study concluded that once utility easements were established, they did not adversely affect community development.

Methodological Evaluation:

Sample sizes were too small to allow determination of transmission line easements' effects on the value of proximate lots.

Comments:

This study conducted for the American Right-of-Way Association and sponsored by the Orange and Rockland Utilities.

New England Power Service Company

1963 A Study of the Effect of High Voltage Transmission Lines on
Adjacent Real Estate Use and Values. Boston, Massachusetts:
New England Power Service Company.

Summary:

This study examined transmission lines' effects on the use and value of proximate properties in New England.

Conclusion:

The study concluded that transmission lines did not adversely affect proximate properties.

Methodological Evaluation:

The study did not control for differences in lot size, proximity to the easement, or other factors that might have affected land values.

Comments:

This study was sponsored by the New England Power Service Co.

Reeves, George A., and Russell E. Swan

1960 The Effect of High Voltage Transmission Lines on the Value of Real Estate. Oklahoma City, Oklahoma: Swan Real Estate Appraisal Service.

Summary:

Using the results of an Oklahoma case study, this report analyzed transmission line's effect on the value of proximate properties.

Conclusion:

The study concluded that any effect of an easement on the value of residential properties was small, provided the easement and location of supporting structures did not prevent the construction of a dwelling similar to the other houses in the neighborhood.

Methodological Evaluation:

Sample sizes were too small to produce reliable results, and the study did not control for other factors which might have affected land values.

Comments:

This study was sponsored by the Oklahoma Gas and Electricity Company.

Rhodes, Richard M.

1970 Economic Effect of High Voltage Transmission Line Construction on Adjoining Properties. Right of Way 16:6-11.

Summary:

This study was a noncritical literature review which examined previously done studies' conclusions about transmission lines' effects on land use and property values in agricultural areas.

Conclusion:

This study concluded that transmission lines adversely affected property values only when they created changes in land use. Moreover, farm productivity was affected only at the towers and, for some crops, in the area under the lines.

Methodological Evaluation:

This study was a noncritical survey of prior studies.

Comments:

This study was conducted for the International Right-of-way Association and sponsored by Rhodes.

Smith, Herbert H.

1965 An Economic Research Study of Electrical Transmission Lines and Property Values. West Trenton, New Jersey: H. H. Smith Associates.

Summary:

This study examined the effects of transmission lines on property values in Montgomery, Prince George, and Howard counties, Maryland. It attempted to ascertain whether properties proximate to transmission tower facilities increased in value at a slower rate than did similar properties not proximate to transmission towers. In each of nine subdivisions, properties were divided into those proximate to the transmission facilities and those not proximate. The latter were used as control properties. In smaller subdivisions, all of the properties were included in the analysis. In larger subdivisions, a sample of comparable properties made up of two to four times the number of lots proximate to the right-of-way were chosen as the control area. Sales recorded since 1950 were compiled and confirmed, and an annual percent increase was estimated.

Conclusion:

The study concluded that electrical transmission facilities have no adverse or beneficial effect on the value of proximate properties.

Methodological Evaluation:

The lots studied were not randomly selected. Lot size and other variables affecting price were not statistically or experimentally controlled. No test for significance was completed for the observed differences in the property value increase between proximate and nonproximate properties.

Comments:

This study was sponsored by the Potomac Electric Power Company.

University of Waterloo, Faculty of Environmental Studies
1978 The Socio-Economic Impacts of Electrical Transmission
Corridors - A Comparative Analysis. April 1978.

Summary:

This study examined long-term social and economic impacts of 500-kV and 230-kV transmission lines in eastern Canada. The influence of line differences (age, voltage, physical size) on impacts was investigated. A review of Canadian and United States literature was included.

Conclusion:

The study concluded that, with the exception of more frequent sales of property along the 500-kV line during the right-of-way acquisition period, no significant differences in property value effects were found between the two lines. However, properties located adjacent to the lines had average prices that were 16 to 29 percent lower than similar lots in the control group, which was located away from the transmission lines. The percentage differences were generally greater for small properties than for larger properties.

Methodological Evaluation:

The sample consisted of 1,007 properties that were located along the lines and in the control group during the 1967-77 period. The study confirmed sales and average prices per acre for different sizes and types of property. By setting up control groups, the study controlled for other variables that could have affected property value.

Comments:

The study was sponsored by the Royal Commission on Electric Power Planning, an agency of the Canadian government.

Woods Gordon Management Consultants, Urban, Regional and Environmental
Affairs Group

1981 Study on the Economic Impact of Electrical Transmission
corridors on Rural Property Values. Toronto, Canada:
Prepared for Ontario Hydro.

Summary:

This paper consists of six rural Canadian case studies of the effect of high-voltage electric transmission lines on the value of adjacent properties.

Conclusion:

The paper concluded that transmission lines did not affect the value of land in agricultural areas. However, transmission lines did appear to lower (by 10 to 15 percent) the selling price of properties in areas where residential development was likely to occur.

Methodological Evaluation:

The study's model would probably have explained more of the variation in property values if it had controlled variables such as lot size, distances from the transmission line, highways, and towns. Also, a more powerful test could have been conducted by combining the test and control groups and using binary variables to estimate the effect of the transmission line.

The study indicated that developers do not usually discount the price of lots located adjacent to transmission line easements but occasionally increase lot sizes. The study relied upon cases where the sample sizes were too small to produce reliable results, and the few cases with adequate sample sizes generally failed to statistically control for other factors affecting sales prices. Moreover, most of the studies looked only at the prices charged by developers and, hence, picked up only what the developer thought the impact of transmission line easements would be, rather than the market evaluation of the impact. The one case that had an adequate sample size, statistically controlled for other factors which affected sales prices, and included both original and resale prices indicated transmission lines had negative effect on adjacent property values.

Comments:

The study's sponsor is unknown.

Zundel, R. C.

1959 A Study of the Effects which an Existing Transmission Line has of the Development of the Immediate Area for Residential Housing. Allentown, Pennsylvania: Pennsylvania Power and Light Company.

Summary:

This study examined the effect of an existing high-voltage electric transmission line on the development of residential housing in Pennsylvania.

Conclusion:

The study concluded that prospective purchasers of residential lots were willing to pay approximately the same price for land which was close to a transmission line as for land in other sections of the development. However, the data indicated the sales price of land in close proximity to a transmission line was about 6 percent lower than the sales price of land in other sections of the development.

Methodological Evaluation:

The study's sample size was too small to produce reliable results. Sales comparison were made on a front-foot basis and did not consider the overall size of the lot.

Comments:

The study was sponsored by the Pennsylvania Power and Light Company.

APPENDIX B:
BIBLIOGRAPHY

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