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FAVERO, Philip Gordon, 1943-
THE PROCESSES OF COLLECTIVE ACTION:
SMALL ELECTRIC COMPANIES IN MICHIGAN.

Michigan State University, Ph.D., 1977
Economics, commerce-business

University Microfilms International, Ann Arbor, Michigan 48106

THE PROCESSES OF COLLECTIVE ACTION:
SMALL ELECTRIC COMPANIES IN MICHIGAN

By

Philip Gordon Favero

A DISSERTATION

Submitted to

Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1977

ABSTRACT

THE PROCESSES OF COLLECTIVE ACTION: SMALL ELECTRIC COMPANIES IN MICHIGAN

By

Philip G. Favero

Rapid fuel price escalations threaten the viability and continued existence of small producers of electric power. Small producers of electricity, operating in isolation, lack economies of size and have uneven system demands. Thus, in the face of rapid fuel price escalations, small electric companies are reconsidering modes of operation -- including their relationships with other electric companies.

Small electric companies have several avenues of response to the challenge of escalating costs for inputs. They may turn to new technology, joint ventures with large investor-owned utilities, wholesale purchases, or collective actions among themselves. The last approach, collective actions, is attractive in that it depends more on the initiative of small companies themselves and less on the assistance or good will of others.

Society may choose to value the continued viability and existence of small electric companies, most of which are cooperatives and municipal organizations. Decentralization and dispersion of electric supply activities among a variety of institutional forms may be valued because of the reliability of services in response to technical or social crises, the opportunity created for measured comparative performance, the choice available for consumers, or the checks placed upon political and economic power.

Previous research is inadequate, however, to answer the question: Does how electricity is supplied make a difference? A survey and summary of previous research on performance in the electric industry is presented in this dissertation. Suggestions for how to conduct future research on performance are also presented. But the prime focus of the dissertation is on collective action as a policy choice for small companies which are concerned about how to survive the threat of high costs for inputs. Answers to three questions are sought. What can be empirically stated about small company power pools as a form of collective action? Why have small companies not formed power pools more rapidly? And what can interested companies, trade associations, and public organizations do to facilitate the creation of small company power pools?

In order to obtain empirical evidence about power pools, a small pool in Michigan, the Michigan Municipals and Cooperatives Power Pool, was studied. An eight year history of this pool was examined, and estimates were made for the size and distribution of savings among the two rural cooperative and three small municipal members.

Total savings were significant -- on the order of a ten percent average reduction in members' costs below the hypothetical case of isolation. Savings arise about equally from energy interchange and from reduced construction requirements. Individual member savings were found to be unequal, and both theoretical and empirical explanations for unequality are presented in the dissertation.

Answers to the puzzle of why electric companies have been slow to pool their systems were sought in three case situations in Michigan. In those cases, small companies have been successful, to varying degrees, in attempts at collective action. Findings reveal that success has been achieved by overcoming two impeding factors -- uncertainty and conflicts over shares of initial costs for collective action. Uncertainty exists about future control of company and individual opportunities. Conflicts over shares of cost arise because of product characteristics -- high exclusion costs, economies of size, and jointness of impacts -- in intermediate steps to power pooling.

A summary of findings and a set of policy recommendations is found in the last chapter of the dissertation. The set of recommendations includes a number of practical ways by which interested actors may create incentives and overcome inhibiting factors to promote small company power pools. Both the findings and recommendations may be more generally applicable to situations wherein actors have difficulties in achieving potential mutual gains through collective actions.

This work is dedicated to my wife and daughter, Janet Jakusz Favero and Mariangela Favero.

ACKNOWLEDGMENTS

Many people supported and improved this dissertation, and this brief statement of gratitude is necessarily insufficient to describe either the number of people or the ways they assisted. My dissertation committee provided both personal encouragement and professional insights. Al Schmid, as major professor, inspired much of the theoretical framework for the research and by his expressions of confidence continually enheartened my efforts. Larry Libby motivated consideration of the broader relevance of the research. Al House stimulated concern for the practical usefulness and applicability of the product. Warren Samuels provided penetrating insights about which arguments were sufficient and which required further effort.

Fellow graduate students also lent their assistance to the project. George Johnston, Michael Patrick, and Phil Wandschneider were particularly helpful.

Members of the electric power industry and related public and private organizations were especially open and supportive of this research. Some individuals who deserve special recognition are: Jim Endicott, Utility Director of the Coldwater Board of Public Utilities; Tom Hancock, Chief of Staff of the Michigan Public Service Commission; Al Hodge of Daverman Associates; John Keen, Manager, Jim Wood, Assistant Manager, and other staff members at Wolverine Electric Cooperative; Don Potter, Executive

Secretary of the Michigan Municipal Electric Association; Bill Strom, Director of Utilities of the Traverse City Light and Power Department; Roger Westenbroek, Manager of Top O' Michigan Rural Electric Cooperative; and Joe Wolfe, Director of the Electric Division of the Lansing Board of Water and Light.

Anne Banfield and Jan Richards typed the dissertation with much ability and good cheer. Janet Jakusz Favero edited the original and final manuscripts, and a measure of her contribution is suggested by the fact that her editing work was only a part of the assistance she rendered.

Financial and administrative support was provided by the Department of Agricultural Economics, Michigan State University.

Finally, family members and many friends prayed for this effort. The effects of these loving acts are still being felt.

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LIST OF ABBREVIATIONS

ABS - *American Behavioral Scientist*

AER - *American Economic Review*

AJAE - *American Journal of Agricultural Economics*

ASM - Adjusted Shares Method

C-ES - Cloverland-Edison Sault

CFC - Cooperative Finance Corporation

CPC - Consumers Power Company

DEC - Detroit Edison Company

ELDM - Estimated Load Duration Method

FPC - Federal Power Commission

FY - Fiscal Year

G and T - Generation and Transmission

IOU - Investor-Owned Utility

KVA - Kilovolt Amperes

KW - Kilowatt

KWH - Kilowatt Hour(s)

LBWL - Lansing Board of Water and Light

MBLM - Maximum Base Load Method

MCLA - Michigan Compiled Laws Annotated

MCP - Michigan Municipals and Cooperatives Power Pool

MG - Michigan Group

MMEA - Michigan Municipal Electric Association

MW - Megawatt

MWH - Megawatt Hour(s)

NS - Net Savings

PA (P.A.) - Public Act

QJE - *Quarterly Journal of Economics*

REA - Rural Electrification Administration

REC - Rural Electric Cooperative

RNS - Real Net Savings

S.B. - Senate Bill

INTRODUCTION

A Brief Description of the Process

This dissertation involves an effort in practical problem solving. Initiation of the research was prompted by the identification of a problem: Why have electric companies -- especially small electric companies in Michigan -- not acted collectively to achieve mutual economies?[1]

Once the problem was identified, knowledge was sought from relevant theory. Theories provide both frameworks for analyses and suggestions of a priori hypotheses for testing. The testing process was inductive and included a longitudinal study of an existing collective of small companies to determine and explain the size and distribution of economies within that collective. A series of extensive interviews with key participants in Michigan's small electric companies and with others in the electric industry was also conducted. The interviews provided evidence about how participants overcame barriers to collective action in three cases in Michigan.

Empirical findings were used in several ways. Suggestions are made in the final chapter for policies to promote collective action by small electric companies in Michigan. Additional research suggestions are also advanced -- for both theoretical and practical research in the future.

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[1] Throughout this dissertation, "electric company" is defined as any public, private, or cooperative organization in the business of selling electric services.

Implications

If small companies do successfully undertake collective actions to capture economies, initial benefits will go, of course, to the companies themselves. Some or all of the economies may also be passed along to customers.[2] Several arguments can be advanced to support the position that small companies should be assisted in their cost reduction efforts so that these companies can continue to be viable members of the electric power supply industry.[3] Further concentration of suppliers would reduce opportunities for consumers and public officials to compare rates, services and management procedures. More concentration would also further limit consumer ability to locate households and firms in areas served by electric suppliers of their choice.

An additional argument can be made that more centralization of electric suppliers would increase our nation's vulnerability to ". . . madmen, guerrillas, Middle East wars, freak winters, earthquakes, (and) unpredicted high-technology failures."[4] A decentralized electric supply system may encourage new, less wasteful technologies and practices and may foster ". . . local initiative and control."[5]

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[2] The interesting question of who the ultimate beneficiaries are was not pursued in the dissertation; it constitutes an item for further investigation.

[3] Several of these arguments are examined in greater detail in Chapter III and in suggestions for research described in Appendix A.

[4] Amory Lovins, "Resilience in Energy Strategy", The New York Times (July 24, 1977), p. E-17.

[5] *Ibid.*, p. E-17.

Underlying Questions and Objectives

Two core questions guide the research effort. One question is: How can contracting relationships among small electric companies be conceptualized and analyzed? The study of an operating collective of companies provides insight into methods for analyzing the consequences of collective actions among small electric companies, information about the size of savings involved, and knowledge about how organizational rules effect the distribution of savings. Research into new institutions provides needed information for the public policy process. Through the design and redesign of institutions, societies can adapt to ongoing change and effect the reallocation of resources and the redistribution of consequences. Collective action among small electric companies is one kind of new institution which is worthy of being placed on an agenda for public consideration. Contractual relationships among small companies will directly affect the use of resources to generate electricity as it will also affect the viability of small electric companies.

A second core question is: What processes are involved in institution building, i.e. collective actions to constrain and free individual actions? Complex theories of human interdependency and behavior were examined, used, and refined to provide explanations of why an institution building process, which appears to be mutually advantageous, has not occurred.

Problems of uncertainty, of how to share initial burdens so as to achieve mutual gains, and of how to divide those mutual gains are inherent in efforts to promote collective action among small electric companies. But the problems of uncertainty, of sharing of initial costs, and of distribution of eventual gains are intrinsic to many social issues. The hope, thus, is that this study of collective action among electric companies will serve to enlighten and to foster insights among those concerned about the general problem of how to promote collective actions for common benefits.

CHAPTER I

IDENTIFICATION OF PRACTICAL AND RESEARCH PROBLEMS

Electricity is provided in America by a large and heterogeneous industry. Investor-owned utilities (IOUs) own about seventy-eight percent of the electrical generating capacity in the United States, while rural electric cooperatives (RECs) own two percent, and local government companies (municipal, county, and state electrical companies and public utility districts) own nine percent.[1] The 284 IOUs serve approximately seventy-eight percent of the country's retail volume of sales, the 919 RECs serve approximately nine percent of retail sales, and the 2,245 local publicly-owned utilities serve approximately twelve percent.[2]

Fuel Cost Increases and the Bulk Power Supply Problem

Such organizational diversity has attracted research. A voluminous but inconclusive body of literature attempts to answer the question: Does the way in which the production and distribution of electricity is organized make any difference?[3] The question of possible differences by organization also

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[1] "Electric Utility Statistics", Public Power, Vol. 34, No. 1 (January-February 1976), p. 32. Of the 2,245 local publicly-owned electric companies in 1976, approximately five percent were state and county companies or public utility districts while the remainder were municipal companies.

[2] The remaining eleven percent of electrical generating capacity is owned by the federal government.

[3] An analysis and evaluation of this body of literature will be found in Chapter III.

prompted the early stages of this research effort until it became obvious that another related but overriding problem demanded research attention. The overriding problem is one of rapidly rising costs of production which create special problems for small electric companies. Costs of production are related to organizational differences in that virtually all small companies in the industry are municipals and RECs.[4]

Rapid rises in production costs are dramatically demonstrated in Figure1-1. The graph illustrates fuel costs, total costs, and total revenue per kilowatt hour (KWH) for a small Michigan company during the period 1957 through 1976.[5]

Fuel costs are seen pushing total costs upward at a very rapid rate. Revenues, with the inclusion of a fuel price rate adjustment, are also climbing steeply but have generally been insufficient to cover costs.

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[4] Any definition of "small" must be arbitrary. When the Federal Power Commission wrote its National Power Survey of 1964, it adopted the definition of a small utility as any electric company with annual electricity sales of less than 100,000,000 kilowatt hours (KWH). With the seven percent per annum growth rate which characterized the electric industry until recently, small would now be defined as annual production of about 200,000,000 KWH or less.

[5] The graph was drawn by the assistant manager of the company who asked that the source remain confidential.

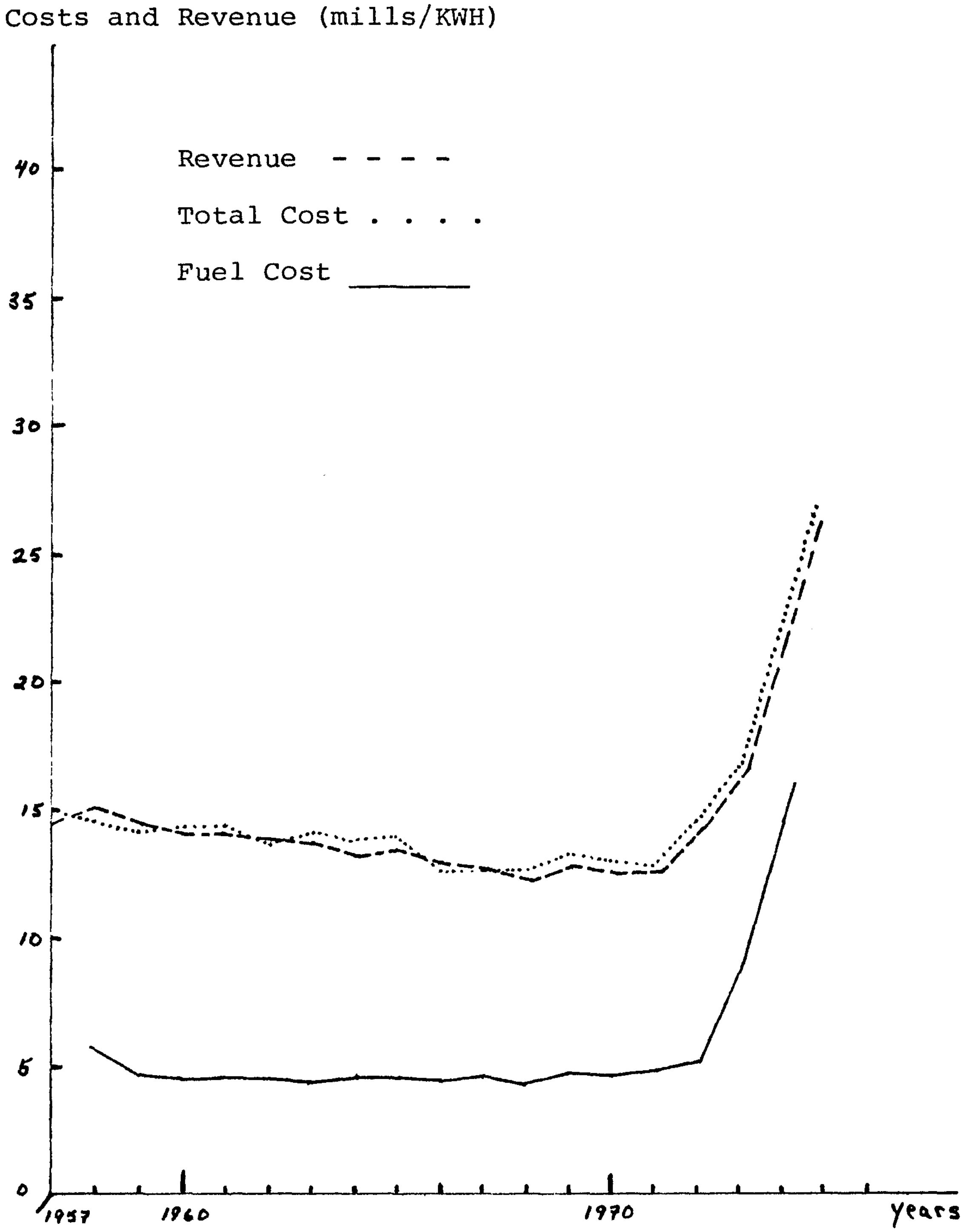

Figure 1-1 Revenue, Total Cost, and Fuel Cost in a Small Michigan Electric Company (1957 to 1975)

Economies of Size

Cost increases are ubiquitous, of course, throughout the electric industry.[6] There are several reasons, however, why small companies would be more adversely affected than large companies during a period of rapidly rising fuel costs. First, economies of size are evident in the industry. The Federal Power Commission (FPC) has stated: "Other things being equal, small plants cost more per kilowatt to build, burn more fuel per kilowatt hour, (and) cost more per kilowatt hour to operate . . ."[7]

Empirical work on economies of size in the supply of electricity is not totally conclusive. Agreement exists, however, on the presence of size economies if not on the degree or range of such economies. William Hughes states

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[6] cf. Edward Berlin, Charles J. Cicchetti, and William J. Gillen, Perspective on Power: A Study of the Regulation and Pricing of Electric Power, (Cambridge, Mass.: Ballenger Publishing Co., 1974), pp. 1-11 and Alfred E. Kahn, "Recent Developments in the Regulation of Electric Utilities", Challenge, Vol. 19, No. 5 (November-December 1976), pp. 42-43. The cost structure of the electric industry is such that conventional steam plant production costs may be divided into fuel (about seventy-seven percent), operation (about thirteen percent), and maintenance (about ten percent). See R.K. Pachauri, The Dynamics of Electrical Energy Supply and Demand: An Economic Analysis (New York: Praeger Publishers, 1975), p. 109. Total cost includes annual production expenses plus six to ten percent of plant cost per annum, depending on the opportunity cost assumption for investment in fixed capital. See also Walter G. Miller and L. Don Lambert, "Economics in the Generation of Electricity", preliminary draft (U.S. Department of Agriculture, December, 1976).

[7] National Power Survey: A Report by the Federal Power Commission, Parts 1 and 2 (Washington, D.C.: U.S. Government Printing Office, October 1964), p. 272. Underlining not in the original.

that the elasticity of total generating cost with respect to unit generator size averaged about 0.8 for scales appropriate to the 1950's and about 0.9 for the 1960's.[8] Walter Miller and L. Don Lambert found "L shaped" cost functions relating cost per kilowatt hour to plant size (not generator size) with economies beginning to level off above 200 megawatts.[9] No minimum unit cost was found, however, and the coefficients of cost per kilowatt hour with respect to plant size ranged from -0.03 to -0.02. Another group of economists has concluded, after surveying the literature on this subject, that size economies exist in generation units up to about 600 megawatts generating capacity.[10] Some perspective on these figures may be gained by noting that the largest generating unit in the Michigan Municipals and Cooperatives Power Pool (MCP), a power pool consisting of three small municipals and two small cooperatives to be analyzed later in this research, has a capacity of only twenty-two megawatts.

Other advantages with respect to fuel costs also exist for larger companies. Cost of fuel involves a transport factor, and larger companies which span more geographic territory than

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[8] William R. Hughes, "Scale Frontiers in Electric Power," in Technological Change in Regulated Industries, ed. by William M. Capron (Washington, D.C.: The Brookings Institution, 1971), p. 48.

[9] Miller and Lambert, Economics in Generation. A megawatt equals one thousand kilowatts.

[10] Berlin, Cicchetti, and Gillen, Perspective on Power, pp. 8-11.

smaller companies would, in general, have increased opportunities to locate generating plants where they would reduce transport costs. Large companies can also be expected to wield relatively greater bargaining power in securing guaranteed and uniform fuel supplies by purchasing under specification.[11]

Fuel cost increases have shaken the electric industry and ended a long period of falling average prices for electricity.[12] Conversations with managers of small electric companies in Michigan reveal that these individuals are, given their indeterminant cost problems, rethinking both organizational ends and organizational means. Some have recently curtailed services while all have raised rates. Traditional relationships with other power companies are being reanalyzed and reevaluated.

Reexamination and reevaluation of intercompany relationships seem especially important at this time. In the past, a key factor in the survival of a small electric company

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[11] This advantage was suggested by J. Maurice Clark, Studies in the Economics of Overhead Costs (Chicago: The University of Chicago Press, 1923), pp. 318-334. Clark provides classic insight into the issue of overhead costs in electric power (and other goods) supply.

[12] Additional factors also contributed to instability. Other input prices also rose quickly. Economies of size may have been exhausted as the reliability of the newest and largest generating units faltered. See Kahn, "Recent Development", Challenge.

was its ability to function autonomously. In Michigan, for example, the two IOU giants -- Detroit Edison Company and Consumers Power Company -- grew by absorbing smaller public and private companies.[13] The way for a small company to survive in Michigan was to function without any dependence on either Detroit Edison or Consumers Power.

Cost of fuel problems in small companies has, however, increased both the level of disadvantages and the perception of disadvantages inherent in autonomous operations. Those special advantages of size -- technical, location, and market -- are unavailable to an independent small scale operation. The fuel cost problem, in short, increased significantly the awareness of small companies that their relationships with others were important and that an interdependence existed for small electric companies with other companies, both small and large.

Alternative New Relationships

Wholesale Purchases

Three general types of new or expanded relationships designed for achieving economies of size advantages seems available, in a practical sense, for small companies. First,

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[13] Raymond C. Miller, Kilowatts at Work: A History of The Detroit Edison Company (Detroit: Wayne State University Press, 1957) and George Bush, Future Builders: The Story of Michigan's Consumers Power Company (New York: McGraw-Hill Book Company, 1973).

small companies might initiate or increase purchases of wholesale electricity from larger companies which have size economies. Difficulty results, however, from the fact that a small company is generally dependent on a single source of supply -- the large company which geographically surrounds it. The single supplier, moreover, may have acted in the past in an opportunistic or predatory manner toward the small company.[14] Actual experiences reveal, in any case, that wholesale rates in Michigan have not been economically attractive for small wholesale purchasers of electricity.[15]

Joint Ventures

A second option for new relationships is that of "joint ventures" whereby small companies can join with large companies in the planning and construction of large generating units. Such ventures have, in general however, been staunchly resisted by large IOUs.[16] Small companies do have a significant legal

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[14] The Brief submitted by the Antitrust Division of the Department of Justice re: the Midland Intervention (1974) implies the past opportunistic behavior of Consumers Power Company *vis ā vis* small companies in Michigan. Opportunism means behavior which involves the making of false and empty (self-disbelieved) threats and promises in the expectation that advantage will result. The definition comes from Oliver E. Williamson, Markets and Hierarchies: Analysis and Antitrust Implications (New York: The Free Press, 1975).

[15] Revealed in studies by Daverman Associates (a private consulting firm) on municipal utilities at Grand Haven and Traverse City, Michigan in 1968.

[16] "Nuclear Licensing Law Is Forcing Big Utilities to Secure Their Wealth", Wall Street Journal, February 5, 1976, p. 1.

weapon with regard to new nuclear facilities being constructed by IOUs. Provision was made in the federal legislation which created the Atomic Energy Commission in 1954 for an antitrust attack on those IOUs constructing nuclear plants which did not allow joint ventures with small neighboring companies. The legislation affords Department of Justice assistance to force the large firms to accept joint venture investments. This method of attack has been used successfully in the state of Georgia and has prompted court battles in other states, including Michigan.[17]

Court battles to force joint ventures are costly, however, in both time and legal fees. The end result of any joint venture, moreover, is a relationship fraught with unknown consequences. How, among traditional and perhaps recent adversaries, will costs and benefits be apportioned? Might decisions be made which would result in marginal irritation to the large partner but disaster to the small partner(s)? Who assumes cost overruns? These questions amply illustrate that joint ventures are not altogether enticing relationships for small companies.

Coordinative Agreements

A third potential new relationship for small companies is the formation of coordinative agreements with other companies of similar size. Coordinative agreements range in degree of

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[17] A lengthy court battle to allow joint venture investments by small companies (municipals and RECs) in the Midland Nuclear Power Plant being constructed by Consumers Power Company is as yet unresolved. For an analysis of the 1954 legislation and its implications see Berlin *et al.*, pp. 83-86.

commitment from simple emergency interconnections to complex power pools. Power pooling involves ". . . a group of electric utilities, formed to achieve the benefits of integrated planning and operation in which each member is contractually obligated . . ." to assume specific responsibilities.[18]

Power pools are formed to carry out two coordinated activities -- capacity exchange contracts and joint ventures. Capacity exchange involves a central dispatch of electricity from various generating sources among the pooling companies to those distribution points requiring electricity throughout the companies' combined service area. Expectations are that capacity exchanges and joint ventures make possible a number of economies for the pooling companies. Economists have theorized about the source of these economies, the FPC has estimated advantages, and engineering consultants have made feasibility studies for individual client companies.[19] Yet

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[18] Charles E. Olson, Cost Considerations for Efficient Electricity Supply (East Lansing, Michigan: Michigan State University Public Utilities Studies, 1970), p. 11.

[19] Discussions of theoretical costs and benefits of coordination and pooling may be found in C. E. Olson, Cost Considerations; Stephen G. Breyer and Paul W. Macavoy, Energy Regulation by the Federal Power Commission (Washington, D.C.: The Brookings Institution, 1974), pp. 89-107; Noel D. Uri, "A Spatial Equilibrium Analysis of Electrical Energy Pricing and Allocation", American Journal of Agricultural Economics, Vol. 58, No. 4 (November 1976, Part 1), pp. 653-662; and the FPC's National Power Survey of 1964.

empirical research is rare. In 1976, Noel Uri used a linear programming technique to estimate the net savings to electric companies in the United States which could have occurred in 1973 had a national system of capacity exchange been in place.[20] Conversations with and requests for information from public regulatory commissions in Michigan, Indiana, and Wisconsin, consultants in Michigan and Indiana, and public power associations in several states and in Washington, D.C. failed to uncover any examples of empirical works on the size and distributions of costs and benefits among the members of an existing power pool. A search of the relevant literature was also conducted and, again, no empirical works were found.

If analyses of the experience of pooling are rare, knowledge among industry members about pooling's potential advantages is not. The advocative position taken by the FPC in its National Power Survey of 1964 was widely publicized. Conversations during 1976 with numerous officials, academics, and industry members in Michigan revealed no individual who disputed potential advantages for pooling. Among these expected advantages are the same economies of size -- technical efficiencies in generation, location opportunities, reserve sharing, and increased market power -- discussed previously.[21] Thus it appears that power pool relationships should be known by and should appeal to small companies.

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[20] Uri,"Spatial Equilibrium", AJAE.

[21] Expected advantages of pooling are examined in detail in Chapter II.

The Puzzle of Few Coordination Agreements

Development of Coordinative agreements has been slow to occur, however, especially among smaller companies. Brookings Institution researchers Stephen Breyer and Paul Macavoy write that ". . . a look at the degree of pooling that now exists suggests that the amount of electricity subject to pooling in 1970 was not substantially greater than in 1963."[22] Corroborative evidence was offered by John Keen, manager of Wolverine REC, in a conversation in June, 1976. Keen, who was a prime mover in the development of MCP, revealed that he personally had worked for over twenty years to organize this pool before it began in 1968.

Thus even though the FPC estimated in 1963 that by 1980 annual electric industry-wide savings from coordination could approximate one billion dollars, coordinative agreements have been slow to develop.[23] Reasons for this slow pace are not evident. Again, Breyer and Macavoy write: "On the face of it, the presence of inadequate coordination is puzzling. Since firms ordinarily try to reduce their costs in order to increase their profits and since economies of scale and risk reduction

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[22] Breyer and Macavoy, Energy Regulation, p. 97.

[23] More recent Brookings Institution estimates have placed the estimate at over $2 billion annually. (Breyer and Macavoy, pp. 89-107). Uri makes an estimate of $301 million in net savings to power companies which could have occurred in 1973 had a national system of capacity interchange been in effect.

in coordination imply opportunities to reduce costs, why haven't the firms coordinated . . .? There seems to be no straightforward answer."[24]

Why have not coordinative agreements and pools developed more rapidly, especially among the small systems which would theoretically have much to gain from such agreements? This puzzle constitutes, it seems, a practical problem for research. The puzzle is but one problem, however, in a set of research questions which emerge from the analysis of recent experiences in the electric industry.

Theoretical and Practical Research Questions

Begin by assuming that the experience of rapid cost increases has been a traumatic one, especially for small electric companies. Power pooling then appears as a seemingly attractive innovative relationship, both on its own and relative to other possible innovative relationships. A series of questions, both theoretical and practical, then follow:

1. At the theoretical level, what framework of analysis applies? Individuals in the electric industry are involved in a variety of political, internal administrative, as well as economic transactions. How can this diversity of activities be subjected to explanatory theory?

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[24] Breyer and Macavoy, Energy Regulation, p. 108.

2. Why worry about the small companies? If they are relatively high cost operations, why not let them "sink"?

3. Does power pooling actually result in advantages to member companies? What, empirically, are the sizes and distributions of costs and benefits in an actual power pooling experience?

4. Why have not coordinative agreements formed among small companies?

5. What are the policy implications of the findings? What policies would affect coordination among small companies?

6. What do the findings imply for the analyses of other types of interorganizational relationships?

This set of questions forms the core of this research effort. Each question is considered in turn in the chapters that follow.

CHAPTER II

A FRAMEWORK OF ANALYSIS

Scarcity and Interdependence with References to the Electric Power Industry

Property Rights

A claim was made in the previous chapter that rapidly rising costs have increased the interdependence of small companies with other actors. That claim requires explanation and elaboration. Consider first the idea of scarcity, then the implications of scarcity for interdependence. Large scale generating units are, of course,physically scarce resources; the output of such generators -- relatively inexpensive electricity -- is also a physically scarce resource. But the fact that large generators and their products are physically scarce and are valued by humans implies also that there are limits to the social opportunity to control these resources.

Humans living in community order their relationships by organizing the use and control of resources with systems of property rights. Such rights provide a social opportunity or freedom for individuals or groups to exclude others from the use of their property. The freedom is reciprocally limited, however. One person's freedom is another's exposure. Because resources are scarce, the rights to control resources are also scarce.[1] Consider two examples. (1) The right of small companies to force joint venture opportunities for investments into a new nuclear power plant means that the IOU owners must accept competition from lower cost production in the small neighboring companies. (2) The right of the large IOUs to set wholesale electricity rates without state regulatory commission review means that small wholesale purchasers cannot use those commissions to obtain more of the benefits of large size production through the lowering of wholesale rates. Property rights distributions, moreover, will generally affect third parties. Consumers served by the various electric companies and the various suppliers of inputs to electricity production are first round examples.

Externalities

Thus opportunities (or potential opportunities) to control scarce resources within communities create interdependencies among community members. Impacts upon interdependent others of actions taken in the exercise of opportunities may be

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[1] John R. Commons wrote: "It is only scarce things, actual or expected, that are wanted and desired. Since they are scarce, the acquisition of them is regulated by the collective action which creates the rights and duties of property and liberty without which there would be anarchy." Commons, Institutional Economics: Its Place in Political Economy (New York: The Macmillan Company, 1934), p. 6.

termed "externalities."[2] Externalities may be positive or negative depending on how they are valued by interdependent recipients. They may be "pecuniary," when the impacts work their way through the market system to enhance or detract from the value of the recipient's assets. They may be "political," when the actions of a government unit affect citizens or other units of government. And they may be "technological" when, outside the price system, they affect the physical or psychic well-being of the recipient or his property.

Shifting Externalities

When a recipient of an externality is dissatisfied with the direction or amount of impact he bears, he has, in general, three methods of change. The recipient may seek an authoritative solution whereby government acts to shift externalities. Or the recipient may use a grant system -- either asking for charity or social due (a positive grant) or forcing his private will (a negative grant) upon the source of the externality. Or the recipient may attempt to exchange with the source, thereby using the market to deal with the externality.[3]

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[2] Warren J. Samuels, "Welfare Economics, Power, and Property." Perspectives of Property, ed. by Gene Wunderlich and W.L. Gibson, Jr. (The Pennsylvania State University: Institute for Research on Land and Water Resources, 1972).

[3] The conventional technique among economists is to assume away a concern for the initial or subsequent vesting of rights. Thus the exchange transaction itself is viewed as mutually beneficial. An expanded notion of externalities reveals, however, the significance of initial rights vestings as they constrain subsequent opportunities (or necessities) to exchange or to exchange from a weak bargaining position.

Whose Preferences Count?

Whether the recipient of externalities turns to authoritative, grant, or market transactions to shift impacts or whether he has any recourse simply to bearing those impacts depends on those political and economic rights which constitute his opportunity set. The distributional consequences of scarcity depend, in short, on whose preferences count. Asking whose preferences count or whose freedom prevails is not the same, as some economists have suggested, as saying that more government is needed.[4] On the contrary, asking whose freedom prevails serves as a tool for objective analysis in gaining an understanding of the system of rights and implications of rights and privileges which lie behind both market and nonmarket alternatives used to shift externalities.[5]

Asking whose preferences count serves, moreover, to illustrate that market relationships involve coercive elements. Whether or not the recipient of a negative externality is forced to pay for relief or has other alternatives is a matter of rights and power. Contractual costs and relative bargaining strengths may be employed to coerce desired behavior in market

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[4] cf. George Stigler, The Citizen and the State: Essays on Regulation (Chicago: University of Chicago Press, 1975).

[5] Objective means subject to the tests of action, internal coherence, and external correspondence. Objectivity will be further explored in Chapter III.

transactions. Third parties interested in promoting or preventing market transactions may be affected without practical market recourse.[6]

Economic Efficiency

Recognizing the importance of underlying property rights by asking whose preferences count also serves to expose potential hidden values behind the concept of "economic efficiency." Orthodox microeconomic theory presumes, sometimes explicitly but often only implicitly, an a priori set of property rights. With property rights predetermined, orthodox theory can be used to analyze whether a market system realizes the ". . . maximum output from available resources (production efficiency), the maximum satisfaction from given outputs (consumption efficiency), and the constellation of outputs which matches personal preferences (integrative efficiency) . . ."[7]

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[6] Take, for example, the scattered individuals interested in preserving the natural quality of Western High Plains rangeland sitting over coal deposits made more valuable by the high cost of substitute fuels for generating electricity and other uses. As a practical matter, the high contractual and information costs involved in organizing a bid for preservation may well prevent those individuals desirous of preservation from turning to the market to purchase the land and avoid the externality of strip mining. In addition, the good, "preserved rangeland," involves in some dimensions high cost for exclusion. This cost creates disincentives for market provision of the good. Transactions costs (contracting, information, and policing) and high exclusion costs will be discussed later in this chapter.

[7] Abba Ptachya Lerner and Haim Ben-Shahar, The Economics of Efficiency and Growth (Cambridge, Mass.: Ballenger Publishing Co., 1975), p. 3. These authors offer a concise, nontechnical explanation of orthodox microeconomic theory concerning efficiency. Property rights are implicitly assumed as given.

First note, however, that for every given pattern of property rights holdings, the theory will yield a different "efficient" solution in that the "optimum" allocation and distribution of factors and products will change. Thus efficiency is rights dependent, and in addition to asking whose freedom, we may, again with analytical insight, ask whose efficiency? The economist who implicitly assumes the status quo property rights pattern as given and pronounces on the (in)efficiency of a production and distribution system masks the normative nature of the analysis.[8] To repeat, for each property rights pattern (institutional set), an analysis of the relative level of economic efficiency may be made; yet for each change in the rights set, the substantive performance consequences (who gets what) will differ.

Internalization of Externalities

Economists, at least since Pigou, have been concerned with the inability of the price system to incorporate and adjust to information concerning the substantive consequences of market activities. Income and wealth may be unevenly distributed; business cycles may result in economic depressions; environmental degradation often accompanies production processes. Economists

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[8] The importance of explicitly recognizing the rights dependency of efficiency depends itself, of course, on the purpose of the analysis. In a consultation project for a firm, such recognition may be of no importance. For policy analysis or general welfare pronouncements, however, such recognition is essential.

have reacted to these undesired consequences of market activity by legitimizing within the disciplinary theory government interventions for cases of "natural monopoly," periods of chronic unemployment, and situations of market "externalities" when "social costs and benefits deviate from private costs and benefits."

Viewing an economy from the vantage point of variable rights and institutions reveals, however, several new insights. First, no single institutional system for carrying out economic activities (including the market system) is "natural" or basic. Thus, the task of the economic analyst concerned with social choice and its distributional impacts changes from proving market failure or defending market institutions into investigating the substantive consequences of alternative institutions, including different types of markets, authoritative structures, or grant systems.

Second, propositions that government may intervene to "internalize" costs when social costs differ from private costs is misleading. Since scarcity exists, those who hold property rights can create exposures for others. If large IOUs held the right to build nuclear power plants without intervention by small neighboring electric companies, for example, the IOUs would be exposing the small neighbors and their consumers to the deprivation of an inexpensive source of electricity. Although an understanding of the magnitude of that deprivation may never be perfect, society may be sufficiently convinced by the evidence to shift rights and exposures. Policy choices could be made whereby the opportunity to sue for joint investment was legally established. Costs for contracting, gathering information, and policing IOU behavior could be lowered for the small companies by involving the Antitrust Division of the Department of Justice. Who gets what on the basis of these policies would be expected to change.

It is revealing for analytical purposes to recognize that to say that "unhampered investments by IOUs into nuclear plants involves a social cost above the market cost of the investment because it deprives neighboring companies of inexpensive power" is, in effect, to say no more than an externality is involved which the community (or at least the speaker) finds unacceptable.[9] Externalities are ubiquitous. When the preferences of someone who wants to shift an externality is legitimized, an asserted "social cost" is recognized. Thus, the concept "social cost" involves a selective perception and should not be regarded as a nonnormative tool of analysis for economists. The same may be said for the concept "internalization of social costs," the process by which externalities are shifted through authoritative means. To call any shift in externalities an "internalization" implies that it is a valued solution to a problem. Analytically, however, what has happened is that rights and exposures have been altered and the substantive consequences have been changed by the fact that someone's preferences counted while alternative preferences did not.

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[9] For a contrasting, more orthodox view of social cost, see Rueben C. Buse and Daniel W. Bromley, Applied Economics: Resource Allocation in Rural America (Ames: Iowa State University Press, 1975), pp. 588-601.

Uncertainty

Two additional insights are revealed by the nuclear power plant example. First, uncertainty generally previals. Participant actors are uncertain of their interdependencies, their choice of property rights alternatives, and the consequences of choosing any alternative. Even the empirically testable hypothesis that sole ownership of nuclear powered generators by large IOUs will deprive neighboring small companies of inexpensive electricity will have its professional advocates and doubters.[10] Given such uncertainty, preferences for alternative actions among the participants is subject to influence by information. Participants who can subsidize and direct the flow of partisan information will be in a powerful position to affect the choices made.[11]

Inevitable Political Choice

A second insight revealed in this case concerns the inescapable public choice which government is forced to make whenever new interdependencies are realized and externalities revealed. If the IOUs who build nuclear power plants (using a technology created in large by public investments) are said to be creating

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[10] Some economists doubt the market cost advantages of nuclear power because of unreliability experiences in nuclear generators. Environmental issues are also obviously at issue.

[11] Theories of uncertainty, preference formation, information subsidization, and economic and political power are explored in Randall Bartlett, Economic Foundations of Political Power (New York: Free Press, 1973) and Anthony Downs, An Economic Theory of Democracy (New York: Harper and Brothers, 1957). The concept of uncertainty will be explored further in a subsequent portion of this chapter.

an externality for small neighboring companies and their customers then the authoritative institutions of society must choose. If the political choice is to refrain from reducing the rights of the IOUs, then government will necessarily be involved by its protection of the rights of unhampered investment held by these firms from private interference. If the government's choice is to make available an antitrust appeal, or if legislation is written to provide assistance by the Department of Justice, or both, then the substantive consequences of who gets what are, again, expected to change. But governmental choice is inevitable. Even the choice of no action necessarily requires governmental involvement.

Elements of a Framework of Institutional Analysis

Critics of economic theory and professional economic practice decry the absence of tools for analyzing the institutional environment of economic systems.[12] The previous discussion of scarcity, property rights, externalities, and different types of transactions are suggestive, however, of concepts useful for an approach to institutional analysis. At this point, elemental concepts of a framework for institutional analysis can be defined.

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[12] The presidential address delivered by R. A. Gordon to the December 1975 meeting of the American Economic Association is a recent example in a series of addresses and writings by prominent economists advocating more and better institutional analysis. See R. A. Gordon, "Rigor and Relevance in a Changing Institutional Setting," The American Economic Review, Vol. LXVI, No. 1 (March 1976), pp. 1-14.

Institutions, Behavior, and Performance

As previously demonstrated, resource scarcity implies that communities utilize property rights to govern resource control. Such rights create roles and relationships, i.e., institutional patterns among individuals and groups. John R. Commons puts the definition of institutions succinctly and with the same assumption of underlying property rights when he writes about an institution as a ". . . collective action in restraint, liberation and expansion of private action."[13] So defined, institutions are the instrumentalities for communities to guide, direct, and condition the behavior of participants -- both individuals and groups. At the very general level, for example, authoritative institutions may reward desired behavior with good citizen status and punish undesired behavior with fine or jail.

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[13] Commons, Institutional Economics, p. 73.

Two additional compatible definitions of institutions serve to illustrate other dimensions. Kenneth H. Parsons refers to institutions as the ". . . procedural or social aspects of an economic system of which the input-output, resources-commodity transformation functions are the substantive aspect. The two aspects are integrally interrelated and are in fact and function inseparable, although analytically either aspect may be singled out for systematic actions." See Parsons, "Institutional Innovations in Economic Development", Optimizing Institutions for Economic Growth, Agricultural Policy Institute, North Carolina State and the Southern Land Economics Research Committee (May 1964) p. 81.

A. Allan Schmid defines institutions as the structural order of relationships defining rights, exposures, rights of others, privileges, and responsibilites. Schmid, "Analytical Institutional Economics: Challenging Problems in the Economics of Resources for a New Environment", American Journal of Agricultural Economics, Vol. 54, No. 5 (December 1972), pp. 893-901.

Market institutions may reward desired behavior with financial return or wage and punish undesired behavior with financial loss. Status institutions such as a family or peer group may reward desired behavior with social esteem and punish undesired behavior with ostracism.[14] Consequences of behavior, as conditioned by institutional relationships, involve a set of distributional impacts which can be termed "performance." Performance thus refers to who gets what out of an institutional relationship; performance includes the externality set resulting from a certain institutional structure.

The three conceptual elements -- institutions, behavior, and performance -- constitute building blocks for a general institutional model of economic relationships.[15] The three elements are conceived of in an interrelated system. To summarize briefly, institutions refer to patterns of property rights relationships in which may be discerned opportunity sets for individual and group actions and social roles for member participants. Institutions are viewed in the model as guiding or conditioning the behavior of participant actors and ultimately affecting the externality set or performance consequences of the sysyem, i.e., who can create costs for whom (remembering that one person's cost is another's income).

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[14] In practice, all institutions are somewhat mixed in character, and their methods of organizing behavior are complex and varied.

[15] The institutions-behavior-performance model is defined in Schmid, "Analytical Institutional Economics," AJAE and James D. Shaffer and A. Allan Schmid, "Community Economics: A Framework for Analysis of Community Economic Problems" (unpublished manuscript, Department of Agricultural Economics, Michigan State University).

Processes of Institutional Change

A dynamic quality is incorporated into the system by including a process by which institutions and behavior change over time. The change process may be thought of as actions taken by participants who find themselves in unsettled situations because of one or more dissatisfying experiences. Participant actions, given indeterminant situations, are thought characteristically to include reexaminations of the ends and means of external relations and internal perceptions with attempts to adjust institutions, behavior, or both.[16]

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[16] These assumptions about the problem identification process owe much to the Pragmatic School of Philosophy. For a succinct treatment of problem identification with special application to economics, see Carl M. Bogholt, "The Value Judgment and Land Tenure Research," Land Tenure Research Workshop, ed. by Joseph Ackerman, *et al.*, (Chicago: Farm Foundation, 1956). Bogholt asks the rhetorical question: "Is it not . . . the case that we do not have occasion to inquire and hence have no problems unless our experiences or activity is rendered indeterminate in some respect not by departure from an ideal, but through the introduction of some factor that interrupts the activity." (pp. 133-134).

See also Charles Morris, The Pragmatic Movement in American Philosophy (New York: George Braziller, Inc., 1970). Morris writes that John Dewey distinguished four stages in the problem solving process: (1) the appearance of the problem in an indeterminant situation; (2) the formulation of hypotheses to solve the problem; (3) the deduction of the consequences of the hypotheses; (4) the testing of the hypothesis by testing the deduced consequences (p. 58). Morris goes on to advise analysts that the results of previous evaluations are relevant to the solution of a particular value problem only as instruments in forming hypotheses and not standards in terms of which a judgment is made or tested. "The 'ends-in-view' with respect to a given problematic situation are formed in that situation and their test is whether they solve the particular problem of that situation." (p. 86).

References to an actual indeterminate situation will serve to clarify. Consider the experience of small electric companies For many years, these companies acted in a relatively stable manner within a relatively stable environment. Growth in the demand for electricity was strong, technological advances lowered operating costs, and input fuels were abundant. There was change to be sure; small IOUs were consolidated into larger firms, and competition for service areas and customers existed, especially among different institutional types of companies. But the number of municipals and cooperatives and their share of the electricity market have changed little from 1940 until today. The patterns of relations among companies were rather static and predictable. During the past few years, however, the industry has been placed in a very unsettled situation by the extreme rise in costs. Small companies especially have been beset with what they call their "bulk power supply" problem, i.e., how to produce or buy electricity and sell at prices which would not incite the wrath of their customers. Faced with this problem, small companies have begun to reexamine in-company behavior so as to reduce costs. Moreover, they have begun to reexamine their institutional relationships (the means and ends therein), especially relationships to their customers and to other companies. The three major alternatives for institutional changes in relationships with other companies were described in Chapter I.

Once again, the flow of information is important. Perceptions of the "bulk power supply" problem and of alternative choices to achieve determinacy depend on information. Ability to influence the direction and flow of information imparts opportunities to influence choices made by other participants.

Situational Factors

When participants perceive that they are involved in an unsettled situation and that changes in institutions, behavior, and ultimately performance would be useful in solving the problem, several "situational factors" are expected to influence the direction of change and, indeed, whether change will be possible or probable. Explanation of such situational factors begins with their identification in the writings of others.

Limiting Factors

J. R. Commons discerned what he termed "limiting factors" or social impediments to collective action.[17] Commons regards scarcity as the core economic problem (and in so doing influences the conceptual underpinnings of this research). But he also writes about "instrumental impediments," those limiting factors subject to human redesign. Reference to an earlier example

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[17] John R. Commons, Legal Foundations of Capitalism (New York: The Macmillan Co., 1924), pp. 375-379.

See also Neil W. Chamberlain, "The Institutional Economics of John R. Commons," Institutional Economics: Veblen, Commons and Mitchell Reconsidered, ed. by Joseph Dorfman *et al.* (Berkeley: University of California Press, 1963), pp. 79-80.

will help illuminate Commons' idea. In footnote 6 of this chapter, contractual costs were described as an impeding factor for individuals interested in preserving the status quo quality of Western High Plains rangeland. Such costs, it was theorized, could limit the ability of preservationists to organize a market bid and buy rangeland covering coal deposits. For those preservationists, the contractural costs of organizing a bid to control land use is a limiting factor.

Liberating Factors

Note too, however, that for those participants desirous of strip mining -- coal companies, electric companies, and others -- those same contractual costs were a liberating factor; high contractual costs allowed these later participants more freedom of action in a situation characterized by scarcity. A nonnormative term which is broad enough to subsume both the liberating and limiting ideas is situational factor. Situational factors are impediments to collective human action which limit, thereby, the opportunities for some and liberate opportunities for others.

Related Works by Economists

The concept of situational factors is related to theoretical constructs and arguments advanced by several other economists, including Armen Alchian, James Buchanan and Gordon Tullock, Anthony Downs, Richard Cyert and James March, Harold Demsetz, Albert O. Hirschman, Harvey Liebenstein, and Oliver Williamson.[18] A thread which ties situational factors to works by these other authors is a common concern for the process of collective action to achieve change. Yet even though some correspondence exists between situational factors (with the base framework developed in this chapter) and the work of others, significant differences also exist.

Alchian and Demsetz

Alchian and Demsetz have developed a theory of the process whereby collective actions are taken to construct new property rights sets. Demsetz views such collective actions as the result of changes in knowledge and techniques which shift

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[18] Armen Alchian, "Corporate Management and Property Rights," Economic Policy and the Regulation of Corporate Securities, ed. by Henry G. Manne (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1969); James M. Buchanan and Gordon Tullock, The Calculus of Consent: Logical Foundations of Constitutional Democracy, (Ann Arbor: The University of Michigan Press, 1962); Downs, Economic Theory; Richard M. Cyert and James G. March, A Behavioral Theory of the Firm (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963); Harold Demsetz, "Toward a Theory of Property Rights", The American Economic Review, Vol. LVII, No. 2 (May 1967), pp. 347-359; Albert O. Hirschman, The Strategy of Economic Development (New Haven: Yale University Press, 1958); Harvey Leibenstein, "Allocative Efficiency vs. 'X-Efficiency'", The American Economic Review, Vol. LVI, No. 3 (June 1966) pp. 392-415; Oliver E. Williamson, Markets and Hierarchies: Analysis and Antitrust Implications (New York: The Free Press, 1975).

advantages and/or disadvantages of present and potential collective behavior. He writes ". . . the emergence of new property rights takes place in response to the desires of the interacting persons for adjustment to new benefit-cost possibilities."[19] Similarly, Alchian writes: "If the value of some right to a good rises . . . the costs of specification, identification and assignment of rights become more worth incurring. In general, the higher the value of potential rights to a good relative to costs of specifying those property rights the greater will be the clarity of specification, identification, and assignment of rights in that good."[20]

The institutional approach developed in this chapter differs in some basic ways from the Alchian-Demsetz approach and allows insights into what appear to be weaknesses in their theory of the property innovation process. Their theory is, first, bloodless; it ignores conflict, especially insofar as third party interests are involved in impeding changes in property rights. Thus, for example, their theory would neither predict nor explain the staunch opposition of some investor-owned electric companies to coordination among smaller companies. Yet such investor-owned company behavior makes sense if one considers that the economies of size and of trade which small

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[19] Demsetz, "Property Rights", AER, p. 350.

[20] Alchian, "Corporate Management", Economic Policy, p. 353.

companies could achieve by coordination would make the small companies more credible and viable members of the electric industry and would make the small systems less willing to sell out to investor-owned companies. Conflict and third party involvement exist as elements in the institution building process.

A second weakness of the Alchian-Demsetz theory is in its implicit assumption of perfect information about the costs and benefits of alternative actions. If, because of new knowledge or techniques, the payoff matrix among alternative property rights sets shifts, a corresponding change in behavior to alter those rights is viewed in the theory as automatic. Obstacles, in the form of transactions costs to alter property rights are recognized, but such costs are apparently completely known. Demsetz, in describing the manner by which land owners will contract to achieve economies of size, writes: "Negotiating and policing costs will be compared to costs that depend on the scale of ownership, and parcels of land will tend to be owned in sizes which minimize the sum of these costs."[21] No room exists in this theory for the befuddlement of uncertainty or for habitually conservative decision making procedures under conditions of uncertainty which, *ex post*, fail to achieve potential benefits.[22]

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[21] Demsetz, "Property Rights", AER, p. 358.

[22] Uncertainty, its costs, and its behavioral implications will be explored more fully in this chapter.

Finally, the Alchian-Demsetz theory ignores complications and barriers to action in the public sector. Thus in describing a resource depletion problem attributed to ownership in common, Demsetz suggests simply: "The state, the courts, the leaders of the community could attempt to (remedy the situation) by allowing private parcels owned by small groups of persons (*sic*) with similar interests."[23] An objective of this research will be to show that activity to create new institutions involves more than transactions costs and is complicated by other barriers to action including certain product characteristics which accompany intermediate steps required to create institutional change. Complete descriptions of both intermediate steps and product characteristics will follow. At this point, it is sufficient to note that the institution building process developed and described in this research is more complicated, less assuming about certainty, and more characterized by conflict than that process theorized by Alchian and Demsetz.

Downs

In his book, An Economic Theory of Democracy, Downs postulates a theory of political behavior which draws upon neoclassical economic theory. Individual political actors are viewed as rational calculators who seek to maximize individual ultilty. Uncertainty is viewed as influencing

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[23] Demsetz, "Property Rights", AER, pp. 355-356.

choice. In fact, uncertainty is a key conceptual element; it explains the need for and process of political persuasion. But Downs' view of the behavioral implications of uncertainty relies on neoclassical economic assumptions rather than empirical study. "Each citizen," he writes, "decides how much information to acquire by utilizing the basic marginal cost-return principle of economics."[24]

In Downs' theory, ideology is a tool of rational choice which can be used to avoid costs of acquiring information. Ideologies, in his theory, help focus attention on differences between political parties and can be used as ". . . samples of all the differentiating stands."[25] A behavior theory of ideology would, in contrast, focus on how ideologies reflect selective perception and the influence of previous experiences in situations of uncertainty.[26] Ideologies could thus act as screening devices for choice and would often imply *ex post* overconservative behavior.

The neoclassical economic influence upon Downs is also illustrated by his treatment of conflict. Conflicts among actors who exercise political choices are only implicitly

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[24] Downs, Economic Theory, p. 219.

[25] *Ibid.*, p. 90.

[26] cf. Kenneth E. Boulding, The Image: Knowledge in Life and Society (Ann Arbor: University of Michigan Press, 1961).

treated. Apparently, for Downs, the political process parallels market choice. Those individuals with effective demand determine allocations. Individual demands are summed and are not complicated by free rider situations or other interdependencies. The role of the analyst is viewed as one of explanation and prediction of processes and comments on system efficiency. Never does the analyst view the basic conflict which underlies the creation and maintenance of opportunity sets which allow for differing degrees of participation.

Buchanan and Tullock

Buchanan and Tullock in their book, The Calculus of Consent, also attempt to extend neoclassical economic theory to political decision making. These authors see two possible approaches for studying politics, the "power maximizing" approach and the "economic" approach. They eschew the power maximizing approach because, in their opinion, ". . . there exists no real evidence that men do, in fact, seek power over their fellows, as such."[27] Such an approach, moreover, forces the analyst, they believe, to ". . . interpret collective choice-making as a zero sum game."[28]

In contrast, the economic approach ". . . incorporates political activity as a particular form of exchange; and, as in

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[27] Buchanan and Tullock, The Calculus of Consent, p. 23.

[28] *Ibid.*, p. 24.

the market relation, mutual gains to all parties are ideally expected to result from the collective action. In a very real sense, therefore, political action is viewed essentially as a means through which the 'power' of all participants may be increased, if we define 'power' as the ability to command things that are desired by men."[29] In order to reduce the presence of conflict, Buchanan and Tullock assume away the allocation of "human and property rights" from that set of collective political actions about which they are concerned.

The theoretical construct presented by Buchanan and Tullock is deficient for several reasons. Physical scarcity <u>necessitates</u> the exercise of power. Property rights are used in every society to order the distribution of scarce physical resources. Property rights rest ultimately on the threat or actual use of power. Evidence does exist that men exercise power over their fellow men; authoritative institutions exist. Moreover, bargaining (exchange) transactions require the presence of authoritative institutions for the protection of property and orderly behavior. Exchanges are guided by the distribution of "human and property rights."

Exchange transactions may involve the exercise of power in and of themselves. One party may force another to exchange. Conflict may arise over how to share the mutual gains from trade. Or a potential exchange transaction may adversely

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[29] *Ibid.*, p. 24.

affect a third party, who may or may not have the power to prevent the transaction. In sum, power exists, even in exchange transactions, and theories of power can and should be applied to both political and economic relations.

Buchanan and Tullock's work is also deficient in its treatment of uncertainty. After admitting that uncertainty acts as a limitation on rationality, i.e., making it difficult to define rational individual behavior, the authors present their defense for assuming away the presence of uncertainty as an influence on behavior. They state that ". . . this limitation is reduced in significance to some extent when it is recognized that collective choice is a continuous process, with each unique decision representing only one link in a long-time chain of social action. Reflection on this fact, which is one of the most important bases of analysis of this book, suggests that the uncertainty facing the individual participant in political decisions may have been substantially overestimated in the traditional concentration on unique events."[30]

This analysis overlooks the existence of different kinds of individual choices. Choices may be: more or less routine; made for different lengths of run; in more or less ambiguous situations; and in circumstances which vary in degree of complexity. Moreover, a theme will be developed in this research that the presence of uncertainty leads to *ex post* overconservative behavior which tends to preclude collective action.

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[30] *Ibid.*, p. 37.

When a collective choice concerns a potential action that is not routine, involves long run implications, and is ambiguous and complex, uncertainty is likely to be present. The sequential learning process used by Buchanan and Tullock as an explanation for discounting uncertainty may never occur; because of uncertainty, the collective action may not be taken.

Hirschman, Leibenstein, and Cyert and March

Fewer contrasts and more complementarity exists between the concept of situational factors and concepts developed by Hirschman, Leibenstein, and Cyert and March. These authors all describe an organizational phenomenon whereby deterioration in performance occurs.[31] Hirschman writes that deterioration usually emerges as an absolute or comparative reduction in the quality of a product or service. Under monopoly conditions the deterioration can also involve cost and resulting price increases.[32]

A parallel exists between the phenomenon of deterioration -- or organizational slack -- and the bulk power supply problem among small utilities. Differences also exist; the bulk power supply problem is characterized by a difficulty in responding to input cost changes and to new larger scale technology rather

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[31] For Cyert and March and Hirschman the phenomenon is organizational slack. For Leibenstein it is X (in)efficiency.

[32] Hirschman, Strategy, p. 4.

than by a slackening of effort under constant conditions. Yet in both the bulk power supply problem and organizational slack, the inability to manage resources through adaptations in collective action is the key notion.

Hirschman *et al.* attribute organizational slack to a variety of causes. Leibenstein places emphasis on incomplete knowledge surrounding production functions and on the nonmarketability of managerial factors. Cyert and March use as an explanation for slack the intraorganizational bargaining process whereby shifting coalitions are formed to carry out the production-marketing functions. Hirschman stresses nonfunctional images of change which create obstacles for entrepreneurial and cooperative behavior.

Another difference between the approach of this research and works by Hirschman, Leibenstein, and Cyert and March is the specific focus these authors place on in<u>tra</u>organizational processes.[33] The concept situational factor may, however, apply to an obstacle which functions either within an organization or between/among organizations to impede collective action.

Works by these authors are useful because they serve to shift analysis away from missing resources (lack of technology, lack of savings) as barriers to social change and toward

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[33] The exception to this statement is Hirschman, <u>Strategy</u>, which focuses on both intra- and interorganizational problems.

institutional-behavioral blockages. The authors emphasize especially behavioral phenomena which reflect ". . . contradictory drives and resulting confusion of the will."[34] The authors encourage both the search for situational factors which impede collective action and offer preliminary ideas on some institutional-behavioral phenomena worthy of consideration as explanations.

Williamson's Organizational Failure Framework

The work which most closely parallels this research effort is, however, that authored by Oliver E. Williamson. In 1975, Williamson proposed a detailed theory about why organizations tend to replace market transactions with internal hierarchical transactions. Williamson assumes that "in the beginning there were markets," then theorizes about situational factors which will create incentives for organizations to grow, encompass both sides of what were previously market transactions, and replace the market thereby with an internal hierarchy. Williamson's theory, which he terms the "Organization Failure Framework," can be used to explain conglomerates, behavior in the labor market, and vertical integration actions, among other things. The theory also has antitrust policy implications.[35]

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[34] *Ibid.*, p. 25.

[35] The theory is spelled out in detail in Williamson, Markets and Hierarchies, pp. 20-40.

Situational factors, for Williamson, are "environmental" and "human." Listed and underlined below are his environmental factors which, when coupled with certain human factors (also listed and underlined below), create advantages for the internal hierarchical organization of transactions and incentives for actions to replace markets with hierarchies:

1. Uncertainty and complexity of transactions when coupled with bounded rationality among participants yields the following advantages to the internal organization of transactions:
   a. adaptive sequential decision making permits learning by experience;
   b. information codes can be developed to summarize complex units;
   c. convergence of participant expectations about the outcome of transactions is furthered, thereby reducing uncertainty.
2. Small numbers of input suppliers when coupled with opportunistic behavior among participants yields these advantages to the internal organization of transactions:[36]
   a. incentives are changed so that the tendency to exploit information impactedness in an opportunistic manner is reduced;

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[36] For Williamson, opportunistic behavior is that which involves making false and empty (self disbelieved) threats and promises in the expectation that advantage will result. (Compare footnote 13 of Chapter I.)

   b. again, better auditing of participant behavior is possible;

   c. language advantages are created so that when parties disclose information, an internal code will permit communicating of "idosyncratic conditions";

   d. experience rating (for example, with regard to qualifications for performing a task or supplying a component) will be possible.

3. Finally, Williamson cautions that analysis should include a concern for "atmosphere": the influence of institutional experiences on participants. His concern thus is for man the product; or, using the concept developed in this chapter, his concern is for human attitudes as a dimension of performance. Williamson hypothesizes that, in general, the experiences of the market ". . . encourage calculative relations . . ." while internal organization experiences make more ". . . allowance for quasimoral involvements among the parties."[37]

This brief description does not do justice to Williamson's work. It is sufficient, however, to draw out the core concepts of his theory and to illustrate the strong parallels between the kind of situations studied by Williamson and the present situa-

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[37] Williamson, Markets and Hierarchies, p. 38.

tion which characterizes the electric industry in the United States.

Application of Williamson's Theory to Small Electric Companies

Rapid rises in input costs have placed small electric companies in an indeterminant situation. Means and ends of internal hierarchical and external market transactions carried on by these companies are being reexamined in the context of this situation. To analyze the problem using Williamson's theory, reconsider the existing and/or potential market relationships which small companies might establish with large IOUs in an effort to ameliorate their cost problems.

The Three Possible New Relationships Reexamined

As described previously, two general types of small company-IOU relationships potentially or actually exist, i.e., wholesale purchase and joint ventures. Both relationships fit into Williamson's framework. Joint venture transactions are surrounded by an environment of uncertainty and complexity. The evaluative capacity of small companies, without their own planning staff to anticipate future choices and choice contingencies, is highly bounded. Wholesale power purchases are less complex by nature and less uncertain than joint ventures in that common experiences exist and transactions are ongoing, thereby providing opportunities for adjustment. Even here, however, a high degree of uncertainty, unresolved by constrained evaluative capacity to anticipate, exists. What future wholesale rates will prevail? How can a small company prevent becoming overly dependent on a wholesale supplier as its single source of energy?

Reference to the uncertainty of overdependence implies the existence of additional characteristics developed in the Organizational Failures Framework. Opportunism, for one, has characterized the aggressive predatory behavior of IOUs in their relationships to small companies. Moreover, opportunism is coupled with the situation wherein only a few input suppliers are available. Generally, small companies must depend for supply of electricity upon the one company which physically surrounds them.

Even when other more distant companies would willingly sell wholesale power to the small company, the large surrounding firm would necessarily be involved. The surrounding firm would need to agree to sell wheeling rights for wholesale electricity to reach the small purchaser.[38] Joint venture possibilities, small company with large company, are limited to a few large firms, some of whom undoubtedly have behaved opportunistically in the past toward their potential small partners. In Michigan, for example, only Consumers Power Company and Detroit Edison Company have constructed large generating facilities. Opportunities for small companies to make joint venture investments

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[38] Wheeling is defined as the use of the transmission facilities of one system to transmit electricity of and for another system.

into large facilities have been limited thus to partnerships with these firms. Both companies grew, however, by absorbing smaller companies. General knowledge in the Michigan electric industry is that Consumers Power, especially, has a reputation for opportunistic behavior toward smaller electric companies.

Finally, information impactedness undoubtedly exists in the present electric industry as it does elsewhere. What one knows and how well he is able to convince others that they too should know (believe) the same, surely influence who gets what out of economic relationships.

Power pooling among small companies, the third type of potential relationship described in Chapter I, is more problematic. Do the situational characteristics described in Williamson's theory apply? The initial answer is that it seems a researchable question.

Does uncertainty exist in potential pooling relationships? To what degree it does and over what issues it does is unknown. Do the decision makers in small firms feel greatly constrained in their ability to anticipate future choice and choice contingencies for potential pooling arrangements? Another unknown.

Certainly, opportunism and a scarcity of suppliers situation may be present if a power pool among small companies can only be formed by purchasing wheeling rights from a large IOU geographically situated between the pool members. Example cases exist in Michigan, however, where such wheeling is not necessary, including the case of MCP. Are small companies concerned then about opportunism in other potential pool members? This, too, is unknown.

Obviously, these questions and the lack of answers are prime topics for a research effort. Williamson's Organizational Failures Framework provides clues to the puzzle of why small companies have not more rapidly formed coordinative agreements. Conversations with officials in Michigan's electric industry provided this research with enough knowledge to develop a priori hypotheses concerning several situational factors it was thought could explain this slow formation of pooling.[39]

Beginning with Hierarchies Rather Than Markets

Before turning to examine these situational factors, however, a final point should be made about the relevance of Williamson's theory. A major departure needs to be made from Williamson's assumption that "in the beginning there were markets." When his ideas are applied to the pooling situation, what is required, in effect, is to consider a case wherein "in the beginning there are hierarchies." The concern is not, in the pooling case, for a situation wherein certain factors create incentives to move from market to hierarchical transactions but rather for a situation wherein factors create incentives to *retain* hierarchical transactions and to *impede* new market relationships. The situational factors then become,

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[39] An alternative, conflicting explanation for the lack of small company coordination is that because most of the small electric companies are not-for-profit organizations, their managers will have reduced incentives to economize. See A. A. Alchian and H. Demsetz, "Production, Information Costs, and Economic Organization", *American Economic Review*, Vol. 62 (December 1972), pp. 777-795. This alternative hypothesis will be considered in Chapter III.

from the standpoint of the potential pool members, limiting. The factors are limiting because they create obstacles to collective action to deal with the problem of rising input costs by creating quasimarket relationships and capturing thereby economies of comparative advantage and size.

Hypothetical Situational Factors

Some hypothetical situational factors which are potential limitations to collective action, including the collective action of forming a power pool, can now be described. The hypothetical factors will be described in a general way as elements in the framework for institutional analysis and specifically as potential explanations for the puzzle of the lack of coordination. Research hypotheses will also be developed. The search for empirical evidence about their relevance to pooling efforts and for refined understanding of the factors on the basis of the research findings will be undertaken in Chapter V.

Potential obstacles to collective action of power pooling are expected to include the following factors:[40]

1. contracting costs;
2. uncertainty and risk;
3. high exclusion costs;

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[40] The section on potential obstacles which follows draws particularly on A. Allan Schmid, "Property, Power and Public Choice: Impact of Institutional Alternatives" (unpublished manuscript, 1975), especially Chapter 3, pp. 81-206. Another useful reference is Mancur Olson, Jr., The Logic of Collective Action: Public Goods and the Theory of Groups (New York: Schocken Books, 1965).

4. joint impact characteristic;
5. interdependencies involved in achieving economies of size in pooling;
6. malevolence.

Contracting Costs

Contracting costs for collective action are those costs involved in coming to an agreement to pursue such action. For a group of small electric companies who have just begun to realize their interdependent opportunities, contracting is the first step toward a pooling agreement. Initially, the company managers or other officials with decision making authority would meet for the purpose of developing an agreement to hire a consultant and obtain thereby further information about future collective actions.

An initial research hypothesis is that contracting costs constitute a situational factor which significantly limits the development of coordinative agreements. Subhypotheses, also considered subject to empirical testing, were developed in initial conversations with people from Michigan's electric industry. These subhypotheses are: (1) the level of contracting costs are indirectly related to company size since the opportunity cost for managers of small companies engaged in developing coordination agreements is expected to be very high; and (2) contracting costs are indirectly related to the amount of previous working experience among the transacting parties since such experience is expected to increase the predictability of shared behavior and the commonality of group values.

Uncertainty, Risk, and Unawareness

Definitions

Uncertainty may be distinguished in the conceptual framework of this research from two related but not synonymous concepts -- unawareness and risk. George Katona writes that uncertainty has several meanings, including ". . . the absence of definite expectations."[41] For purposes of this research, however, the absence of definite expectations is defined as "unawareness." Unawareness, that is, refers to a lack of knowledge by an actor about the possible negative consequences of a potential act. Unawareness thus also implies a lack of caution. For example, an electric company might be unaware of the opportunistic intent of another company and so enter without caution into a joint venture with that company.

Another set of meanings of uncertainty suggested by Katona is concern with future contingencies, fear of adverse developments, and definite unfavorable expectations. This set of meanings is split, for the purposes of this research, into two concepts -- uncertainty and risk. Uncertainty refers to the perception by an actor of possible negative consequences inherent in an action without a measure of the probabilities that the negative consequences will occur. Uncertainty implies caution or, as will be shown, *ex post* overcaution.[42] Thus, for

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[41] George Katona, Psychological Analysis of Economic Behavior (New York: McGraw-Hill Book Co., Inc., 1951), p. 56.

[42] The inverse concept for uncertainty is certainty, which is defined as a situation in which an actor possesses complete information related to an unique outcome for a potential action.

example, an electric company may be aware of, yet uncertain about, the opportunistic intent of a potential joint venture partner. This uncertainty is expected to prompt caution, to the degree, perhaps, that the joint venture is not undertaken even if, *ex post*, it is learned that the other company did not have an opportunistic intent and an investment opportunity had been lost.

Risk refers to a perception by an actor of possible negative consequences inherent in a potential course of action <u>with</u> some self-perceived notion of the probabilities that the negative consequences will occur.[43] Risk implies neither caution nor imprudence since a decision under conditions of risk will be made relative to the <u>level</u> of risk perceived. With the perception of high risk, the scales are tipped against the potential action, and vice versa. For example, suppose two electric companies consider, as a joint venture, the provision of an

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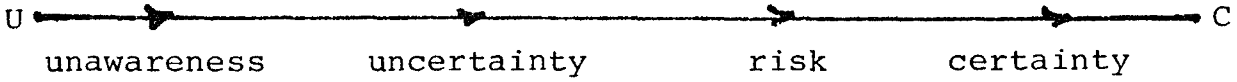
[43] These definitions of uncertainty and risk correspond generally with definitions first developed by Frank H. Knight, <u>Risk, Uncertainty and Profit</u> (Boston: Houghton Mifflin Company, 1921). Note that risk can involve both the objective <u>and</u> subjective assignment of probabilities. Uncertainty turns to risk when the actor becomes confident enough on the basis of experience (either subjective or objective) to perceive the likelihood that various consequences will follow action.

Some psychologists believe that research on various subtypes of uncertainty and risk and on the behavioral implications of each will have payoff. See Thomas W. Milburn and Robert S. Billings, "Decision-Making Perspectives from Psychology: Dealing with Risk and Uncertainty," <u>American Behavioral Scientist</u>, Vol. 20, No. 1 (September-October, 1976), pp. 111-126.

interchange facility for emergency power transfer. Company A is willing to participate if Company B will accept maintenance responsibility for the new facility. Because objective knowledge about the possibility that interchange facilities will fail is well developed and/or because subjective experiences of interchange facility failures are likely to be remembered by B's management, Company B can, under conditions of perceived risk, assess the offer of Company A.

An individual actor's movement from complete unawareness to complete certainty (with probabilities of 1.0 attached to each unique outcome of a potential action) depends on objective and subjective information. A linear path conceptualization of the movement from unawareness to certainty is illustrated in Figure 2-1 below.

Figure 2-1 The Linear Path From Unawareness to Certainty[44]



As an actor becomes more informed, unawareness may change to uncertainty and imprudent behavior change to caution or perhaps overcaution. Additional information can then change uncertainty to risk and, eventually, risk to certainty. Caution or overcaution gives way to calculated, planned, purposive behavior.

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[44] Behavioral implications of additional information tend to be situation specific and more difficult to generalize than the linear path might imply. For example, new information might move a recipient actor from unawareness almost directly to risk perception without significant uncertainty. Information itself is complex and may be usefully differentiated, at times, from knowledge or reason. See Downs, Economic Theory, p. 79.

Conservative Bias of Uncertainty

The degree of caution exercised by an actor faced with uncertainty depends, in large part, on the willingness of the actor to assume potential negative consequences. Ruth Mack argues, however, that aversion to potentially negative consequences under conditions of uncertainty tends to be excessive.[45] Mack has observed that the individual psyche is such that a distaste for uncertainty exists, thereby leading to selective perceptions of alternative choices by the tendency to ignore uncertain ones. When the actor is a group, Mack observes that collective decision making tends again to rule out ambiguous evidence. Thus, given these individual and group tendencies, aversion to potential negative consequences is excessive in so far as it causes a conservative bias and opportunities lost.

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[45] Ruth P. Mack, Planning on Uncertainty: Decision Making in Business and Government Administration (New York: Wiley-Interscience, 1971). See especially pp. 122-151. Mack's treatment of uncertainty is insightful. She structures her work in three parts. Part One focuses on "rational" decision theory using statistical theory. Uncertainty is inherent in decisions involving a set of predetermined alternative acts, but goals are clear, and expected consequences can be subjectively quantified by the decision maker. Conventional economic theory of choice behavior fits Part One. Part Two retains the assumptions of predelineated alternatives but draws upon empirical works from social psychology to reveal realistic differences in behavior from the assumed behavior in Part One. Three differences are basic: actors use selective perception in choice situations; actors learn aspirations on the basis of experience and self image; and actors are influenced by their intragroup relationships with others. Part Three relaxes the assumption of predetermined alternatives and focuses on the ongoing deliberative process of choice within collectives. Suggestions are offered on ways to structure this process so as to avoid unnecessary costs of decision making under conditions of uncertainty.

Mack also distinguishes three other phenomena which she has observed lead to a conservative bias under conditions of uncertainty. These phenomena include the:

1. seriability of decision consequences which go unrecognized by actors so that learning does not reduce uncertainty;
2. visability of management "mistakes" relative to less visable "right" management decisions so that managers fear uncertainty;
3. relative ease in the quantification of costs as compared to benefits so that converting uncertain costs to risk is difficult.

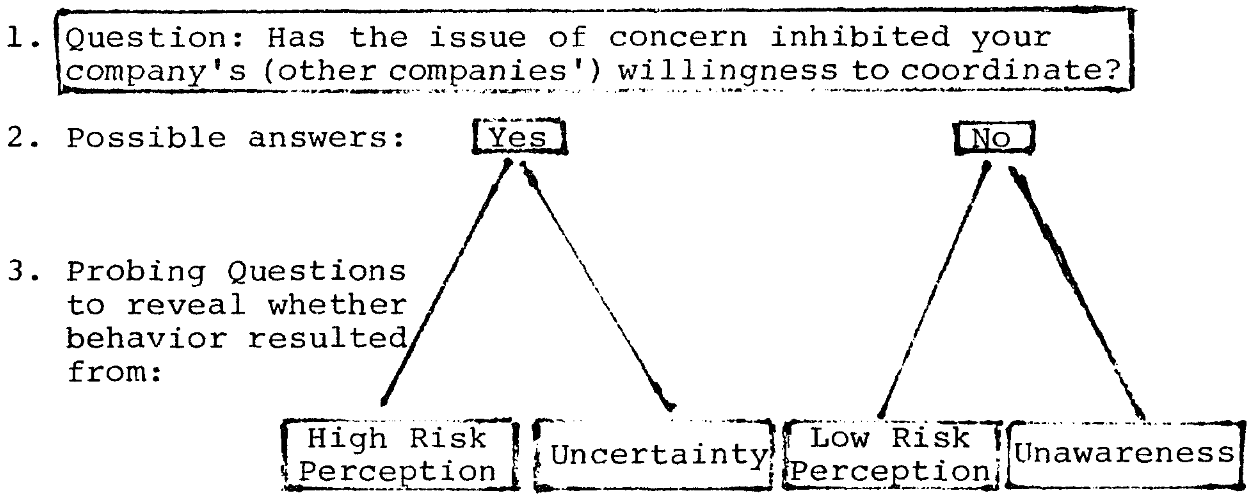
To the extent that Mack is correct in her argument that these phenomena are often tied to uncertainty and thereby create a conservative bias, then uncertainty becomes even more limiting. Potential collective actions such as power pooling, given uncertainty and a conservative bias, are less likely to occur.

Hypothesized Issues of Concern

A Note on Interview Techniques and Verification of Answers

Discerning the presence of risk and uncertainty in decision makers' attitudes about power pooling is made difficult, in part, by the complexity of power pooling as a collective decision. Pooling involves various steps and activities. In preinterview conversations with industry participants, therefore, several less complex hypothetical issues of concern were identified and chosen for research purposes. The issues of concern are some potential negative consequences of power pooling as seen by participants. The issues emerged in the conversations as common concerns, especially among small company managers. Thus for each issue, decision makers were subsequently interviewed in order to discern their levels of awareness about the issue, their levels of uncertainty about it, and their perceptions of risk inherent in the issue. Figure 2-2 below illustrates the question-answer sequence used in the interviews.[46]

Figure 2-2 Question-Answer Technique re: Uncertainty



1. Question: Has the issue of concern inhibited your company's (other companies') willingness to coordinate?
2. Possible answers:
3. Probing Questions to reveal whether behavior resulted from:

A second dimension of difficulty in undertaking research on uncertainty and risk involves the ability of the researcher to perceive correctly unawareness, uncertainty, and risk in an interview dialogue. Four techniques were used by this researcher

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[46] For an additional extended discussion of interview techniques, see Appendix C.

to insure the validity of interview data. First, systematic focused interview methods were used wherein the attention of those decision makers being questioned were directed by specific questions toward possible issues of concern, yet open-ended answers were allowed to discern awareness of consequences and confidence of knowledge about probable outcomes.[47] Second, rules of evidence such as those used in formal judicial proceedings were applied. Third, no less than two, and generally several, actors were questioned about the same issue, one with which they held a common experience. Reliability of answers may then be checked by comparing the consistencies of responses. Finally, as already implied, in every case the actors questioned had actually been involved to some degree in a power pooling experience. Experiences ranged from beginning efforts in developing a pool to participation in an ongoing pool. Decision makers were asked about experiences rather than about hypothetical situations. More specific details about interview techniques and insights they afforded as well as other techniques to insure validity will be discussed in Chapter V and in Appendix C.

The hypothetical issues of concern used in the interviews with decision makers are listed below. In each interview it was hypothesized that the actor would be aware of each issue

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[47] Robert K. Merton, Marjorie Fiske, and Patricia L. Kendall, The Focused Interview: A Manual of Problems and Procedures (Glencoe, Illinois: The Free Press, 1956) and Claire Selltiz *et al.*, Research Methods in Social Relations (New York: Holt, Reinhart and Winston, 1951).

and that he would either be uncertain about potential negative consequences or would perceive a high risk inherent in the issue. Such uncertainty and risk would then function as situational factors limiting the possibility for collective pooling action. The hypothetical issues of concern are:

Reliability of service. When small electrical systems are pooled into a larger system, the probability is increased for disruptive occurrences, e.g., ice storms, to interrupt service over a wider geographical area. However, the several small systems can, in a power pool, provide emergency backup service to disrupted individual members. It was hypothesized that individual managers in small systems would weigh the potential for disruption more heavily than the potential for backup.

Ability to assume financial burdens. Power pooling requires investments for additional transmission lines, interconnection facilities, and, possibly, generation facilities. Costs can be met through loans, the use of retained earnings, or (for municipals) through the passage of bond issues. Other potentially more certain or less risky investment opportunities may exist, thus increasing the opportunity cost of pooling. Bond issues require an approval of voters which is not always forthcoming.

Potential loss of individual company control over future choices. Power pooling involves, necessarily, that some future decisions be made in common over joint investments, cost allocation, and degree of mutual assistance. To the extent that such decisions require less than a unanimity rule of agreement, undesired costs may be imposed on member companies.[48]

Similarly, a potential exists for the loss of control by individual managers over decisions which affect their companies.

Opportunistic behavior by other pool members also exists as a potential negative experience in power pooling.

High Exclusion Costs, Joint Impacts, and Interdependencies of Pooling

Intermediate Steps to Pooling

After two or more electric companies have accepted the contracting costs of coming together to explore common objectives and after the companies have each defined uncertainties and/or risks as being low enough to proceed with common projects several intermediate steps are necessary before a power pool actually exists. These steps are:

1. Provision of a feasibility study to estimate the costs and benefits of collective pooling action. (For small companies, the study is usually done by a private engineering consultant.)

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[48] cf. Buchanan and Tullock, The Calculus of Consent.

Buchanan and Tullock develop the point that the degree of unanimity required and potential "political externalities", i.e., costs authoritatively imposed, are indirectly related. They also describe the direct relationship between contractual or decision costs and degree of unanimity required. The idea of "loss of control" is actually broader than that of "political externalities" since a reduction in opportunities (loss of control) is considered possible in voluntary market transactions as well as in political transactions.

2. Construction of transmission and interconnection facilities to tie members together.
3. Provision of a central dispatch communications office.
4. Construction of common generation facilities, if such generation is desired.
5. In Michigan, a change in state law.

The fifth intermediate step requires some introductory explanation. A special legal situation existed in Michigan during the field research for this dissertation. Municipal electric companies were "prohibited" from making joint venture investments either among themselves or with IOUs and RECs. According to Michigan statute, municipal government agencies were allowed to coordinate with others only when such activity did not involve joint ownership or operation of ". . . a public utility for supplying transportation, gas, light, telephone service, or electric power except as may be provided by the statutes or constitution of the State of Michigan."[49] Originally the statute was intended to prevent the expansion of municipal electric companies. According to the Executive Secretary of the Michigan Municipal Electric Association, Consumers Power Company was instrumental in creating the original legal restriction.[50]

As a barrier to common investments by municipal electric companies with others, the statute has, however, not always been effective. Municipal company members of the MCP pool have, for

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[49] Michigan Compiled Laws Annotated (MCLA) Section 5.4084.

[50] Conversation with Mr. Don Potter, January 1977.

example, contributed to some common facilities. Technically, the law was circumvented by construction of "joint facilities" in which each physical component of the facility was owned by an individual company and no component was owned in common.

During the writing of this dissertation a bill removing the legal restriction on joint ventures passed both houses of the Michigan legislature and was signed by Governor Milliken. Analysis of the bill can be found in Appendix B.

A rationale can be made for calling new legislation to allow joint ventures an important, if not a necessary, intermediate step to development of power pooling by municipals in Michigan. This rationale holds even when past circumvention is recognized. Conversations with municipal managers during the summer of 1976 revealed that some believed that the circumvention technique might not be upheld in courts of law. Others stated that the circumvention technique itself created obstacles by requiring involved transactions over who would own what in such a "joint facility."

Product Characteristics Which Have Implications for Interdependencies

Consideration needs to be given to the <u>products</u> of the five intermediate steps. Essentially, the question is: How would the products affect interdependencies among potential pool members and interdependencies between pool members and other interested individuals and groups? Two particularly important questions are: does "the product" of the intermediate step exhibit joint impact characteristics; and does the product exhibit the characteristic of high exclusion costs? Joint impact goods are those goods which, once provided, involve a marginal cost of zero for additional individual "enjoyers."[51] Costs of exclusion refer to the costs of prohibiting the use of a good by any individual. A third important question is: does the product involve economies of size which will affect interdependencies?

Application of Product Characteristics to Intermediate Steps and Resulting Questions of Interdependence

Information: Who Pays? Provision of a feasibility study is usually an early step in coordination, begun soon after the companies begin to regard themselves as a group with a potential for collective action.[52] The product of a feasibility study is information to improve both individual and collective decision making, especially in the early stages of a pooling effort. Two essential early pieces of information are estimates for potential members of the costs and benefits possible and a plan for making joint investments.

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[51] When joint impact goods exist, the nature of interdependencies created depends, in part, on whether the good is positively or negatively regarded by individual actors, on costs of avoidance, on the presence of exclusion costs, and on symmetry of interdependence (are all equally affected?). These contingencies of interdependence will emerge in the discussion which follows.

[52] A. Allan Schmid made the comment at this point that a sense of group is an important cultural phenomenon in and of itself. Sense of group cannot therefore be assumed as present.

Information, the product of a feasibility study, has some distinctive characteristics. First, and probably most important, such information is a joint impact good. If only one company were to hire the study, information in the report, once produced, could be enjoyed by additional companies at zero additional cost. Such information is presumably a positive good for all the companies, although it will probably be more highly valued by some than by others. That is, companies are expected to place uneven values on this good since some companies will find the information more novel or more useful than others. Enjoyment of the good would be optional depending on whether company officials chose to read and discuss the report.

Costs of exclusion, with regard to the information, may or may not be high, although maintaining secrets generally involves a cost. One company might hire a study and hoard the report, but this seems foolish. Value is obtained only be spreading the information, by making the findings known. If costs of exclusion are high, say for example because of a state's laws on public disclosure by municipal organizations, negotiations about feasibility studies are complicated by an incentive for potential users of the information to become users without payment, i.e., free riders. When a company behaves as a free rider, it hides any expression of demand in order to avoid payment. Public disclosure laws do exist in Michigan so that the free rider complication potentially exists in negotiations over feasibility studies involving municipals. Note, however, that the joint impact nature of information provided by feasibility studies and the possible high exclusion cost of such information are separate and distinct product characteristics, each with its own behavioral implications.

Because information as will be provided by a feasibility study is a positive, optional, probably unevenly valued joint impact good, when consideration is given to its provision, some interdependencies among potential pool members may be hypothesized. Specifically, the question of who should pay for the study is expected to arise, with disagreement involved in reaching an answer. Should costs be evenly divided? But some companies will probably value the information more highly than others. Should costs be divided according to company size or according to expected benefits derived? But who can estimate expected benefits, and what company would want to reveal its demand for information, given that demand implies a willingness to pay? Because the question of conflict over payment is expected to arise, we can hypothesize further that this interdependency will create an impediment to collective action. Having to decide who should pay, i.e., who, in effect, will be the intramarginal and who the marginal investor may delay or even preclude the feasibility study. That is, the joint impact nature of the information (in combination with the other characteristics described) is expected to constitute a limiting situational factor for potential pool members.[53]

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[53] This analysis illustrates the importance of considering high exclusion costs and joint impacts as separate and distinct phenomena rather than indistinguishable characteristics of "public goods."

Interchange Capacity Involves Transmission, Interconnection, and Dispatch Facilities and Makes Possible Several Economies. Construction of transmission and interconnection facilities and provision of a central dispatch office may be considered simultaneously because they constitute together the physical requirements for the purchase and sale of electricity, internally to the pool. A market for electricity among pooled systems has several potential advantages. It allows for: technical economies of size, location, and utilization; reduced reserves of generating capacity; and, for sellers, the spreading of fixed costs of production.

Technical economies of size in the generation of electricity were discussed in Chapter I where previous studies were cited to show that as the size of generators increases, over a relevant range, average cost per KWH generally falls. Technical economies of utilization refer to a similar concept. For the generation of electricity, as an individual generator of fixed size is fired by degrees to capacity output, the utilization of fuel per KWH and therefore the average cost per KWH may decline over a relevant range.[54] Location economies arise when a plant is constructed at a point which reduces the transport costs for fuel inputs. Reduced reserves of generating

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[54] Conversation with Mr. James Wood, Assistant Manager, Wolverine Rural Electric Cooperative. A conflicting and apparently more general view is that technical economies of utilization are negligible or nonexistent. See Fred M. Westfield, "Marginal Analysis, Multi-Plant Firms, and Business Practice: An Example", Quarterly Journal of Economics, Vol. LXIX (1955), pp. 253-268. The contrasting views will be discussed again in Chapter IV.

capacity are possible because individual members of a pool can call on other members for electricity to meet peak demands, emergency outages, and scheduled maintenance outages.[55] Spreading fixed costs involves utilizing what would otherwise be idle facilities and receiving revenues greater than variable costs.

Ability to Exchange Economy Energy: Who Will Pay? Economies of size, utilization, and location and the spreading of fixed costs of production are achieved in a power pool by the buying and selling of so-called "economy energy." Economy energy is relatively low cost electricity produced by a company which has comparative cost of production advantages and sold to another company which does not have those cost advantages.

But the ability to exchange economy energy is expected to create distinctive interdependencies among companies contemplating coordination. Some companies may possess very high or very low cost generating capacity. For them, high potential gains from exchange exist. For other companies, who possess neither very high nor very low cost generating capacity, potential gains from trade are not so high. Some companies are more likely than others to value the future ability to exchange as a management option.

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[55] Advantages in reserve sharing to meet peak demand are illustrated through the use of load factor ratios. A load factor is the ratio of average load requirements on a system to peak load requirements on that system. A load factor "improves" as the ratio approaches its maximum of 1.0. An improvement of the load factor in an electrical system results in less reserve requirements for peaking purposes. Whenever two or more electric systems without perfectly coincidental peaks join in a pooling arrangement, the load factor ratio will improve.

Thus for those companies with strong perferences for sales of economy energy, an incentive is created to persuade other companies to make investments in interchange facilities. Yet a coincidental incentive is for all potential investors to proceed with caution and cast themselves as the *marginal* investor. Once a central dispatch center is established, transmission and interconnection facilities constructed, and a market potential created, the cost of making an additional interconnection with a marginal company is relatively low. By being the marginal investor, entering the pool late, and paying only the marginal cost of entry, a company could conceivably capture market advantages equal to other companies', yet for a relatively low cost. The interdependencies created by economies of utilization in interconnection facilities are likely to cause friction in relationships. Who will be intra-marginal members, and who can join late? In essence, who will pay for what in setting up interchange facilities?

This analysis reveals that the ability to exchange has joint impact characteristics, i.e., if the marginal cost of an additional user is not zero, the cost at least is relatively very low. Thus if one company were to create the ability to exchange among a group of companies by constructing and operating interchange and dispatch facilities, successive group members could begin to enjoy their ability to exchange at a very low additional cost. The additional companies would only need to interconnect with the pool. Presumably, all companies would regard this ability as a positive good, although, as was suggested previously, not all would value the ability the same. That is, because the ability to exchange would affect companies differently, according to their cost of production, their expected future investment opportunities, their system growth expectations, etc., they would value the ability to exchange at different levels.

Participation in exchange may be more or less optional in a pool, depending on the contract which created the coordination. Costs of exclusion are, however, not necessarily high. Dispatchers could refuse to include one company in exchanges, although, again, this seems foolish since the value of the good derives from its common use.

Because the ability to exchange exhibits the characteristics of positive (but not uniform) value and joint impact, it suggests difficulty in deciding who should pay. Rules of equal cost shares or shares in proportion to size may be used, but these do not necessarily correspond with the value which companies will place on the good.[56]

Ability to Call upon Reserves: Who Will Pay? Interchange facilities will also make available two other types of exchanges--the purchase or sale of electricity for emergency or scheduled shutdowns of generators and for peak demands--in the several pooling systems. Because electricity cannot be inexpensively

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[56] Evidence will be developed in later chapters that rules of cost sharing based on simple formulae such as equal shares in proportion to size do, in fact, play a significant role in overcoming conflict to allow for collective action.

stored in large quantity, reserves of generation capacity equal in size to the largest generating unit in production are required Similarly, the nonstorable nature of electricity requires that reserves in generating capacity must be held for times of peak purchases by consumers.

With the ability to interchange electricity in a power pool, however, the reserve requirements within individual member systems for outages and peaking are reduced, thereby creating savings for individual members. Emergency outages may be met in individual systems by purchasing electricity from other members. The reserves in generation capacity required for emergency outages in a pool is equal in size to the largest unit of the pool. Individual companies are relieved of the reserve burden. Maintenance, too, can be scheduled among companies in a pool to provide alternative sources of power from other members.

Advantages are also available by pooling individual systems which have noncoincidental peaks. Power may be exchanged within the pool (thereby also capturing economies of size and utilization) so that reserves for peaks are reduced. The degree of advantage declines as peaking times are more coincidental among the companies.

Provision of ability to use electricity interchange to reduce reserve requirements for outages and for peaking is again, however, a joint impact good. If one company were to construct the physical connections and dispatch office and then staff that office, other companies could successively begin to enjoy the opportunity to call upon other members for reserves at zero marginal cost.

It can be expected, however, that the companies would value the option demand for reserves differently. One company may have rather old generating facilities and therefore value highly the option to call on emergency or maintenance reserves. Another company may own generation facilities with few maintenance problems. One company may also be faced with peak demands on its system which are expected to be noncoincidental with its neighbors. Pooling to reduce peak reserves would be advantageous for this company, and it would presumably value highly the opportunity to call upon its neighbors. However, the company may have peak demand times which coincide with those of its neighbors, thus reducing the value of the option demand.

These examples suggest that jointness of impact involved in making insured reserves available will create the problem of deciding who should pay how much for that opportunity. Each company knows best the value it places on the opportunity to call on reserves. The incentive is present to refrain from revealing positive preferences for reserves, especially strong preferences since expressions of demand imply willingness to pay.

Low Cost Power: Who Will Be the Marginal Investor? If electric companies <u>do</u> decide to form a power pool and then to invest in large size joint generating capacity, the investment process will have some special characteristics. Demand for joint generating capacity will generally be distributed unevenly among potential pool members. Some companies may already have excess generating capacity in their own systems or have capacity under construction. Others may not. Estimates for future load requirements will differ. Some companies may previously have made wrong decisions by investing in high priced generation, such as that using high priced fuel. Thus the amount of new generating capacity individual companies would prefer and the price that companies would be willing to pay for capacity can be expected to differ.

Prices within the pool for electricity generated by jointly owned facilities will not be set by any market mechanism but will be administratively set within the pool itself. All companies are not necessarily required to invest the same amount per kilowatt of generating capacity or to pay the same amount per kilowatt hour. Pool members will need to decide who will set prices, what criteria will be used to adjust them, and which exchanges by members of the pool will be optional.[57]

Over some relevant range, the marginal investment cost of adding an additional kilowatt of capacity declines. Similarly, economies of size and utilization are present in

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[57] Subtle but potentially significant differences in cost sharing can also be accomplished by allowing for delayed contribution or by nonmarket evaluation of contributions in-kind.

the operation of electric generators. Larger generators, operated at capacity, exhibit relatively low average cost per KWH. Because economies of size and utilization are present in generation, some behavioral incentives are likely to be created. For those companies with strong perferences for pool generating capacity, the incentive is to persuade as many other companies as possible to make large investments in pool generation. Yet, a coincidental incentive is for all potential investors to proceed slowly and cast themselves as the marginal investor or user. Since prices will be administratively set, the marginal investor or user could bargain for relatively low prices.

A story from the history of one generation and transmission (G and T) rural electric cooperative will illustrate a situation of interdependence resulting from economies arising from sales which spread fixed costs and the friction created thereby.[58] Wolverine REC, the G and T cooperative, negotiated a sale of electricity to a large private firm. A third party, one of Wolverine's member distribution cooperatives, was necessarily involved in that Wolverine sells electricity only to its member cooperatives. The sale by Wolverine to the private firm had to go through the distribution cooperative.

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[58] G and T cooperatives produce and transmit power for their member distribution cooperatives. They are, in essence, cooperatives of cooperatives. This story was told by Mr. Al Hodge of Daverman Associates, an engineering consulting firm in Grand Rapids, Michigan.

Advantages to Wolverine from the sale were potentially significant because the G and T could spread its fixed costs of production. The marginal cost to Wolverine of the electricity generated for the sale was low. Potential advantages were also present for the member cooperative who needed only to invest in a few feet of "wire" from a Wolverine substation to the private company. The private firm, however, had a price ceiling on its demand for electricity since power generation could have been a by-product of its own operation. The firm was willing to buy electricity, but only for a price less than its own costs for self-production. This price elasticity of demand, known to seller as well as buyer, allowed the firm to cast itself as the marginal buyer.

When negotiations ended, the agreed upon price was less than the firm's cost for self-production and above Wolverine's marginal cost of production. The distribution cooperative collected receipts on all electricity purchased by the firm. Yet, and this was the point of controversy, the sale price to the firm was <u>lower</u> than that price for which the distribution cooperative itself needed to pay to buy wholesale power from Wolverine. The distribution cooperative was considered an intramarginal buyer and therefore paid the higher price necessary to cover fixed as well as marginal costs. This experience created friction between Wolverine and the distribution cooperative.

Two hypotheses result from this realization that joint pooling capacity involves economies of size and utilization in construction and operation. These economies are expected to create interdependencies among potential investors. And, the interdependencies likely involve social friction, i.e., intercompany conflicts in reaching decisions. Thus the interdependencies created by such economies may create limiting situational factors and inhibit the development of power pools.

Changed Legal Opportunities: Who Will Pay, and Whose Preferences Will Count? Finally, recall the last intermediate step and consider the characteristics of new legislation, desired by municipals in Michigan because of legal restrictions on joint ventures to provide electricity. At the time this research was begun, new legislation was an intermediate step to pooling which would, it was expected, provide the "good" of increased opportunities for municipals. These oppotunities exhibit characteristics which suggest certain types of interdependencies among participant actors.

Legislation to remove restrictions on joint ventures which has now been enacted is considered a positive good, presumably by all municipals -- although with varying degrees of perference, depending on their desire for joint investments. For other companies in Michigan, however, the new legislation may be perceived as mixed good and bad or outright bad. Consumers Power Company (but not Detroit Edison Company) lobbied to limit the removal of restrictions on joint ventures to those involving mutual investments by municipals and IOUs. So limited, the legislation would not have removed the ban on joint ventures among municipals only. Consumers Power used the rationale that allowing joint ventures by municipals only would foster "unfair competition."[59]

Interest by Consumers Power in new joint venture legislation stemmed from the fact that such legislation has joint impact characteristics which are nonoptional for all companies in the state. When all types of joint ventures were made legal, the impact fell upon every present and future electric company in the state (with a marginal cost of zero)--regardless of the varying perceptions of good and bad these companies held for the legislation.

High exclusion costs are also evident. Since becoming law, P.A. 448 of 1976 can be used by all who desire the opportunity to enter into joint venture agreements. Anyone who desires to exclude a company from this opportunity would need to go to court to prevent such entry.

These product characteristics -- high exclusion costs and joint impactedness -- coupled with mixed preferences and nonoptionality imply some hypotheses for interaction. Actors who perceived parts or all of the legislation before it was

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[59] Other possible reasons for Consumers' action include the desire to channel future investments by municipals toward Consumers' own capital needs and increased control by Consumers over future municipal bulk power supplies afforded by municipal-IOU ventures versus municipal-municipal ventures.

enacted as bad fought the legislation, it can be hypothesized, because of its nonoptional joint impact characteristics. These same characteristics also created a problem for those actors who perceived the legislation as good. Proponents had some difficulty in deciding who should finance efforts to promote its passage. The problem of who should pay was reinforced, it can be hypothesized further, by the high exclusion cost characteristic. Incentives were created for actors desirous of passage to lie back as free riders, contribute little to lobbying, yet eventually enjoy the benefits of the law. Or these companies might have envisioned themselves as unable to contribute any significant resource to the lobbying effort that would affect its success. This attitude, the so-called "latent group effect", is enhanced by the fact that a rather large group of proponents, all the municipals in Michigan, were involved.

To what extent that new legislation will remove legal obstacles for small companies to form power pools and to the extent that high exclusion costs and joint impactedness, nonoptionality, and mixed value perceptions created obstacles to passage, these product characteristics were limiting situational factors for small companies interested in developing power pools.[60]

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[60] Evidence (and some informed speculation) will be offered in Chapter V on some methods by which the lobby organization for the municipals in Michigan -- the Michigan Municipals Electric Association -- succeeded in promoting the enactment of the legislation.

This discussion of the manner in which joint impactedness, high exclusion costs, and economies of size and utilization create interdependencies and function, thereby, as situational factors can be summarized in table form. Table 2-1 includes the five intermediate steps to power pooling, product characteristics of these steps, and hypothesized implications.

Malevolence

The final situational factor which may serve to limit the development of power pools is malevolence. Malevolence is defined, for this research, as activity by an actor who seeks to deny to others potential *mutual* benefits. On the basis of conversations with electric industry participants, a hypothesis was developed that some small companies, acting out of malevolence, refuse to enter into pooling agreements which will benefit other pool members more than themselves. This behavior is expected to be most in evidence when different insitutional types -- municipals, RECs, and IOUs -- are involved as potential pool members. Such malevolence will, of course, serve to limit the development of power pools.

Care must be exercised in interviews with decision makers to distinguish, if at all possible, malevolence from other situational factors. Uncertainty based upon previous negative experience can be mistaken for malevolence. Perceived risk of future competiton can also be mistaken for malevolence. The possibility is left open, however, for finding instances when malevolence itself serves as a situational factor, thereby impeding the development of power pools.

Table 2-1 Interdependencies Created by the Product Characteristics of Intermediate Steps to Pooling

Intermediate Steps: (and Their Products)	Product Characteristics					Hypothesized Situational Factors
	Exclusion Cost	Joint Impact			Incompatable Use with Economies	
			Value	Avoidance		
1) Feasibility Study: (Information) [see pp. 66-68]	*Not necessarily* high but is high in Michigan because of an institutional rule.	Yes	Positive but Unequal Benefits Among Companies	Not Costly	No	Difficulty in deciding who will pay and who will be a marginal user. Incentive to avoid revealing demand
2) *Interchange Capacity:*						
a) (Ability to Exchange Economy Energy) [see pp. 70-72]	Low. New Members could be excluded.	Yes	Positive but Unequal Benefits Among Companies	Not Costly	No	Difficulty in deciding who will be the marginal investor in creating mutual capacity.
b) (Ability to Call upon Reserves for Emergency and Scheduled Outage and for Peak Demand Situations) [see pp. 72-74]	Low. New Members could be excluded.	Yes	Positive but Unequal Benefits Among Companies	Not Costly	No	Difficulty in deciding who will be the marginal investor in creating mutual capacity.
3) Joint Generation: (Low Cost Power) [see pp. 74-68]	Low	No			Yes. Economies of size in construction and economies of size and utilization in operation.	Difficulty in deciding who will be the marginal investor and who will pay how much for the electricity generated.
4) New Legislation: (Expanded Opportunities for Municipals; Possibly Restricted Opportunities for Other Companies) [see pp. 78-81]	High	Yes	Positive and Negative	Costly	No	Among those who regarded legislation (pre-enactment) as good, difficulty in deciding who would pay for the lobbying effort; among all, conflict over who would decide the form and content of the legislation.

Summary

This chapter began with a theory of scarcity. Scarcity, it was argued, not only had input-output, production function implications, but institutional implications as well. Scarcity was viewed as creating the need for property rights to order relationships. The theory served to redefine some concepts which will be used later in the research, namely externalities and efficiency.

The theory of scarcity was then used as a base for a framework of analysis. Three key elements in the framework are: institutions, i.e., patterns of human relationships defined by property rights; behavior, i.e., human conduct in the context of institutions; and performance, i.e., the distribution of externalities. Institutions, it was theorized, ultimately affect performance and changes in performance.

Problem situations were defined as those situations in which individuals and groups find performance unsettling. The example used to illustrate a problem situation was that of small companies faced with extreme escalations in input costs, i.e., the bulk power supply problem. In the context of problem situations, participants are expected to examine both means and ends. For small electric companies, changes in relationships vis-á-vis other companies are likely subjects for reexamination.

It was further theorized, however, that certain situational factors are likely to frustrate collective efforts to "solve" problems. Oliver Williamson uses a parallel theory to explain the way organizations reorder relationships from market to hierarchy. The reverse case is involved, however, in power pooling. That is, pooling involves the reordering of relationships from that of interdependent but unrelated companies, each with its distinct internal hierarchy, to the establishment of quasimarket transactions among companies in a power pool.

Several situational factors were used to explain the lack of collective pooling by small companies. These factors may be termed limiting in the way they block small company coordinative efforts. At the same time, in an environment characterized by scarcity, some actors prefer no small company pooling. For those actors the factors are liberating.

The situational factors were defined to include: contracting costs; uncertainty and risk about some pooling issues; high exclusion costs, joint impacts, and other interdependencies involved in the necessary intermediate steps to pooling; and malevolence. The relevance of these situational factors was illustrated by application to potential pooling situations. Finally, some research hypotheses were deduced. These hypotheses, which will be summarized to introduce Chapter V, serve as potential explanations for why small companies have not readily formed power pools. The research hypotheses, if they are shown to have explanatory value, can further serve to suggest policy instruments whereby limiting factors might be overcome and small company coordination promoted.

CHAPTER III

SO WHAT? THE QUESTION OF PERFORMANCE

Introduction

In Chapter I, the problem of high costs for small electric companies was described. At this point it is appropriate to ask, "So what?" So what if small companies face a bulk power supply problem? So what if these companies find their potential for collective pooling action limited by situational factors? If small companies are relatively high cost producers, why not reduce government support and allow them to be purchased by larger so-called "more efficient" producers?

Answering these questions requires an examination of institutional performance. Who, it should be asked, are affected by rules which preserve small company existence, and in what way are they affected? Because the large company versus the small company dichotomy in the electric industry is essentially a private (IOU) versus public (municipal) and cooperative dichotomy, previous research on performance by the various types of companies needs also to be examined.

Chapter III begins with a section on "efficiency." The section is necessary in that the argument is made by some economists that small electric companies are "inefficient." By drawing upon the theoretical framework of Chapter II and additional information about production of electric services, the conventional efficiency argument is shown to be unacceptable.

A second section in this chapter considers the large body of literature on public versus private electric company performance. The observation is made that the public versus private debate has spawned an inconclusive body of empirical literature. Some possible explanations for the inconclusiveness of the findings are offered, and a suggestive study by Marc Roberts is examined. This second section leads directly into Appendix A which offers detailed suggestions about ways to improve research on the performance of electric companies.

Although the empirical work on electric company performance is weak, the theoretical underpinnings which prompted economists to search for public versus private performance differences are alive and well. Those theoretical underpinnings are drawn from the Chicago School of economic thought. Chicago School theories of company performance are dealt with necessarily because they suggest an alternative hypothesis to that formed in this dissertation for the lack of pooling among small electric companies. Chicago School theories suggest that citizen-owners and managers of municipal and cooperative firms lack incentives to economize. This suggestion is dealt with by showing that strong incentives to economize do in fact exist and that policing company waste is in some ways easier in small public companies and cooperatives than in large IOUs.

Because the literature on electric company performance is inconclusive, the argument that public companies should exist because they provide yardsticks to regulate private performance is weakened. A somewhat similar argument -- that a decentralized electric industry provides consumer choice through location decisions -- is also rather weak.

It may be observed that some of the conclusions reached in this chapter are negative. The negative conclusions rest on the fact that both theory and empirical work on electric company performance is underdeveloped. Two upshots follow. First, better theory and empirical work is needed. Appendix A sets the stage for that effort. Second, the researcher interested in studying the existing bulk power supply problem among small companies can proceed with confidence that policies toward small companies should not be based on efficiency arguments. To the critic who asks why not let small companies fail, the answer is that no valid theory can be found which demonstrates why such failure would be preferable. Conventional wisdom among some economists and a large body of literature suggest the contrary, but performance evaluation among electric companies is yet a wilderness.

Efficiency Arguments

> Considered purely as economic enterprises, within the context of a freely competitive market, the rural cooperatives have demonstrated insufficient efficiency to justify their continued support at public expense.[1]

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[1] John D. Garwood and W.C. Tuthill, The Rural Electrification Administration: An Evaluation (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1963), p. 71.

> The most efficient method of supplying bulk power is through a system that employs large scale generating units with a high capacity, interconnected transmission system. Isolated REA and municipal generating stations are not economical because their limited demands do not allow them to employ the most efficient scale of plant.[2]

> Public policy should recognize that the existing institutional arrangement encourages inefficiency and permits state regulatory commissions to require small publicly-owned systems to obtain their bulk power requirements in the most efficient manner possible.[3]

These quotations reveal a conclusion, held by a number of economists, that small municipal and cooperative electric companies are "inefficient" because of high cost production. Can these arguments be answered? Productive efficiency is measured, in general, by the ratio of outputs to inputs or $(\frac{O}{I})$. When intercompany units of output can be measured in common units and costs can also be measured in common units, an intercompany comparison is possible to discern relative efficiency.

Rights Dependency

The argument was made in Chapter II that efficiency, however, was rights dependent. How may that argument be applied to the production of electricity? Consider the

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[2] C. E. Olson, Cost Considerations, p. 74.

[3] *Ibid.*, p. 73. Olson suggests three policies: eliminating bond interest exemption for the financing of publicly-owned systems; returning federal income taxes collected on investor-owned systems to local governments; and eliminating low interest loans from REA.

factor costs which go into the denominator (I) of the efficiency ratio. Technical economies of size suggest, over a relevant range, higher average costs of production for small scale production than for large. But access to large scale production is governed, in part, by rights. Investor-owned utilities have traditionally held the right to refuse to accept offers for joint ventures by small utilities. The recent right of joint venture in nuclear facilities given to small utilities by federal law implies lower production costs for these companies.

Similarly, the rights to sell wholesale power and wheeling services without stringent regulation have also been used by large companies effectively to deny an access to size economies by small companies. If such rights were amended, perhaps by creating common carrier transmission lines for electricity, production costs for small companies would probably fall. Thus who must bear costs is determined by the rules of the game. When efficiency arguments are used to suggest policies for small municipals and cooperatives, they generally serve to direct attention away from potential rule changes which would have favorable effect on costs for the small producers.

Assumptions about an Homogeneous Product

Consider next the numerator of the efficiency ratio, i.e., output. Comparative efficiency measures for the electric industry assume a homogeneous product usually measured in KWH. This assumption is, however, suspect. What electric companies provide as a product is not necessarily homogeneous. Electric services of a range of quality and reliability are furnished to customers.

Impacts by electric companies on the community are, moreover, not limited to services provided. Electric companies affect others through rates and billing practices, employee relations, environmental policies, taxes paid or public services rendered, and in other ways. This diverse set of impacts suggests that when intercompany comparisons are made, the criteria of comparison should be by general performance indicators rather than by efficiency ratios based on the assumption of a homogeneous product. Indeed some general performance analysis was done by observers of the electric industry in its infancy.[4] Some modern authors

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[4] For examples of early studies on the performance of electric companies see John R. Commons, "Municipal Electric Lighting", Municipal Monopolies, ed. by Edward W. Bemis (New York: Thomas Y. Crowell & Co., 1899); Charles H. Porter, "A Comparison of Public and Private Electric Utilities in Massachusetts," The Journal of Land and Public Utility Economics, Vol. VII, No. 4 (November 1931), pp. 394-438; National Electric Light Association, Political Ownership and the Electric Light and Power Industry, 1925; Donald M. Whitesell, Municipal Electric Utilities in Michigan (Ann Arbor: Michigan Municipal League Bulletin R-4, 1934); and Frederick L. Bird and Frances M. Ryan, Public Ownership on

(continued on following page)

also study electric compant performance, although narrow efficiency arguments continue to be used in many contemporary works.

Research on the Performance of Electric Companies

DeAlessi on Performance

The central theme of almost all research on the performance of electric companies, like popular debate on this subject, is that public versus private provision of services leads to differences in performance. During the last twenty years, modern statistical techniques have been employed to relate public and private ownership with electric company behavior. These studies were analyzed by DeAlessi in 1974. DeAlessi used an approach which bears some resemblance to the insitutions-behavior-performance framework described in Chapter II.

An Aggregated Institutional Type Theory

For DeAlessi, public-private ownership differences constitute the prime reason for behavioral differences in electric companies. He postulates a theory of management

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[4] (continued from previous page) Trial: A Study of Municipal Light and Power in California (New York: New Republic, Inc., 1930). More recent studies include William Iulo, "Problems in the Definition and Measurement of Superior Performance," Performance under Regulation, ed. by Harry M. Trebing (East Lansing: Michigan State University Public Utilities Studies, 1968); William G. Dodge, "Productivity Measures and Performance Evaluation," Performance under Regulation, ed. by Harry M. Trebing (East Lansing: Michigan State University Public Utilities Studies, 1968); and the several studies analyzed by Louis DeAlessi, "An Economic Analysis of Government Ownership and Regulation: Theory and Evidence from the Electric Power Industry," Public Choice, Vol. XIX (Fall 1974), pp. 1-42.

choice based on constrained utility maximization. Characteristics of the managers' opportunity sets will affect decisions systematically, he believes. Institutions will affect behavior in that ". . . different institutional arrangements, by establishing different structures of property rights, present decision-makers with different cost-reward structures and thus affect outcomes systematically."[5]

DeAlessi argues that considerations about incentives created by regulation for IOUs should include the weakened rights to profits for owners. If property rights are attenuated by a profit constraint, however, the gain to owners from enforcing restrictive contracts on IOU managers is believed to fall, ". . . thereby implying an increase in the manager's opportunity set."[6] If a manager's contract determines his personal performance, he will thus enjoy ". . . increased welfare at the expense of the fisc and the firm's owners."[7]

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[5] DeAlessi, "Economic Analysis", Public Choice, p. 6. DeAlessi's article rests on previous work by Alchian and Demsetz, "Production", AER. These authors propose the theory that profit, nonprofit, cooperative, and other types of firms differ in their behavior by creating contrasting incentives for management to monitor joint inputs and thereby reduce shirking. This theory, a part of the Chicago School approach to economic analysis, will be critiqued later in this chapter.

[6] DeAlessi, "Economic Analysis", Public Choice, p. 6.

[7] *Ibid.*, p. 6.

To increase his pecuniary income, the manager of an IOU may increase either his salary, the time period during which he receives it, or both. These goals imply increasing output, sales, and the size of the firm -- activities similar to those found in unregulated private firms. But the binding profit constraint, according to DeAlessi, also implies increased opportunity by managers to obtain <u>non</u>pecuniary sources of utility. Some possibilities include larger and better staff and expansion of the firm beyond the profit maximizing size.

Turning to municipal electric companies, DeAlessi employs a theory developed by Alchian who believes that ". . . the crucial difference between private and political firms lies in the relatively higher cost of transferring ownership shares in the latter."[8] According to this theory, high transfer cost rules out taxpayer (owner) specialization in ownership and ". . . inhibits the capitalization of future consequences into current transfer prices (if such prices were available) thereby reducing incentives to detect and police managerial behavior which is inconsistent with employer's welfare."[9]

Limitations are imposed on managers of public electric firms, according to DeAlessi, by the budgetary and political constraints on managerial discretion and by some discipline

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[8] *Ibid.*, p. 7 (A. A. Alchian quoted by DeAlessi).

[9] *Ibid.*, p. 7.

in the market. Yet, DeAlessi views the managers of public electric companies as having relatively fewer constraints on opportunities to derive utility than their private counterparts, especially for utility derived from nonpecuniary sources. Since future profits are less of a concern in public firms, DeAlessi deduces that municipals will invest in advanced techniques of production, excess capacity, and long lasting assets (so as to avoid breakdowns). The author also deduces more municipal responsiveness to the wishes of employers and their unions.

Managers of IOUs have greater incentive, he believes, to seek the wealth maximizing degree of price discrimination, whereas the managers of municipals have greater incentive to seek simpler (easier to administer) and lower price rate structures. Municipals are also throught to provide less variation in services (because of a lower incentive to further owners' welfare) and higher quality services (so as to reduce complaints and heighten company prestige).

In essence, thus, DeAlessi assumes informed rational decision making by managers and hypothesizes that differences in managerial incentives within public and private firms are the overriding behavioral influences which account for performance differences by the companies. After developing this framework of analysis, DeAlessi describes and carefully analyzes a large number of empirical studies on the performance of electric companies. Included in this survey are works by Peltzman (1971), Moore (1970), Mann and Seifried (1972), Colberg (1955), Jackson (1969), Mikesell and Mann (1971), and Primeaux (1974). His analysis of the literature leads DeAlessi to the following conclusions:

> . . . The evidence suggests that municipal firms, relative to privately-owned regulated firms, in general will: charge lower prices; have greater capacity; spend more on plant construction; have higher operating costs; engage in less wealth-maximizing price discrimination, including fewer peak-related tariffs; relate price discrimination less closely to the demand and supply conditions applicable to each group of users; favor business relative to residential users; offer a smaller variety of output; change prices less frequently and in response to larger changes in economic determinants; adopt cost-reducing innovations less readily; maintain managers in office longer; exhibit greater variation in rates of return.[10]

Yet immediately after summarizing his conclusions, DeAlessi admits that the evidence is "not overwhelming."[11] "Levels of significance," he writes, "often are not low enough, while the variables used and their measurement frequently lack sufficient precision and theoretical justification."[12] Nevertheless, DeAlessi discerns a "pattern" in the evidence and suggests further research to gather more precise and refined evidence.

Why Are the Conclusions Weak?

Why, with a theoretical model bearing similarities to that developed in Chapter II, did DeAlessi not find stronger evidence in his comprehensive search and analysis of the

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[10] *Ibid.*, p. 36.

[11] *Ibid.*, p. 37.

[12] *Ibid*,. p. 37.

literature? Assuming that the common theoretical concepts do have predictive power, three alternative answers seem plausible.

Assumptions re: Uncertainty

First, DeAlessi's model implicitly assumes perfect certainty by managers. In contrast, uncertainty is a key element of the framework in Chapter II. Uncertainty was regarded in Chapter II as a theoretical limiting factor, an obstacle to collective action, and a phenomenon which implies conservative, nonmaximizing behavior. Given an uncertainty of outcomes, electric companies may adopt different nonmaximizing procedures, even when incentives established by property rights appear similar. These procedures could, in turn, affect company performances.

Institutional Types Too Aggregated: A Comparison with Marc Roberts on Performance

A second possible answer for the weak conclusions in DeAlessi's study is that his institutional categories -- public and private -- are too aggregated. More subtle subclassifications of institutions within the public-private categories may bear substantially on performance outcomes. A more disaggregated analysis of electric company performance would include additional institutional variables as candidates for explaining and predicting company performance.

A Disaggregated Institutional Type Theory. Support for the ideas that DeAlessi's institutional classifications are too aggregated and his assumptions about information too heroic is found in a report of research by Marc Roberts.[13] Roberts uses the impact of electric companies on environmental quality as a single performance criterion. In a series of six case studies of large public and private electric companies, he develops a number of institutional variables which seem related to environmental performance. Roberts' institutional variables are more subtle and multidimensioned than the gross public-private dichotomy. Indeed, one of his conclusions is that the public-private distinction "... contains little predictive information about behavioral differences."[14]

For institutional variables, Roberts turns to factors which determine ". . . the opportunity sets, objectives, and beliefs of (organizational members) and . . . how the organization aggregates their choices into corporate patterns of action."[15] One category of variables includes those of the "external environment" such as a company's product and factor markets, the regulatory constraints upon it, and the social and political pressures to which it is subject. Another category of variables incorporates those of the "organizational structure" which defines member tasks and the resources he

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[13] Marc J. Roberts, "An Evolutionary and Institutional View of the Behavior of Public and Private Companies", The American Economic Review, Vol. 65, No. 2 (May 1975), pp. 415-427.

[14] *Ibid.*, p. 416.

[15] *Ibid.*, p. 415.

controls to carry them out. Included here are ". . . the way authority is delegated, information communicated and the responsibilities, size, and the scope of various functional units."[16] A third category involves the company "control system ," including ". . . all personnel, promotion, and compensation practices that mete out rewards and punishments to members of the organization as a result of their choices and behavior."[17]

Roberts incorporates into his framework of analysis two additional elements which are also part of the institutional framework developed in Chapter II. First, he discusses the need to study values and attitudes. "Individual objectives and beliefs," he writes, "determine how the members of the organization respond to the decision problems which the organization poses to them. The beliefs held by others are also an important aspect of each individual's opportunity set. Such beliefs include personal and professional norms, beliefs which are distinctly characteristic of most organization members and the plans and approach to business problems chosen by top management."[18] Thus Roberts' treatment of values corresponds closely with that of the framework of

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[16] *Ibid.*, p. 423.

[17] *Ibid.*, p. 423.

[18] *Ibid.*, p. 416. Roberts differentiates his analysis from the so-called "behavioral analysis of the firm" with the comment that his analysis "seeks to reproduce the decision problems of particular individuals and not simply the implicit logic of the firm's behavior." (Footnote #1, p. 416).

Chapter II wherein values are viewed as affecting the manner in which participants behave in indeterminant situations and view alternative collective actions to change performance.

A second common element in Roberts' framework and that of Chapter II is the recognition of barriers to collective action for problem solving. Roberts hypothesizes that uncertainty and decision making costs involved in the complex web of institutional relationships will mean that organizations will not optimally achieve, *ex post*, goals subscribed to by management. Rather, Roberts theorizes an evolutionary "muddling through" adaptation of organizations to changing problem situations. Habitual or "historical" behavior is viewed by Roberts as affecting later behavior and the rate of adaptation. Moreover, adaptation, he believes, involves inabilities to reach performance goals and, *ex post*, mistaken, wrong decisions.[19]

These concepts, without exactly the same labels, correspond to some of the situational factors developed in the institutional framework of Chapter II. "Decision making costs" are a kind of transaction cost and are akin, therefore, to "contracting costs." "Habitual behavior in an environment of uncertainty" corresponds to "standard operating procedure" and conservative bias." Roberts does not employ other concepts such as joint impact, high exclusion cost, interdependencies of economies of scale, or malevolence.

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[19] *Ibid.*, p. 417.

These additional situational factors do not emerge in Roberts' framework, possibly because he was concerned with the behavior of single companies. Free rider situations or interdependencies created by economies of size can only be recognized in the context of group dynamics wherein a number of participants, e.g., electric companies, interact in such a way that they fail to achieve collective action. Analysis of a group problem, such as a lack of small company pooling, forces the researcher to incorporate additional situational factors.

In an application of his framework of analysis to the six case study companies, Roberts generates a number of proposed hypotheses and findings.[20] The hypotheses and findings are described in Appendix A. Roberts' contribution to the analysis of institutional performance seems significant. He has extended and refined the institutional variables of concern for the study of electric companies. And he has illustrated the importance of a study of values and attitudes as they affect company behavior.

At first sight, the large number of studies on electric company performance discourages further research. Surveys and analyses of these studies reveal, however, that the most common assumption among them is that the public-private dichotomy provides the significant institutional difference.

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[20] *Ibid.*, p. 419-425.

A more disaggregated institutional research approach may well add useful new knowledge. Appendix A develops this thought by describing Roberts' findings, describing early research in Michigan by Whitesell, analyzing a study on competitive municipals by Primeaux, and reporting on other studies of company performance. The general intent of Appendix A is to provide a base for future research on electric company performance.

Other Behavioral Incentives

Both assumptions of certainty and aggregated institutional types may be reasons why DeAlessi was forced to admit his weak conclusions. A third possible reason is that other incentives, which DeAlessi did not consider, also influence behavior. Many municipal managers in Michigan, when commenting on the fact that their companies are not regulated by the State's Public Service Commission, suggested that they <u>are</u> closely scrutinized by citizen-consumers. The managers' argument was that the various transactions costs involved in citizen-consumer oversight of municipal utilities were very low, and therefore representation through a regulatory commission was unnecessary. Information about municipal operations is directly observable or easily obtainable. Ready access is available to top management and/or officials with direct responsibility. Contact, in fact, between consumers and managers is unavoiable on small town streets. Some reconciliation of consumer complaints is necessary for community harmony. Irresponsible officials face periodic election.

These different incentives and lowered transactions costs were observed by Commons in his early study of municipal electric companies. He wrote that ". . . the result is a constant effort on the part of officials to meet the demand for efficiency and economy . . ."[21] Commons further observed that in small cities with municipals, the voting constituency has a preponderence of small owners and a ". . . thrifty and independent middle class . . . " with no multimillionaries using their ". . . power to exploit neighbors. . ." and no working class ". . . struggling to secure through politics those advantages and liberties which they are unable to obtain in industry." The result, he thought, was simpler administration with wages and hours in conformance to private industry.[22]

The Chicago School Approach to the Puzzle of Coordination

Commons' analysis does not correspond with an approach known in contemporary times as the Chicago School of economics. It is important to consider the Chicago School viewpoint because it offers an a priori hypothesis to answering why small electric companies have not pooled their systems more rapidly. The Chicago School approach to analyzing

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[21] Commons, "Municipal Electric Lighting", Municipal Monopolies, p. 60.

[22] *Ibid.*, p. 60.

electric company monopolies has several elements.[23] Among these elements is the notion that private firms contain more incentives than either cooperatives or public organizations for economizing resources.[24] Since most small electric companies are rural cooperatives and municipals, the Chicago School viewpoint offers an a priori hypothesis about why pooling to achieve economies has been slow to proceed; that viewpoint suggests that incentives to economize may be of insufficient strength.[25]

Two structural characteristics of private firms are used in the Chicago School approach as explanatory factors for why private firms should or do economize more than public or cooperative companies. These structural factors are: (1) a manager who can capture residuals; and (2) owners who can capitalize anticipated future improvements into present wealth through the purchase and sale of stock. Both of these explanatory factors are viewed as creating incentives by managers and owners to economize and reduce shirking among employees of an organization.

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[23] See Harry M. Trebing, "The Chicago School versus Public Utility Regulation", Journal of Economis Issues, Vol. X, No. 1 (March 1976), pp. 97-126.

[24] This notion is most fully developed in Alchian and Demsetz, "Production", AER.

[25] The hypothesis would not explain the lack of pooling throughout the industry, including investor-owned firms as well as public and cooperative companies.

It should be noted, however, that both of the explanatory factors refer to structural characteristics within organizations. A more general view of how incentives direct economizing behavior in organizations needs to include forces and incentives from outside organizations as well as those within.

Both municipal companies and cooperatives are structured in ways to maximize consumer voice. The consumer-citizens of municipals and the consumer-members of cooperatives are given easy access to management. If noneconomizing behavior or employee shirking in a municipal or cooperative results in high rates, poor services, or both, consumers can directly voice their displeasure. Moreover, voice is an especially important mode of communication between consumers and suppliers of electric power. The alternative mode of communication -- exit of the consumer who chooses to purchase from another firm -- is rendered relatively ineffective by the protected monopoly status of suppliers of electricity.[26] Ease of access for consumers desiring to influence municipals and cooperatives creates an additional incentive in these organizations to economize.

Another extraorganizational incentive for managers of small electric companies to economize occurs because of the common practice by managers to change companies. Management of small electric companies requires specialized training

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[26] A theory which uses exit and voice as concepts to explain organizational behavior is developed in Albert O. Hirschman, Exit, Voice and Loyalty (Cambridge, Mass.: Harvard University Press, 1970).

and experience. Job shifting by managers who move from very small electric companies to higher paying positions in larger companies is quite common. By shifting between companies, managers can, in effect, capture rewards for economizing behavior. New managers are hired on their reputation for, among other things, effective monitoring of employee behavior and general economizing skills.[27] This incentive to economize and thereby increase expected income exists for managers of municipals and cooperatives as well as for managers of investor-owned companies.

The existence of these extraorganizational incentives to economize suggests that incentives for managers of electric companies are more complex than the Chicago School approach would imply. Their existence also suggests that incentives to economize in investor-owned firms are not necessarily stronger than incentives to economize in municipals and cooperatives. The Chicago School approach to answering why small electric companies have not pooled systems is insufficient and, perhaps, misleading.

The Need for Performance Evaluation

Harry Trebing has encouraged further study on performance with these thoughts: "In the past, most of the academic literature in the field of public utility economics has

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[27] Ways to improve the job market information about managers and to strengthen incentives for economizing behavior among managers of municipals and cooperatives are proposed in Chapter VI.

dealt with the familiar questions of valuation, rate of return, and pricing. Too often the interminable dialogue on these subjects has seemed to obscure the equally important problems associated with the adequacy and determinants of performance in this sector of the economy. For the most part such problems have either been summarily assumed away of given only implicit recognition."[28]

The Yardstick Argument

Knowledge about the performance of electric companies would provide society with information for public choices about the electric industry. This new knowledge would be an expansion, actually, on the notion of "yardsticks." Proponents of public power sometimes argue for the continued existence of municipals (and federal power investments) because they provide performance information to help regulate IOUs. The extent to which such information is gathered and used is not, however, apparent. In Michigan, the Public Service Commission does not systematically gather data on the state's municipals "because municipals are not regulated." Yet statistics on rates reveal a correlation between public facilities and relatively low regional rates for electricity.

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[28] Harry M. Trebing, Performance under Regulation (East Lansing: Michigan State University Public Utilities Studies, 1968). Even with this point of view, Trebing argued in personal conversation that the more relevant research at this point in time is the study of coordination.

Federal investments in public generating facilities in the Pacific Northwest and Tennessee Valley are correlated with relatively low rate levels for all electric companies in these regions.[29] Whether lower rates for these regions result from more informed regulation (through the use of yardstick comparisons), lower factor costs for federal power, or competition among companies (with small public and cooperative companies having greater access to inexpensive wholesale power) in unclear.

Additional Arguments for Small Company Survival

Other arguments can also be made for a concern in public policies about the survival of small companies, municipals and cooperatives included. Note that the presence of numerous suppliers offers some consumer choice and creates the potential, at least, for citizen-consumers to "vote with their feet" by moving to communities having a desired mix of public-private services, including electricity. The argument for citizen choice in service levels has been most strongly advanced by the so-called "public choice" theorists beginning with Charles Tiebout.[30] Their argument, in essence, is that having numerous

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[29] Average revenue per KWH (residential sales) for the Tennessee Valley area, Pacific Northwest area, and other areas in 1973 were, respectively, 1.28¢, 0.90¢, and 2.14¢. FPC, Statistics of Publicly Owned Utilities, 1973 (Table 16a), p. XLI.

[30] Charles M. Tiebout, "A Pure Theory of Local Expenditures," Journal of Political Economy, Vol. 64 (October 1956). See also Robert L. Bish, "Public Choice Theory: Research Issues for Nonmetropolitan Areas" (unpublished manuscript), 1977.

suppliers of public services allows for the creation of communities with homogeneous patterns of tastes for such services, thereby making the allocation of resources for services coincide closely with citizen preferences. Tiebout's seminal article admits that the argument rests on the assumptions that complete information about alternative choices will be available to citizen-consumers, that negative impacts created by the decisions of one unit of government upon citizens of other units will not be felt, that consumer-voters are fully mobile, that ". . . restrictions due to employment opportunities are not considered . . ." and that ". . . a large number of communities exist in which the consumer-voters may choose to live."[31]

The argument for multiple suppliers can be readily applied to electric companies. Here too a choice is offered to citizen-consumers. With a variety of suppliers, the consumer may choose to locate where the level and mix of electric services suits his tastes. Caution should be exercised, however, about the basic argument itself.[32] Tiebout's assumptions are obviously not completely realistic.

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[31] Tiebout, "Pure Theory", JPE, p. 24.

[32] Two recent provocative critiques of the Tiebout argument can be found in Alan K. Campbell, "Approaches to Defining, Measuring, and Achieving Equity in the Public Sector", Public Administration Review (September/October 1976), pp. 556-562 and Max Nieman, "From Plato's Philosopher King to Bish's Tough Purchasing Agent: The Premature Public Choice Paradigm," American Institute of Planners Journal (March 1975), pp. 66-82.

Information about alternative sets of services in various communities is imperfect. Significant negative spillovers among communities do occur. Moreover, "voting with one's feet" requires resources and is biased against the poor. The poor have, by definition, less effective demand.

What the argument for multiple suppliers does offer is a hypothesis. For the researcher concerned with the question of survival for small electric companies, this argument offers the hypothesis that numerous citizen-consumers benefit by the choice of electric companies. What is needed is performance analysis about who gets what. The argument of multiple suppliers resembles other arguments reviewed in the chapter, i.e., the arguments about efficiency, private being preferable to public, or the desirability of yardsticks. Resemblance derives from the way the arguments are used by proponents, used, that is, almost like answers in search of situations.

Conclusion

The intent of this chapter has been to remove obstructions in order to reveal the need to consider performance or who gets what. Appendix A takes the next step by analyzing several helpful previous research efforts on performance and suggesting some new performance criteria.

A review of the literature reveals that several global hypotheses about the desirability or undesirability of having small municipals and cooperatives have been advanced, but these either remain untested or the conclusions are weak.

Analysis of the Chicago School viewpoint of municipal and cooperative behavior shows it is narrow and probably misleading. Roberts' insightful disaggregated research suggests that the global hypotheses about differences among public, private, and cooperative organizations are unlikely to bear fruit and that performance is related to more specific institutional variables. An agenda for disaggregated performance analysis is established.

Normative choices are, however, necessary in any research effort, and the choice in this effort was to meet the immediate need suggested by small company spokesmen for information about the consequences of coordination and the barriers to achieving power pooling relationships. An analysis of the costs/benefits of power pooling, using an existing pool with eight years' experience, is the subject matter for Chapter IV. In Chapter V the topic will be the limiting situational factors which have impeded the development of three power pools in Michigan. A need for more conclusive research on performance is suggested by the review of literature contained in this chapter. The immediate research task is, however, an analysis of small company power pooling. Does such pooling provide economies? Why have small companies been slow to coordinate their systems? What policies are likely to solve the problem?

CHAPTER IV

A COST EFFECTIVENESS EVALUATION OF THE MICHIGAN MUNICIPALS AND COOPERATIVES POWER POOL

> A careful study of the periodical indexes . . . reveals few writings by economists, public utility or otherwise, on pools as subjects of economic interest. Yet people in the power industry are excited about the economic possibilities in the integration of electrical systems.[1]

Introduction

Unanswered Questions

W. Stewart Nelson's statement that economists have not written about power pools was made almost ten years ago, and since that time several economists have examined pooling.[2] Yet, three major questions have not yet been answered. First, given that projected estimates reveal significant potential savings from coordination, how do actual experiences conform to the projections? Second, what distributions of costs and benefits among coordinating participants are revealed in the actual experiences, and how can differences be explained? And third, what methods can be developed to estimate the magnitude and distribution of costs and benefits in actual experiences?

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[1] W. Stewart Nelson, Mid-Continent Area Power Planners: A New Approach to Planning in the Electric Power Industry (East Lansing: Michigan State University Public Utilities Studies, 1968), p. 19.

[2] See especially C. E. Olson, Cost Considerations; Breyer and Macovoy, Energy Regulation; Uri, "Spatial Equilibrium," AJAE; and Pachauri, Dynamics.

A Case Study of MCP

This chapter provides, at least, some partial answers to these questions by analyzing the Michigan Municipals and Cooperatives Power Pool (MCP). The pool has existed since 1968, involves five members -- two cooperatives and three municipals --, and, as revealed by Figure 4-1, the map on the following page, covers the northwestern region of Michigan's lower peninsula. Chapter IV begins with a detailed description of MCP. Next, analytical techniques are developed, and an analysis of the experience of the pool is made to determine the size and distribution of net benefits among the pool members. Explanations for differences in distribution are formulated and tested. The chapter concludes with consideration of the sources of pooling benefits and of the impact of MCP on interrelated nonmembers.

Description of the Pool[3]

Participants and Relations

MCP involves a complex set of relationships among nineteen public, private, and cooperative electric power companies in Michigan. The core subset of relations is among two G and T

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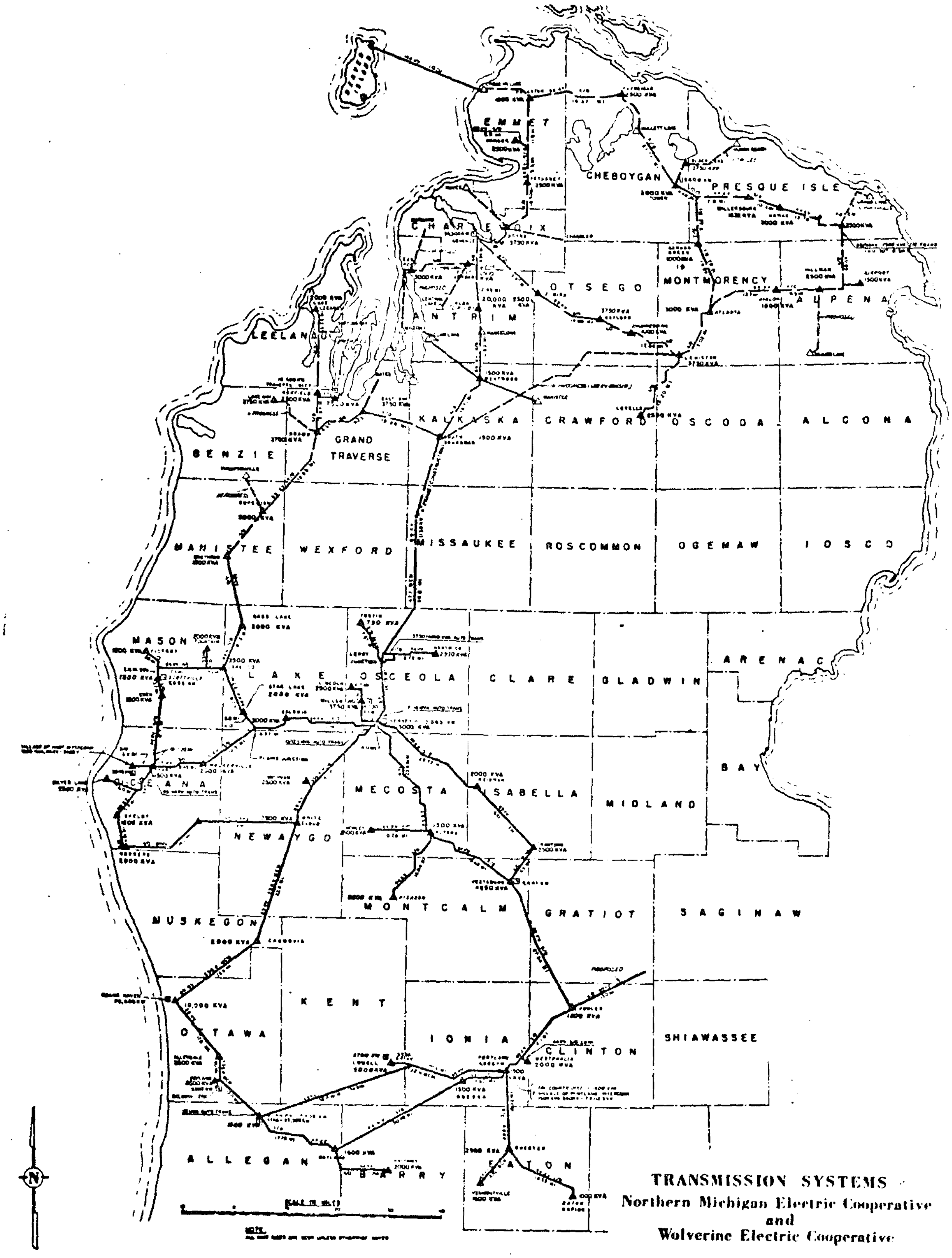
[3] This section is based upon an analysis of the Michigan Municipals and Cooperatives Power Pool Agreement. In addition, the section draws upon conversations with electric company managers and assistant managers at Grand Haven, Northern Michigan, Traverse City, Wolverine, and Zeeland (manager only). Other helpful sources of information were Mr. Al Hodge of Daverman Associates and feasibility studies done for pool members by Daverman Associates (Grand Rapids, Michigan), Lutz, Daily and Brain, Consulting Engineers (Kansas City, Missouri), and Pfeifer and Shultz, Engineers (Minneapolis, Minnesota).

Figure 4-1



TRANSMISSION SYSTEMS
Northern Michigan Electric Cooperative
and
Wolverine Electric Cooperative

cooperatives -- Northern Michigan and Wolverine -- and three municipal utilities at Grand Haven, Traverse City, and Zeeland. Figure 4-2 indicates the nineteen companies involved and the direction of possible power flows among the companies.

Pool Structure

The initial MCP Agreement, signed in 1968, clarified and formalized interconnections among Grand Haven, Northern Michigan, Traverse City, and Wolverine. Zeeland became a full member in late 1975.[4]

As illustrated in Figure 4-2, Northern Michigan supplies wholesale electricity to three member distribution cooperatives, and Wolverine supplies four cooperatives and the Portland municipal. In addition, Wolverine has interconnection arrangements with the cities of Hart and Lowell.

The agreement between MCP and Consumers Power Company was signed in 1973. Early transactions between Consumers and the pool were generally in the form of purchases by Northern Michigan of wholesale power from the IOU. Subsequently, in 1974, Consumers began wheeling power from the Detroit Edison Company in the pool. In 1976, Consumers also began wheeling power sold to the pool by the Lansing Board of Water and Light, a municipal utility.

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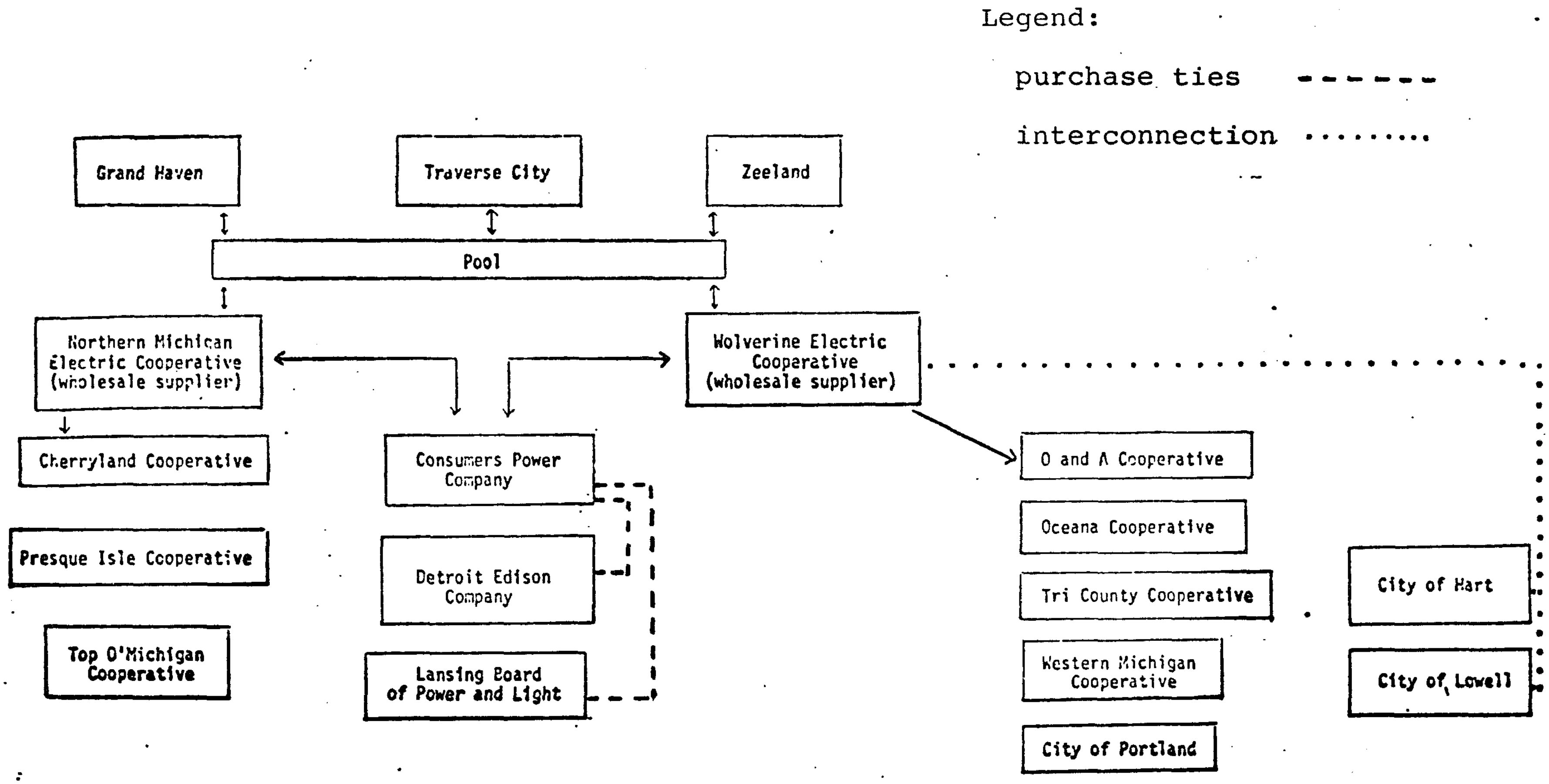
[4] Under the terms of the agreement, any of the full members may terminate their participation in the pool with five years' written notice to the other members.

Figure 4-2 Michigan Municipals and Cooperatives Power Pool (MCP)



According to the MCP Agreement, the three municipal and two cooperative members intend collectively to provide capacity to meet the annual system demands of the members and to provide adequate reserve capacity.[5] To meet this end, the members have agreed to promote and encourage coordination in the operation of the individual systems and in the planning and construction of new facilities.

Operating Committee

Formal structure in the pool consists of an Operating Committee and a Planning Committee, each of which holds meetings at least twice a year following the summer and winter peak load seasons. The Operating Committee determines and recommends practices, rules, and procedures to coordinate member systems through the provision of various services. Both this committee and the Planning Committee operate according to a unanimity rule. Authority in the committees is limited to that of recommending actions.

Planning Committee

Plans for the acquisition of additional power sources and transmission facilities are reviewed by the Planning Committee for the determination and recommendation of

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[5] System demand is defined in the agreement as the number of kilowatt hours required in any clock hour by any member system to supply energy, including wheeling losses. Annual system demands are the kilowatt hours required over a year's time. Seasonal system demand is defined as the highest system demand incurred by a member during a peak load season. The seasons are: Winter (November 1 through April 30) and Summer (May 1 through October 31).

practices, rules, and procedures to coordinate the systems. While the Planning Committee is governed by a unanimity rule, if disagreement occurs in the committee, alternative recommendations with evaluations of advantages and disadvantages for the choices are submitted to the members for final approval.

Plans for new installations submitted by the Planning Committee to members are to include recommendations for:

1. capacity of the new facility;
2. location;
3. time when the facility should be placed in operation;
4. member or members who should make the installation and the division of costs;
5. purchases and sales between the members to enable each to maintain capacity equal to or greater than its seasonal system demand plus its reserve capacity obligation.

Reserve Capacity

Obligations for reserve capacity are shared among members in order to meet the reserve responsibility assumed by MCP as a whole. The reserve of the MCP pool is determined under an agreement with Consumers Power Company with provisions that the reserve will be at least equal to that provided by Consumers Power for its system but not more than twenty percent of the projected MCP peak load for the oncoming peak load season.

This pool responsibility for reserve capacity is divided among the members as an obligation according to the ratio of the individual company's forecasted seasonal system demand to the sum of all the members' forecasted demands for the same season. For example, for the summer, 1976 peak load season, the reserve responsibility for the pool was 36.3 megawatts (MW). The ratio of Grand Haven's forecasted peak load (32 megawatts) to the sum of the members' forecasted peak loads (211 megawatts) was 15.16 percent. Grand Haven thus had a reserve obligation of 15.16% X 36.3 MW = 5.5 MW for the season.[6]

In the event that a member does not have sufficient capacity to meet its own projected demand plus its reserve obligation, that member must secure additional capacity from inside or outside the pool. Generally, the member who has found itself in the position of needing to secure additional capacity has been Northern Michigan. To meet the requirement of securing additional capacity within the pool, a member can purchase "seasonal capacity" from those members who have excess generating capacity.

Sale of such seasonal capacity represents a dedication of the generating capacity of the seller to the purchaser. The in-pool capacity charge rate for sales of seasonal capacity is $1.25 per kilowatt per month, if the capacity is committed from the seller's generating facilities, which existed at the time of the pool inception, or a mutually

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[6] The example was provided by Pfeifer and Shultz, P. C. Engineers, Board of Light and Power, City of Grand Haven, Michigan: Report on 1976 Power Study (Minneapolis, December 1976), no page number.

agreed upon charge, if the capacity is committed from generation installed after the inception of the agreement or if it is secured from a third party.[7] An energy charge per KWH is also included for those occasions when reserves are actually utilized and is calculated as the seller's marginal costs incurred in providing the electricity plus ten percent.

Service Schedules

In addition to the sale of seasonal capacity and energy interchange previously described, four other types of services exist within the pool. Services are identified and described within the pool agreement by an alphabetical "schedule," described in total in Table 4-1.

Table 4-1 Service Schedules in MCP

Service Schedule	Service
A	Seasonal capacity and energy interchange.
B	Emergency and scheduled outage interchange.
C	Daily operating reserve interchange.
D	Economy energy interchange.
E	Wheeling.

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[7] This charge for capacity is quite low as compared to the annual fixed costs of generating equipment. Such costs vary, at 1977 prices, from about fifty to one hundred dollars per killowatt of capacity.

Any member may request services from other members under the provisions of Service Schedules B, C, and D. Those requested must supply the service up to the full amount of their capability not already being used. Requested members must also provide wheeling services insofar as such wheeling will not interfere with other obligations.

Payment for emergency and scheduled outage interchanges under Schedule B may either be in-kind or at a price of "marginal costs" plut ten percent.[8] Daily operating reserves are defined in the agreement as reserves to meet daily contingencies. The price for such services are, again, incremental costs plus ten percent or on a basis which equally divides the savings resulting from the transaction between the two systems.

Wheeling service under Schedule E involves transmission services between members to deliver seasonal energy and/or emergency or scheduled outage energy over a transmission system of a company not a party to the transaction. The price for wheeling is $0.15 per kilowatt per week for reservation of wheeling capacity plus 0.4 mills per KWH wheeled. During the first thirty minutes of an emergency outage, no charge is made.

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[8] Later analysis will reveal that the pool uses a substitute <u>average</u> cost calculation for true marginal cost.

Method for Allocating, Pricing, and Estimating Savings from Economy Energy

The Pool's Estimate for Average Variable Costs

Economy energy interchanges, under Schedule D, constitute the bulk of the interchanges made within the pool and are also priced so as to divide equally the savings achieved.[9] Every month an "average cost" figure is derived for each generating unit within the pool. This number is calculated by dividing the cost of fuel consumed within the unit during the three previous months by the output of the unit during those months. So derived, the number may be termed the pool's estimate of an average variable cost (AVC_n^p) for the *n*th generating unit owned by pool members.[10]

The pool uses AVC_n^p to approximate true incremental or marginal cost (MC_n). AVC_n^p differs from MC_n in three ways. First, AVC_n^p is a type of average cost and not a marginal cost. Second, AVC_n^p is an average cost figured for <u>one</u> level of output only -- the average output of a generator for the previous three months. And third, AVC_n^p includes fuel costs only. Each of these differences has implications for the pool's ability accurately to divide the savings derived from economy interchange.

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[9] See p. 68.

[10] The "p" in AVC_n^p represents "pool" and distinguishes <u>this</u> calculation of average variable costs from other average variable cost calculations.

Transactions involving economy energy within MCP proceed as follows. When a member within the pool requires more energy, the AVC^p for all units within the pool operating at less than capacity are noted at the central dispatch station near Big Rapids, Michigan. That unit with the lowest AVC^p (for example, unit s_1 with $AVC^p_{s_1}$) is chosen by the dispatcher and put "on line" by its owner. If capacity is reached on the first unit chosen, an additional unit or units will be employed using the same allocation rule.[11]

The total expected savings resulting from the transaction are estimated by the pool by using the difference between seller's costs ($AVC^p_{s_1}$) and the buyer's opportunity cost for self-production, i.e., the lowest AVC^p among the idle units owned by the buying member (for example, unit b_1 with $AVC^p_{b_1}$). Price for the transaction is determined by adding to $AVC^p_{s_1}$ one half of the difference between $AVC^p_{b_1}$ and $AVC^p_{s_1}$. That is, the expected buyer's savings which are obtained by purchasing rather than self-generating the electricity is divided equally between buyer and seller. Each transaction has a distinct price. For the example transaction, the price would be:

$$\text{Example Price} = AVC^p_{s_1} + \frac{AVC^p_{b_1} - AVC^p_{s_1}}{2}$$

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[11] The reverse process is used in reducing generation, i.e., the unit with the highest AVC^p will be removed from production first. "Capacity" for each generator is known through a combination of technical (name plate) information and operator-dispatcher experience.

Any transaction will always be a benefit for the seller provided that true marginal costs of the generator used, i.e., MC_{s_n}, are less than the average cost figure used by the pool ($AVC^p_{s_n}$). But if $MC_{s_n} > AVC^p_{s_n}$ then the transaction will be a benefit for the seller only if $(MC_{s_n} - AVC^p_{s_n}) < \frac{AVC^p_{b_n} - AVC^p_{s_n}}{2}$. True marginal costs for both generators s_n and b_n are, however, unknown within the pool so that whether the parties to a transaction benefit and by how much is unknown.

This same type of analysis applies to the purchaser. The transaction will always be a benefit for the buying company provided that the true marginal cost which the buyer would have assumed had the electricity been self-produced (MC_{b_n}) are greater than $AVC^p_{b_n}$. If $MC_{b_n} < AVC^p_{b_n}$, then the transaction will be a benefit for the seller only if $(AVC^p_{b_n} - MC_{b_n}) <$ $\frac{AVC^p_{b_n} - AVC^p_{s_n}}{2}$.

The analysis reveals that actual savings are indeterminable without knowledge of true marginal costs. With a knowledge of marginal costs for the example transaction, total savings at any given level of production could be estimated according to the formula:

$$\text{Total Savings} = MC_{b_n} - MC_{s_n}$$

Without a knowledge of the true marginal costs, pool estimates of savings are likely to be inaccurate. Savings may not, in fact, be present at all, and/or prices may systematically create distributional biases within the pool. To the extent that AVC_n^p is a true predictor of MC_n, estimated savings become accurate.

Possible differences between AVC_n^p and MC_n are understood by the assistant manager of Wolverine, who also has managerial responsibilities for operating MCP. He explains that AVC_n^p is used to calculate production costs, allocate production, and set prices because the pool has only limited knowledge of costs, and AVC_n^p affords a cost estimate which is related to MC_n^p and which does not apparently discriminate against any member of the pool. The assistant manager also believes that MC_n may, over a relevant range, be lower than AVC_n^p even though the latter calculation contains no variable costs other than fuel. He reasons that maintenance costs may, in fact, decline over a relevant range as any given generating unit is fired from start-up to capacity. Figure 4-3 graphically illustrates a representative AVC^p and its hypothetical relationship to other costs. The graph also includes the declining marginal cost hypothesis of the assistant manager at Wolverine.[12]

The curves in Figure 4-3 are for generating unit n and illustrate a marginal cost function (MC_n) which initially declines as the unit is fired from zero output. At output

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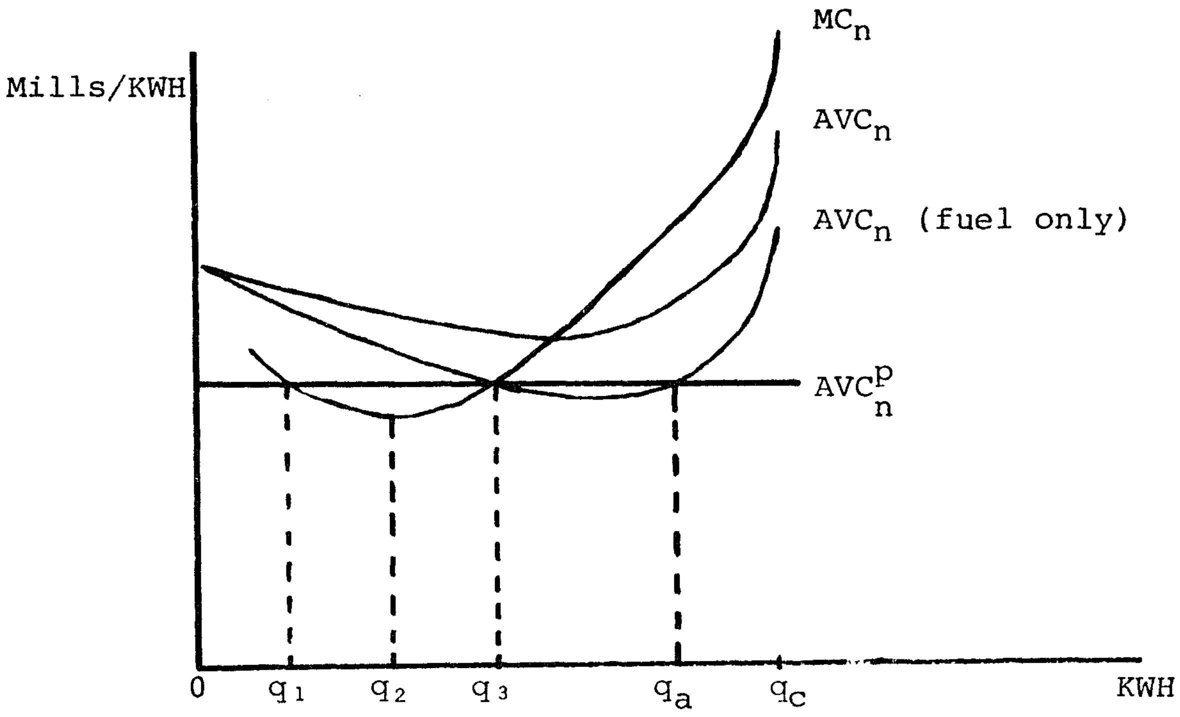
[12] The assumption that the cost curves decline over a relevant range was not tested in this research. Moreover, the assumption is contrary to conventional wisdom about cost curves for electric generators. Differences will be explored in a subsequent discussion.

Figure 4-3 Representative Average Variable Cost (AVC), Average Variable Cost (fuel only), and Average Variable Cost in the Pool (AVC^p) for Generating Unit n



q_2, MC_n begins to rise, and at the capacity output for the generator (q_c), it rises at an infinite rate. The corresponding average cost curves are: average variable cost (AVC) and average variable cost (fuel only). The AVC^p_n figure is calculated as the cost for fuel at the average output of the unit during the past three months (q_a). AVC^p_n is thus shown as a constant function over the whole range of output.

Figure 4-3 is also drawn to illustrate a difference between average variable cost and average variable cost (fuel only). Statistics provided by the FPC reveal that fuel costs were approximately seventy-seven percent of generating expenses for conventional steam generating plants in the United States from 1958 to 1972.[13] During a sample year, 1973, the 41.8 megawatt Advance Steam Plant owned by Northern Michigan REC had the following generating expenses:

Table 4-2 Northern Michigan's Advance Plant Generation Expenses (1973)

	Mills/KWH
Operation Supervision and Engineering	.11
Steam Expenses	.55
Electric Expenses	.28
Misc. Steam Power Expenses	.27
Maintenance, Supervision, and Engineering	.07
Maintenance of Structures	.02
Maintenance of Boiler Plant	.34
Maintenance of Electric Plant	.04
Maintenance of Misc. Steam Plant	.56
Total, Exclusive of Fuel	2.24
Fuel	7.00 (75.7 percent of total)
Total Production Expenses	9.24

Generating costs for gas turbine production reveal a similar pattern. In 1973, for example, fuel costs for gas turbines accounted for eighty-two percent of total generating costs. Of the remaining eighteen percent, most were labor

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[13] Federal Power Commission, Steam-Electric Construction Costs and Annual Production Expenses (Washington, D.C., 1973), p. 76.

costs for operating (eighteen percent) and maintenance (eighty-two percent).[14] Thus while average variable costs and average variable costs (fuel only) would diverge, the difference is not great.

Thus Figure 4-3, which is representative insofar as it incorporates empirical information about fuel costs and the hypothesis of the assistant manager at Wolverine, illustrates that AVC_n^p and MC_n are generally not equal. Only at two levels of output, q_1 and q_3, does AVC_n^p equal MC_n. From zero level output to q_1 and from q_3 to q_c, MC_n is greater than AVC_n^p. From q_1 to q_3, MC_n is less than AVC_n^p. The graphical analysis illustrates the earlier conclusion that pool estimates of savings are likely to be inaccurate. Accuracy requires that MC_n equals AVC_n^p, and such equality occurs only when the example generator is operating at q_1 and q_3. Insofar as MC_n and AVC_n^p diverge, estimated savings from economy energy transactions are indeterminable, and the division of savings inaccurate.

A Possible Systematic Advantage for Buyers of Economy Energy

It is important to note that, given the cost curves as illustrated in Figure 4-3, MC_n is generally greater than AVC_n^p. If the relationship $MC_n > AVC_n^p$ exists, in general, for the generating units of MCP, then a systematic advantage is created

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[14] Federal Power Commission, Gas Turbine Electric Plant Construction Cost and Annual Production Expenses (Washington, D.C., 1973), p. X.

for buyers of economy energy in the pool. By buying economy energy, a pool member would actually save more than is recognized by the pool for the purpose of pricing the exchange. For any given level of output, the difference $MC_b - AVC_b^p$ for the buyer's unused generator is a savings for the buyer which is not shared with the seller.

Similarly, if $MC_s > AVC_s^p$ for the seller's generating unit used in the economy energy interchange, then the seller absorbs an unrecognized cost of production which again is not shared. The difference $MC_s - AVC_s^p$ is a cost incurred by the seller which would not be recognized in the pricing formula for the transaction.

As was previously noted, MC_n is generally greater than AVC_n^p in Figure 4-3. That figure was drawn, however, by accepting the assumption that marginal cost for the generating unit declines over a certain range of output because of declining maintenance costs. Actually, that assumption is contrary to conventional throught about cost functions for electric generating units. Fred M. Westfield has written: "The very nature of (electric) plant equipment insures that marginal fuel rates and hence marginal costs are increasing functions of output."[15]

Westfield's description of the marginal cost function for electric generators requires that marginal costs will always be greater than average variable costs and therefore

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[15] Westfield, "Marginal Analysis", QJE, p. 261.

always greater than AVC^p. Thus the pricing rule for economy energy exchanges in MCP would inevitably and systematically favor buyers over sellers. This theoretical deduction will be subjected to an empirical test in a subsequent section of this chapter.

MCP Agreements with Others

MCP has also established agreements with other public and private utilities for the purchase of wholesale power. Whether, in lieu of MCP, individual company members would have been able to enter into such agreements is unknown. Officials from several of the MCP member companies stated that the existence of MCP prompted the agreements. They argued that because of the pool, these other utilities -- Consumers Power Company, Detroit Edison Company, and Lansing Board of Water and Light -- are assured of and attracted to a large steady market. Moreover, MCP has enough generating capacity among the several members to be a potential supplier of electricity to these outside companies.

The agreement between MCP and Consumers Power is dated September 1, 1973. Statements of purpose, definitions, obligations, etc. are similar to the MCP Agreement. Parallel classes of services to be interchanged are also found in the agreements. Although specific rates for services are included in the MCP-Consumers Power Agreement, Consumers reserves the right to unilaterally apply to the FPC for changes in rates or in any rules, regulations, or contracts entered.

By signing the MCP-Consumers Agreement, MCP members have availed themselves of a potential source of electric power and energy. More importantly, to this point in time, the agreement has allowed MCP access to Consumers' transmission facilities. Purchase of wheeling services by MCP members from Consumers gives access to wholesale purchases of electricity from the Detroit Edison Company and the Lansing Board of Water and Light.

Although the agreement with Detroit Edison is between that company and the pool, transactions have been between the IOU and MCP's two cooperatives. The agreement, effective September 1, 1974, has provided 10,000 kilowatts of Detroit Edison's capacity at 100 percent load factor to Wolverine and the same amount to Northern Michigan. Power is wheeled over Consumers' transmission lines. Under the terms of the MCP-Detroit Edison Agreement, the MCP members maintain potential generating capacity in a state of readiness to supplant the 20,000 kilowatts for up to 50 hours per year upon request of Detroit Edison. Charges for the service as of November 1976 include a "demand charge" of $3.26 per kilowatt of contract demand per month plus an "energy charge" of 6 mills per KWH subject to a full adjustment. During November 1976 the energy charge was about 20 mills per KWH.

First round benefits of the purchase of power from Detroit Edison are to the cooperatives. These benefits involve the difference between the purchase cost to the RECs and alternative purchase or self-production costs. However, the potential of sales of capacity or economy energy by the municipals to the cooperatives within MCP is reduced by purchases by the cooperatives of Detroit Edison electricity. Yet simultaneously, purchases from Detroit Edison displace some generating capacity within the RECs and make generating capacity available for purchases by other members. The ultimate performance consequences have not been studied in this research project and are unknown.

Lansing's municipal utility entered into an agreement with MCP effective June 1, 1976. Again, this agreement parallels the original MCP pool agreement. Wheeling of services is by Consumers Power. In the late summer and fall of 1976, Lansing provided very attractively priced energy to several of the MCP members at approximately twelve mills per KWH. Subsequently, however, the Lansing municipal has had difficulty meeting air emission standards and as of early 1977 had discontinued sales to all MCP members except Northern Michigan. This case provides an example of a shift in externalities which enabled Lansing's citizens to enjoy cleaner air and required higher costs for electricity in other areas of Michigan's lower peninsula.

Analysis of the MCP Experience: Size and Distribution of Benefits

An analysis of the experiences of the five members of MCP was made to develop estimates of the size and distribution of advantages, if any, of membership in the pool. The original method employed and later abandone as unfeasible was a "sample hour method" to estimate advantages of interchange.

The idea was to draw a random sample of hours from the pool history, to record amounts purchased and sold by each company during those sample hours, to attach costs and prices to the transactions, and to estimate, thereby, gains from trade.

A random sample was drawn, and estimates of purchases and sales by company were made for the period August 1, 1968 to July 31, 1976. Pool records on costs and prices proved inadequate for the analysis, however. Records of monthly AVC^p by generating unit, a number which would have provided an estimate of costs, had been discarded prior to 1974. Records on sale price for energy sold within the pool were unavailable at a reasonable research cost for that period of the pool's history prior to late 1975. Because of missing data, the high cost of gathering data that was available, and the ambiguity of the relationship of AVC_n^p to true marginal cost, three alternative methods of analysis were employed.

These alternative methods utilize data published by the FPC on municipals and the REA on cooperatives, supplemented with records provided by each of the five pool members. Some simplifying assumptions are required by the alternative methods which, as they differ, yield differing estimates of advantages for pooling.

Even had the sample hour method been feasible, its application was only to savings from interchange transactions. Similarly, the three alternative methods also apply only to interchange transactions. Other savings (and costs) of pooling, however, need also to be considered. Thus estimates were developed for the savings of delayed construction, the costs of necessary transmission and interconnection facilities the costs and benefits of capacity charges, as well as the benefits of interchange transactions. Each of these categories of costs and savings and the methods of estimation employed are described in turn. For each category, estimated amounts are found by contrasting two case situations -- the actual case of pool membership and the hypothetical case of isolated operation.

Savings in Delayed Construction

A standard rule within the electric industry is that an isolated company should have "firm power capacity" to meet peak system demands. Firm power capacity is defined as the summed capacity of generating units available to the company except for the largest single generating unit. In contrast, the rule on reserve generation within MCP is that the pool as a whole will have reserves of twenty percent of the projected pool peak load for the oncoming peak load season.

Thus, expectations are that by participating in a pool, individual companies can rely upon other pool members for reserves and delay construction of new generating units.[16] Companies can avoid the cost of interest on debts or the opportunity cost of interest payments foregone when retained earnings are used for new construction. Another cost avoided is the depreciation cost on equipment. Delayed construction may also permit the avoidance of negative environmental impacts. While no attempt was made in this study to calculate environmental benefits, they may be significant, especially for Traverse City.[17]

The method employed in calculating savings by avoiding costs for interest and depreciation is as follows. Each member of the pool furnished information about its annual peak system demands in megawatts for the period 1968 to 1976. Next, the "firm power capacity rule" was applied to each company. When firm power for any given year was insufficient to meet peak load for that year, new construction was assumed for the hypothetical case of isolation. Management in the companies was assumed to possess correct forecasting ability so that investments were not made "too late" or, as would be more likely, "too early" to meet the firm capacity rule.

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[16] One potential problem in power pools such as MCP, i.e., a power pool without common generating capacity, is that the incentive to rely on fellow pool members for generating capacity will create conflict about which member(s) should add new capacity.

[17] A scrapbook of local newspaper clippings maintained by Traverse City's municipal company contains numerous descriptions of community opposition to the municipal's power generating plant on Grand Traverse Bay. Dissatisfaction has been voiced about fly ash in the air, plant unsightliness, and uncertain impacts on the Bay's ecosystem.

Interest costs were calculated at six percent compounded annually.[18] A straight line method of depreciation over a thirty year period was applied to new generating equipment.[19]

During the eight year period of pool history studied, three pool members actually installed new generating equipment. Grand Haven added seven megawatts of diesel generation in 1975. Northern Michigan added twenty megawatts of gas turbine generation in 1971, and Wolverine added twenty megawatts of gas turbine generation in 1973. When the firm power capacity rule dictated new capacity for hypothetical isolation, these investments were assumed shifted to earlier years and, when necessary, were assumed duplicated to provide the required capacity.

Traverse City made no new investments during the study period. To meet the firm power requirement for this municipal in the isolated case, a hypothetical investment in a fifteen megawatt gas turbine generator for 1970 was assumed. This

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[18] Choice of an interest rate was somewhat arbitrary. The choice can be defended, however, with reference to United States Government Bond Yields over the study period 1967 through 1975. Yields on United States bonds due or callable in 10 years or more for the study period averaged 6.047 percent.

See U.S. Department of Commerce, Bureau of the Census, <u>Statistical Abstract of the United States, 1976</u>, 97th edition (Washington, D.C., 1976), p. 495.

[19] The straightline method of depreciation is employed by all REA members and was applied over thirty year periods in feasibility studies supplied by Daverman Associates Incorporated for new generation at Grand Haven and Traverse City.

assumption is defended on the grounds that a feasibility study done for Traverse City in 1968 recommended that if the municipal were to follow a plan of isolated operation, the fifteen megawatt turbine would be necessary. Also, gas turbine generation requires less initial capital investment costs (but higher operating costs) than does steam generation.[20]

While actual construction costs provide an estimate for hypothetical costs for investments required to maintain firm capacity, the actual figures must be deflated to reflect price differences in two time periods. Actual construction costs were deflated for the study by using the Handy Whitman Cost Index for construction costs of electric light and power.[21]

Costs for Transmission and Interconnection

Another category of costs required for the formation of power pools is the cost for added transmission and interconnection facilities. Almost all of these costs in MCP have been paid by the two cooperatives. An assumption was made in the analysis to assign any and all interconnection costs among members of the pool to the formation of MCP. Some officials argued that a

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[20] Hass estimated that for the period 1970 to 1972, basic coal fired plants in the United States cost an average of one hundred thirty-five dollars per kilowatt of capacity and that SOx removal equipment cost an additional fifty dollars per kilowatt for a total of one hundred eighty-five dollars average cost per kilowatt. Northern Michigan and Wolverine gas turbine plants cost ninety-five dollars per kilowatt of capacity and one hundred and six dollars per kilowatt in 1971 and 1973, respectively. See Jerome E. Hass, Edward J. Mitchell, and Bernell K. Stone, Financing the Energy Industry (Cambridge, Mass.: Ballinger Publishing Company, 1975), pp. 115-118.

[21] This index reveals that construction costs for new generation facilities doubled over the 1967 to 1975 study period. See U.S. Department of Commerce, Statistical Abstract, p. 734.

proporation of these costs would have been incurred even if the pool had not been formed. But the assumption that all interconnection costs should be assigned to MCP is suggested because no official was able to say what part of the costs were pool related implies a more conservative estimate of the advantages of pooling. The six percent interest rate and straight line depreciation over thirty years previously employed in estimating construction costs were also applied to costs for transmission and interconnection.

Capacity Charges

These charges, calculated within the pool by the manner set forth in the agreement and previously described, have been paid almost exclusively by Northern Michigan to other pool members. Northern Michigan has a very rapidly growing system load and has been chronically short of power service since the pool's beginning.[22] Capacity charges paid by Northern Michigan, and by Traverse City on rare occasions, show as capacity receipts to the receiving system.

Purchases from Non-Pool Companies

Purchases by MCP members of electricity supplied during the eight year period by Consumers Power Company and Detroit Edison Company are assumed in the study to be independent of the existence of the pool. Although some officials attributed

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[22] The manager of Northern Michigan related in February 1977 that his system's load is growing at a rate of about eleven percent per year. Nationally, loads are growing at a rate of about seven percent per year. The manager of one of Northern's member distribution cooperatives -- Top O' Michigan at Boyne City -- stated in February 1977 that his system's load has been growing recently at a rate of over twenty percent per annum!

such purchases to the pool, it becomes difficult to determine when and if such purchases would have occurred in the hypothetical case of isolation. Again, because the purchases were made at an expense somewhat less than self-production, this assumption implies a conservative estimate for the benefits of pooling for those members which have purchased power from the IOUs.[23] The conservative bias is balanced somewhat by the additional assumption that Consumers and Detroit Edison would not have provided an attractive source of available generating capacity in lieu of the pool; thus the necessity remains for the companies to invest in additional generating capacity in the hypothesized isolation case.

This second assumption of no attractive capacity source from the IOUs appears realistic. Consumers Power Company surrounds MCP and offers the only source of wholesale power to the MCP members. Consumers has offered an unattractive agreement for wholesale power on a partial purchase basis.[24]

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[23] As stated previously, the effect on nonpurchasing members is indeterminant.

[24] In 1968 Consumers' partial purchase schedule of rates was as follows:

Demand Charges - First 2200 KVA (kilovolt amperes) @ $1.90 per KVA
Over 2200 KVA @ $1.70 per KVA
Energy Charges - First 5,000,000 KWH @ 0.7¢ per KWH
Over 6,000,000 KWH @ 0.6¢ per KWH

In addition, the formula contained a "sixty percent ratchet clause". If the purchaser experiences a sudden jump in required demand (say from the almost inevitable emergency outage in its own base load generators), for the month in which the demand occurred, the purchaser would pay charges on the full demand created. For the succeeding eleven month period the purchaser would be liable for demand charges on sixty percent of the

(continued on following page)

Central Dispatch Costs

Another cost incurred in creating MCP involves interest, depreciation, and labor outlays for the central dispatch center near Big Rapids, Michigan. Wolverine shouldered the total costs of dispatch until 1974 under the rationale that this cooperative needed central dispatch for its own system. One half of the dispatch center costs are assumed in the analysis to be attributable to MCP. Interest costs are figured at six percent compounded annually. Depreciation and labor costs were provided by Wolverine from its own accounts.

Benefits of Energy Interchange Calculated by Three Methods

Three different mathematical models were used to estimate savings provided by energy interchange. The models differ in the underlying assumptions about what mix of generating facilities would have been used by MCP members for the hypothetical case of isolation.[25]

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[24] (continued from previous page) original peak demand; and, during the following eleven month period, it would be liable for demand charges on sixty percent of the first sixty percent. This ratchet effect would continue until a minimum level was reached or until a new peak demand was created. Daverman Associates, Inc., Power Supply Study Prepared for Grand Haven, Michigan (Grand Rapids, March 1968), pp. 5-6.

[25] One assumption common to all three models is that no feedback effect exists between savings and rates for electricity. That is, estimates of savings are derived from differences in costs of operation for the actual experience of pool membership and the estimated costs of production for the hypothetical case os isolation. The same amount of output is assumed for both cases. If savings *were* to be used to lower rates, consumption would likely increase. Since actual output is used to estimate hypothetical output, the feedback of savings onto rates onto consumption would lead to an overestimate for output in the hypothetical case. Estimated savings as developed in the models would be biased upward relative to true savings.

Actual Net Costs of Production

Savings in energy interchange derive from the difference between actual net costs of production and hypothetical net costs of production under conditions of isolation. Thus, all three approaches utilize as one component the actual net costs of production. Actual net costs of production are calculated according to Formula 4-1 below:

Formula 4-1

$$X_{At}=(P_{At}\cdot C_{APt})-(S_{At}\cdot R_{ASt})+(\sum_{j=1}^{n}G_{A(j)t}\cdot C_{A(j)t})+(\sum_{i=1}^{m}N_{A(i)t}\cdot C_{A(i)t})-(\sum_{h=1}^{r}V_{A(h)t}\cdot R_{A(h)t})$$

Where:

X_{At} = Actual net costs of production for member A during time t.

P_{At} = Purchases of electricity from the pool by A during time t.

C_{APt} = Mill price per KWH of pool purchases by A during time t.

S_{At} = Sales of electricity to the pool by A during time t.

R_{ASt} = Mill rate per KWH of sales by A to the pool during time t.

$G_{A(j)t}$= Amount (KWH) of generation by member A from n generators during time t.

$C_{A(j)t}$= Mill cost per KWH of production for n generators during time t.

$N_{A(i)t}$= Purchases from m nonpool sources by A during time t.

$C_{A(i)t}$= Mill price per KWH of purchases from m nonpool sources by A during time t.

$V_{A(h)t}$= Sales to r nonpool retail distributors by A during time t.

$R_{A(h)t}$= Mill rate per KWH of sales by A to r nonpool retail distributors during time t.

Actual net costs of production (X_{At}) are the costs which each pool member has incurred during the period of study in providing energy (including line losses) to its own customers. For the two cooperatives, "own customers" include distribution cooperatives which in turn sell to ultimate customers. For the three municipals, "own customers" refers to ultimate retail customers.

Amounts of sales to "own customers" were found in annual reports published by the REA and the FPC.[26] The next step in calculating benefits of energy interchange involves consideration of the hypothetical case of isolation from other pool members and allocation of production for "own customers" among the various generating units which each member either actually owns or would have owned according to the "firm power capacity rule." Such allocation can be performed in three ways, according to different sets of underlying assumptions. The three ways or models of hypothetical production may be termed: (1) the Adjusted Shares Method (ASM); (2) the Maximum Base Load Method (MBLM); and (3) the Estimated Load Duration Method (ELDM).

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[26] See REA, Annual Statistical Report: Rural Electric Borrowers and FPC, Statistics of Publicly Owned Electric Utilities in the United States (Annual).

In order to calculate sales amounts to "own customers" by the cooperatives, use the REA Annual Report and adjust "KWH Generated and Received" by subtracting sales to the pool and adding interchanges-in from the pool. To calculate sales amounts to "own customers" by the municipals, use the FPC Annual Report and adjust "System Energy Requirements for Ultimate Customers" to include line losses and interchanges-in from the pool.

Adjusted Shares Method

This method involves making adjustments in the actual production figures for the base load and peak load generating units used by the pool members.[27] The first assumption of ASM is that all sales to the pool were accomplished by expanding the output of each member's base load unit(s). Rationale for this assumption comes from the fact that base load units have low cost per unit of output and are called upon first, therefore, in the pool allocation process. All purchases from the pool are assumed to replace the highest output cost peaking unit(s) of each member. The rationale is the same; pool allocation will be used to replace higher cost production with lower.[28] Thus to adjust generation for the hypothetical case

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[27] Base load generating units as compared to peaking units cost more per unit of capacity to construct and cost less per unit of output to operate. For Grand Haven, Northern Michigan, and Traverse City, the base load units are coal fired steam generators. Wolverine uses a convertible gas-oil unit (STAG) as a base unit. Zeeland has only diesel generation. For Grand Haven and Zeeland, the peaking units are diesel. For Northern Michigan and Wolverine, the peaking units were diesel and are now gas turbines. Traverse City uses older, more costly coal fired steam units for peaking purposes. Both Northern Michigan and Traverse City have small hydraulic plants which were assumed to be operating at full capacity according to actual annual production figures.

[28] Occasions may exist when no self reserves are available to the purchaser. Such occasions are the rule for emergency energy and may also occur during the purchase of scheduled outage energy. Under no reserve conditions, the only courses of action for the buyer would either be failure to meet consumer demands, or purchase of energy from a high priced out-of-pool source. To the extent that those occasions do occur, the Adjusted Shares and Maximum Base Load Methods will underestimate savings for the purchasers because they underestimate the true opportunity cost of purchase from a nonpool source or failure to meet system load requirement.

of isolation by ASM, subtract actual sales to the pool from the member's base load unit(s) and add actual purchases from the pool to the member's peaking unit(s).

Next, an adjustment in costs per KWH of output must be made to reflect economies or diseconomies of generator utilization. Previous analysis concerning sales of economy energy has revealed that over a relevant range and up to capacity output, incremental costs are, in the main, fuel costs only.[29] On the average, fuel costs are approximately eighty percent of operating costs. Thus an adjustment is required to change costs of output as generators are hypothetically used more or less. The adjustment factor used was 0.8 of actual costs.[30] The Adjusted Shares Method for deriving the benefits of energy interchange can now be mathematically defined. Three steps are involved in deriving estimates of benefits according to ASM. These steps are shown in Formulas 4-2, 4-3, and 4-4 below.

Formula 4-2

Obtain (G'_{ABt}) with: $G'_{ABt} = G_{ABt} - S_{At}$

Where:

G'_{ABt} = Adjusted output of member A's base load unit(s) during time t according to ASM.

G_{ABt} = Actual output from A's base load generator(s) in time t.

S_{At} = Sales to the pool by A during time t.

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[29] See p. 126.

[30] The adjustment factor of 0.8 is an average adjustment and lacks the precision which a marginal adjustment factor would provide in estimating economies of utilization.

Formula 4-3

Obtain G'_{APt} with: $G'_{APt} = G_{APt} + P_{At}$

Where:

G'_{APt} = Adjusted output of member A's peak load unit(s) during time t according to ASM.

G_{APt} = Actual output of member A's peak load unit(s) during time t.

P_{At} = Purchases from the pool by A during time t.

Formula 4-4

Obtain $B_{A(ASM)}$ with:

$$B_{A(ASM)t} = [(G'_{ABt}-G_{ABt})\cdot C_{ABt}\cdot 0.8 + (G_{ABt}\cdot C_{ABt})]+[(G'_{APt}-G_{APt})\cdot C_{APt}\cdot$$

$$0.8 + (G_{APt}\cdot C_{APt})]+(\sum_{k=1}^{S} G_{A(k)t}\cdot C_{A(k)t})+(\sum_{i=1}^{m} N_{A(i)t}\cdot C_{A(i)t}-(\sum_{h=1}^{r} V_{A(h)t}\cdot R_{A(h)t})-X_{At}$$

Where:

$B_{A(ASM)t}$ = Benefits of energy interchange to pool member A according to the Adjusted Shares Method during time t.

G_{AKt} = Actual amounts of production from S generating unit which are neither peaking nor base units during time t.

C_{AKt} = Mill costs per KWH of production from the S nonpeaking nonbase units during time t.

Maximum Base Load

This second method for estimating the benefits of energy interchange utilizes a conservative set of assumptions to establish a minimum base estimate of benefits. Maximum Base Load assumes away part of the peaking problem for electric companies by taking the actual production figure for a member's base load unit(s) and using this same figure for the hypothetical case of isolation.

That is, MBLM follows the assumption that even had the company been isolated, it would have been able to utilize its base load unit(s) to the extent of the actual production figures. Adjustments in MBLM are in the peaking unit(s) with actual G_{APt} decreased by actual pool sales and increased by actual pool purchases to derive G''_{APt}. Relative to the Adjusted Shares Method, MBLM reduces estimated benefits with the assumptions that electricity which was sold into the pool came from high priced peaking units and that base load units could have been extensively employed for self-production. The precise mathematical estimate of benefits according to MBLM is shown in Formulas 4-5 and 4-6.

Formula 4-5

Obtain G''_{APt} with:

$$G_{APt} = G''_{APt} - S_{At} + P_{At}$$

Where:

G''_{APt} = Adjusted output of member A's peak load units during time t, according to MBLM.

Formula 4-6

Obtain $B_{A(MBLM)t}$ with:

$$B_{A(MBLM)t} = G_{ABt} \cdot C_{ABt} + [(G''_{APt} - G_{APt}) \cdot C_{APt} \cdot 0.8 + (G_{APt} \cdot C_{APt})] + (\sum_{k=1}^{s} G_{A(k)t} \cdot C_{A(k)t}) + (\sum_{i=1}^{m} N_{A(i)t} \cdot C_{A(i)t}) - (\sum_{h=1}^{r} V_{A(h)t} \cdot R_{A(h)t}) - X_{At}$$

Where:

$B_{A(MBLM)t}$ = Benefits of energy interchange to pool member A according to the Maximum Base Load Method during time t.

Estimated Load Duration

This third method requires as data the capacity of generating units available to a given system, relative costs of production among the units, and the distribution of the demand on an electric system over a given period of time. With this data, a prediction can be made of the relative share which each generating unit will contribute to meeting demand. Data from 1968 on the municipals at Grand Haven and Traverse City were provided by Daverman Associates so that this third method for estimating the benefits of energy interchange could be applied to these two pool members only.[31]

Load Duration Analysis can be graphically depicted and is illustrated in Figure 4-4.

This figure shows a typical load duration situation for the companies of MCP. Line ab reveals the distribution of demand for a year. At the lowest level of demand (point b), the kilowatts demanded are approximately forty percent of the peak. Generating units are: a hydroelectric plant which has the lowest relative cost of production and a capacity of approximately twenty percent of peak load; a steam plant which has the median level cost of production and a capacity of

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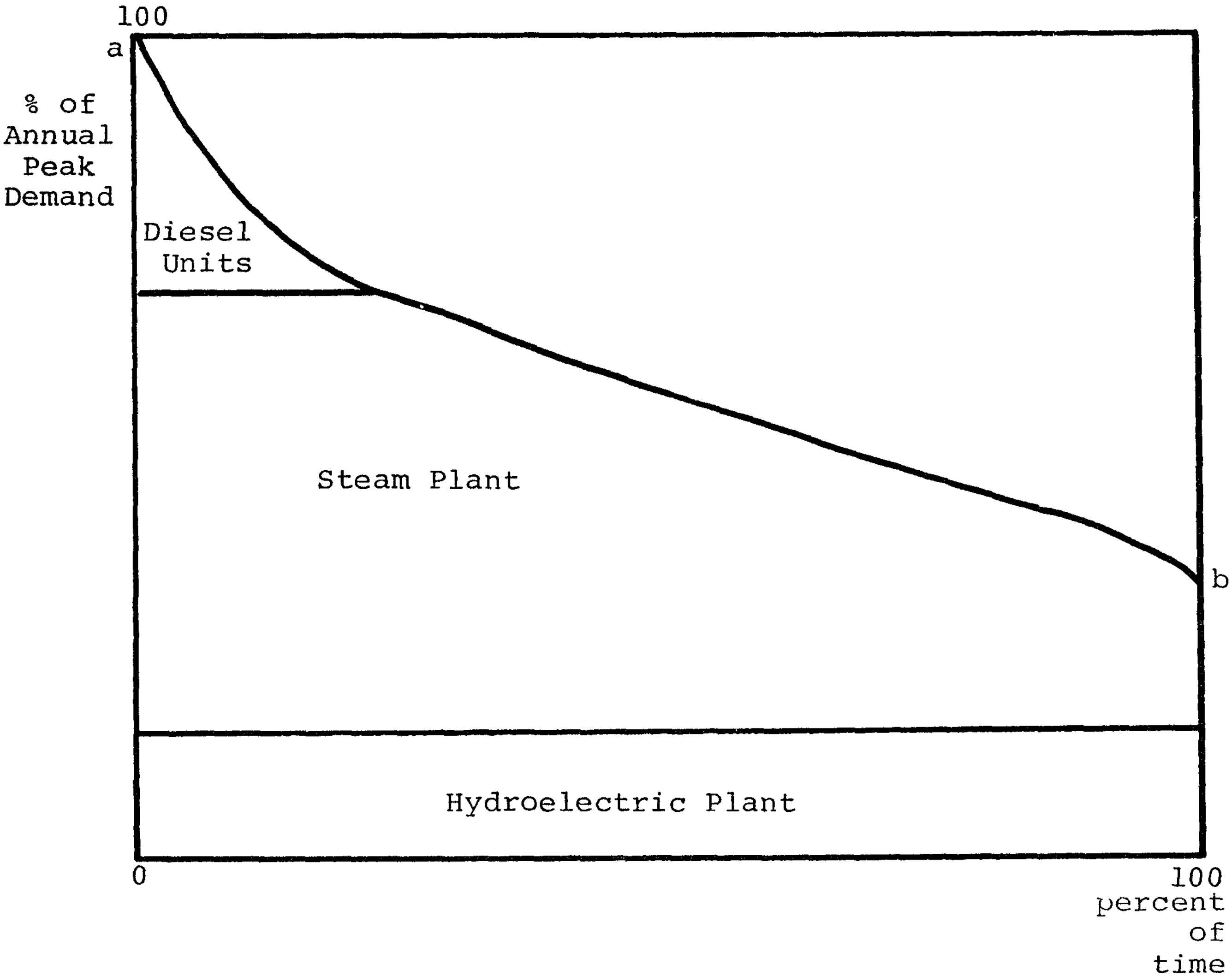
[31] Daverman, Power Supply Study - Grand Haven and Daverman Associates, Inc., Interconnection Capacity and Transmission Firming between City of Traverse City and Northern Michigan Electric Cooperative (Grand Rapids, August 1, 1967).

Figure 4-4 A Typical Load Duration Situation in MCP



approximately seventy percent of peak; and diesel units which have the highest cost of production and a capacity of approximately ten percent of peak. Given the data as illustrated, the hydro plant would produce approximately twenty-five percent of the load over the year; the steam plant would produce seventy percent; and the diesel units would produce about five percent.

Daverman's studies on Grand Haven and Traverse City developed estimates for the percentage of load by generator type under conditions of isolation. Thus as peak load was expected to change year by year, loads by generator type were adjusted. As peak load grows, *ceteris paribus*, base load units are expected to contribute a decreasing percentage of total output and peaking units an increasing percentage of total output.

A major advantage of Load Duration Method over either Adjusted Shares or Maximum Base Load is that it allows for predictions while the other two are empirical only. The disadvantage of the Load Duration Method is that it does not, on its own, account for unexpected changes in shares of production, such as those that would result from emergency outages, maintenance down-time, or conversion shut-downs. A combination of methods to incorporate both experience and prediction seems possible, although such a combination was not pursued for this research.[32] Rather, the three different methods were followed to allow for a type of sensitivity analysis which would find how much estimated savings are affected by differing assumptions.

There are two steps in calculating benefits from energy interchange by ELDM, as illustrated in Formulas 4-7 and 4-8.

Formula 4-7

Obtain G^{*}_{Ayt} with $G^{*}_{Ayt} = G_{Ayt} \cdot f_{Ay}$

(continued on following page)

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[32] For example, the Load Duration predictions for shares of generation could be adjusted by a factor to incorporate different rates of emergency down-time among the various units.

(Formula 4-7 continued)

Where:

$G^{\approx}_{Ayt}$ = Estimated output of member A's y generating units during time t, according to ELDM.

G_{Ayt} = Actual output of member A's y generating units during time t.

f_{Ay} = The fraction of actual generation estimated for generating units by load duration analysis.

Formula 4-8

$$B_{A(ELDM)t} = \sum_{y=1}^{u} [(G^{\approx}_{Ayt} - G_{Ayt}) \cdot C_{Ayt} \cdot 0.8 + (G_{Ayt} \cdot C_{Ayt})] + (\sum_{i=1}^{m} N_{A(i)t} \cdot C_{A(i)t}) - (\sum_{n=1}^{r} V_{A(h)t} \cdot R_{A(h)t}) - X_{At}$$

Results of the Study of MCP Energy Interchange

Estimated savings captured by MCP members through energy interchange only are summarized in Table 4-3. Several pieces of information provided by this table are noteworthy. First, the Zeeland case illustrates that when only one type of generation is used (diesel generation in this case), differences between Adjusted Shares and Maximum Base Load Methods are eliminated.

The Credibility of Adjusted Shares Over Other Methods

Note, too, that only one of the three models -- Adjusted Shares Method -- consistently provides positive estimates of savings. Fourteen of the thirty-two annual estimates of

Table 4-3 Estimated Savings for MCP Members from Energy Interchange Only

Methods:	Annual Periods: 1	2	3	4	5	6	7	8	Totals
Grand Haven									
Adjusted Shares	47,678	51,879	31,687	30,580	42,138	12,104	55,009	262,882	533,957
Maximum Base Load	-22,252	-18,890	-27,148	-75,118	-11,436	-45,433	33,402	240,542	73,667
Load Duration	60,083	40,997	65,545	42,557	41,582	45,637	66,321	265,568	628,290
Northern Michigan									
Adjusted Shares	212,332	86,010	28,321	148,915	421,914	330,506	470,955	422,165	2,121,118
Maximum Base Load	-23,636	-78,337	-93,267	-16,690	188,109	112,176	387,202	183,599	659,156
Traverse City									
Adjusted Shares	4,152	117,219	72,695	102,955	96,672	151,867	251,339	194,424	991,323
Maximum Base Load	-13,743	38,991	25,897	89,914	22,703	23,063	-122,581	-52,282	11,962
Load Duration	4,152	85,044	71,012	126,410	51,730	117,280	-29,389	30,528	456,767
Wolverine									
Adjusted Shares	670,342	669,753	700,083	461,966	407,896	233,787	695,680	520,302	4,359,809
Maximum Base Load	257,049	583,752	620,829	288,398	282,516	127,248	-868,649	198,681	1,489,824
Zeeland									
Adjusted Shares	X	X	X	X	X	X	X	203,914	203,914
Maximum Base Load									

savings as provided by the Maximum Base Load Method are negative; thus the expectation of conservative estimates by this method are fulfilled. The Estimated Load Duration Method provides a negative estimate for savings for Traverse City in FY (fiscal year) 1975. Finally, note that a comparison of estimated savings by Adjusted Shares to estimated savings by Load Duration does not reveal any pattern of relative bias. Adjusted Shares provides a higher estimate for savings than does Load Duration in the Traverse City case and a lower estimate for savings than does Load Duration in the Grand Haven case.

Because the Adjusted Shares Method yields consistently positive estimates of savings, this method gains credence. Descriptions earlier in this chapter of the various types of energy interchange reveal that exchanges are priced in the pool in such a manner that both buyer and seller are expected to gain in any transaction. Economy energy is priced in exchange so as to attempt to divide equally savings between buyer and seller.[33] Emergency and scheduled outage energy are priced in exchange at cost-plus for the seller, thus guaranteeing a seller net return.[34] Likewise, the buyer of emergency and scheduled outage energy will only make purchases when such action is advantageous; the advantage derives from the difference between the higher cost of self-production

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[33] Analysis revealed, however, that buyers may be at an advantage over sellers.

[34] Again, however, if $MC_s > AVC_s^p$ for the seller's generating unit, savings will be reduced and could, in fact, be negative.

to meet emergency and maintenance needs and the lower cost of purchase from the pool.

Distributional Differences: Both Absolute and Relative

Table 4-3 also reveals large absolute differences in estimated savings among the companies. Using the Adjusted Shares Method only, estimated savings range from $4,152 for Traverse City in FY 1969 to $700,083 for Wolverine in calendar year 1970. Another perspective on savings is to consider *relative* rather than absolute figures. Table 4-4 uses the estimated savings as provided by the Adjusted Shares Method and divides estimated savings by total dollar transactions with the pool -- both sales and purchases -- to derive an estimated "savings from energy interchange as percentage of pool transactions" figure.

As Table 4-4 reveals, absolute differences are reduced by the new relative calculation. Estimated savings as a percentage of pool dollar transactions range in total from 29.54 percent for Grand Haven to 93.99 percent for Wolverine.

Yet large differences remain even among the relative figures of Table 4-4. For Traverse City in FY 1969, estimated savings relative to pool transactions are 6.34 percent. The same calculation for Wolverine in calendar year 1970 is 286.57 percent. Some explanation for these large differences is required.

Table 4-4 Estimated Savings as a Percentage of Pool Transactions

Annual Periods:	1	2	3	4	5	6	7	8	Average
Companies:									
Grand Haven	20.46	28.28	20.77	21.26	23.92	11.69	46.44	37.44	29.54
Northern Michigan	177.16	46.69	11.08	47.65	50.05	68.30	86.35	25.67	48.40
Traverse City	6.34	59.67	55.56	43.78	41.67	39.37	51.58	28.39	41.00
Wolverine	221.21	202.03	286.57	130.58	90.69	33.70	78.52	36.85	93.99
Zeeland	-	-	-	-	-	-	-	34.34	34.34

An Empirical Test of the Hypothesis that Buyers Are at an Advantage over Sellers

Recall from previous discussion that theoretical analysis suggests that for each generating unit in the pool, true incremental costs (MC_n) are likely to be greater than the pool's estimate of average variable costs (AVC_n^p). The pool uses AVC_n^p as a proxy for MC_n, however, in attempting to divide equally the gains from economy energy transactions. AVC_n^p is also used as a proxy for incremental costs in pricing sales of emergency and maintenance energy.

But if MC_n is greater than AVC_n^p, sellers will incur costs which go unrecognized in the pool's pricing formulae. Concurrently, buyers will reduce costs by more than the pool will recognize. Thus the hypothesis is deduced that sellers of electricity are placed at a systematic, unrealized disadvantage in pool transactions.

To test this hypothesis, Table 4-5 was prepared. Columns in the table distinguish two types of energy transactions aggregated on an annual basis. First, there are those annual aggregates in which company purchases were relatively low as compared to company sales (purchases being zero to fifty percent of total transactions). And, there are those aggregates in which company purchases were relatively high as compared to company sales (purchases being 50.1 percent or more of total transactions).

Table 4-5 A Matrix to Test the Hypothesis that Buyers are at an Advantage

	Individual Company Purchases as a Percentage of Aggregated (Annual) Pool Transactions		
	Low (0% to 50%)	High (50.1% +)	Total
Individual Company Savings as a Percentage of Aggregated (Annual) Pool Transactions			
Low (0% to 50%)	16	5	21
High (50.1% +)	5	7	12
Total	21	12	33

Rows in the table contain two categories of savings as a percentage of total pool transactions. These categories are "low," with savings captured by individual companies amounting to zero to fifty percent of total pool transactions and "high," with savings being 50.1 percent or more of total pool transactions.

The resulting matrix of data contained in Table 4-5 affords testing the null hypothesis that savings as a percentage of total pool transactions are identical whether or not purchases as a percentage of aggregated annual pool transactions are high or low. The hypothesis will be tested against the one-sided alternative that savings will be low when purchases are low relative to sales.

The appropriate test for the hypothesis is Fisher's Exact Test, a nonparametric test for analyzing count data when numbers of observations are small.[35] This test involves calculating and summing the probabilities that sixteen or more of the twenty-one observed times when savings were low will be correlated with low purchases relative to sales (see the top row in Table 4-5).

These summed probabilities are then compared with a Type I Error tolerance level (α). When the summed probabilities are less than the specified tolerance level (α), the null hypothesis is rejected and the alternative accepted. An ($\alpha = 0.1$) tolerance level was chosen to test the relationship of savings to sales.

Calculations and summation of the probabilities described yields a figure of 0.055.[36] This figure is less than the specified tolerance level (α), and the null hypothesis is rejected. The test implies that buyers gain more than sellers in pool transactions. Inductive evidence from this test adds credence to the original deductive hypothesis.[37]

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[35] See William Mendenhall, Lyman Ott, and Richard F. Larson, Statistics: A Tool for the Social Sciences (North Scituate, Mass.: Duxbury Press, 1974), pp. 333-336. Chi-Square analysis would have been the appropriate test had the number of observations been larger. The expected cell count of the lower right cell of the matrix is less than five, however, thus requiring Fisher's Exact Test.

[36] *Ibid.*, p. 334. The formula for calculating probabilities is given here.

[37] One more point can be made: An additional benefit to buyers may result from the manner in which ASM will underestimate buyer advantage when the buyer has no peak reserves in emergency and scheduled outage situations. See footnote 28 in this chapter.

Other Costs and Savings

Absolute Savings: Apparent and Real

Tables E-1 to E-4 in Appendix E present detailed analyses of total costs and benefits by MCP member by annual periods. Costs and benefits are derived by comparing the actual experience of pool membership with the hypothetical case of isolation. Allocations of generation among the various units owned by companies in the hypothetical case were estimated using the Adjusted Shares Method.[38] Calculations for new generation, dispatch, and interchange facilities costs follow the methods previously described in this chapter.

Table 4-6 is a summary table which reveals the absolute net savings (total net costs in the hypothetical case minus total net costs in the actual case) by member by annual period. The table also illustrates the total "real worth" of net savings at the end of the eight year period by assuming the opportunity to invest net savings at six percent interest compounded annually.

Net Savings as a Percentage of Total Net Costs

Once again, Table 4-6 reveals substantial variance in absolute savings by member. Annual savings range from $30,580 for Grand Haven in FY 1972 (Period 4) to $914,822 for Wolverine in calendar year 1974 (Period 7). A different

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[38] Appendix E also contains parallel tables by company by annual periods for the hypothetical case using the Maximum Base Load and Estimated Load Duration Methods for allocating generation.

Table 4-6 A Summary of Absolute Net Savings for MCP Members: Apparent and Real (Using ASM)

		Annual Periods								
MCP Members		1	2	3	4	5	6	7	8	Totals
Grand Haven	NS[a]	77,774	65,722	51,509	30,580	48,971	63,404	52,237	278,129	$ 668,326
	RNS[b]									$ 780,775
Northern Michigan	NS	282,959	224,813	246,650	348,399	581,505	688,480	748,634	584,569	$3,706,009
	RNS									$4,214,643
Traverse City	NS	-5,802	198,189	216,658	218,653	224,880	276,509	380,862	353,450	$1,863,399
	RNS									$2,174,078
Wolverine	NS	687,442	742,430	764,118	514,513	573,828	343,057	914,822	710,485	$5,250,695
	RNS									$6,532,056
Zeeland	NS	-	-	-	-	-	-	-	203,679	$ 203,679
	RNS	-	-	-	-	-	-	-	203,679	$ 203,679

[a] Net savings (NS) are calculated by subtracting annual net costs in the actual case of pool membership from annual net costs in the hypothetical case of isolation.

[b] Real net savings (RNS) are calculated by multiplying annual figures by six percent interest compounded annually for the appropriate length of time and summing.

perspective on savings is given in Table 4-7 wherein real annual savings are shown as a percentage of annual net production costs for the hypothetical case of isolation (again, using the Adjusted Shares Method). This calculation makes savings reflect differing sizes among the systems and shows the percentage decrease in costs as a result of pool membership. A similar correction for size is reflected in Figure 4-5 wherein the effect of annual net savings on production costs for electricity (in mills per KWH) over time is graphically illustrated.

Explanations for Unequal Shares of Savings

Examination of Tables E-1 to E-4 in Appendix E reveals why differences in savings exist even after corrections for size. First, substantial savings result from postponed construction of new facilities. Grand Haven benefited least by this type of savings in that this company has generally had excess capacity over need.

Some offset for the differential advantage in postponement of construction is provided by the transfer of capacity charges according to the rules of the pool previously described. For the period of study, however, only Northern Michigan, with its significant capacity deficiency, has paid capacity charges.

Other partial offsets exist in that the two members who have most benefited from delayed construction -- Northern Michigan and Wolverine -- also contributed disproportionate shares of interconnection and dispatch costs. In fact,

Table 4-7 Net Savings as a Percentage of Total Net Production Costs in Isolation (ASM)

	Annual Periods								
MCP Members	1	2	3	4	5	6	7	8	Average
Grand Haven	12.2	8.0	5.9	2.8	4.1	4.2	2.5	8.5	6.0
Northern Michigan	12.2	8.4	7.8	8.6	12.8	10.5	12.8	5.0	9.7
Traverse City	-0.9	23.9	24.3	19.2	17.4	18.7	15.6	11.1	16.2
Wolverine	28.2	24.5	23.2	15.5	14.3	7.1	12.7	7.6	16.1
Zeeland	-	-	-	-	-	-	-	19.0	19.0

Figure 4-5 Saving in Annual Production Costs Relative to Total Production

Wolverine alone paid for the dispatching services from the beginning of the pool until 1974, when Northern Michigan paid part, and 1975, when dispatching costs were shared by all members.

Conclusion

Several economists have written about theoretical benefits potentially available to electric companies from power pooling.[39] Savings are expected to arise from economies of size in generation, reserve sharing, and generator site selections which reduce transport costs and environmental impacts.[40] The empirical study of MCP allows for a test of these expectations and estimates for the size and distribution of costs and benefits.

Estimated savings were revealed by the analysis to be quite large. As illustrated by Table 4-7, power pooling reduced MCP member total net costs by an average of more than thirteen percent during the eight year study period. Tables 4-8 and 4-9 show the sources of savings and costs by member company.

Analysis of MCP revealed that the distribution of savings were unequal, even after corrections for degree of participation and size of member. It was demonstrated in the analysis that inequality results from pricing rules in MCP

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[39] See Pachauri, Dynamics; C.E. Olson, Cost Considerations; and W.S. Nelson, Mid Continent Area Power Planners.

[40] See especially, Olson, Cost Considerations.

Table 4-8 Sources of Savings

	Savings			
MCP Member	Energy Interchange	Delayed Construction	Capacity Transfers (In)	Totals
Grand Haven	533,957	12,086	128,663	674,706
Northern Michigan	2,127,118	2,890,799	0	5,017,917
Traverse City	991,323	1,055,445	113,991	2,160,759
Wolverine	4,359,809	1,439,632	280,991	6,080,432
Zeeland	203,914	0	0	203,914
Totals	8,216,121	5,397,962	523,645	14,137,728

Table 4-9 Sources of Costs

MCP Member	Capacity Transfers (Out)	Interconnection Costs	Dispatching Costs	Totals
Grand Haven	0	0	6,380	6,380
Northern Michigan	471,646	779,255	55,007	1,305,908
Traverse City	0	292,323	5,037	297,360
Wolverine	0	631,431	198,276	829,707
Zeeland	0	0	235	235
Totals	471,646	1,703,009	264,935	2,439,590

which may favor energy purchasers, from unequal ability to delay construction, from unequal assumptions of the burdens of making interconnections and providing dispatching services and from capacity charge transfers within the pool.

All members have, however, gained substantial savings by participating in MCP. As loads grow and new generating capacity is provided, differential advantages within the pool may shift, so that the next eight year period may see a substantial redistribution of pooling benefits. In any case, efforts by former and current managers and by oversight institutions to establish and administer MCP have been well rewarded. For an investment of approximately two million dollars, MCP members have captured savings of approximately fourteen million dollars.

In a general sense, savings by MCP have probably benefited member company customers, employees, and the communities in which the companies operate.[41] The burden of these savings have fallen on fuel suppliers and construction firms whose products and services were not required. For a time when conservation of energy is highly valued, the experience of MCP is noteworthy.

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[41] Additional empirical research could be undertaken to determine the distribution of these savings. Without (before) -with (after) studies could be designed to test the impact of pool membership on rates, retained earnings, capital expenditures, salaries, and contributions in lieu of taxes.

The experience of MCP illustrates by example how new institutions can be designed to shift resource allocations. Institutions, that is, can be thought of as instruments for redistribution. Thus state or national legislatures who are interested, for example, in conserving scarce fuel resources can consider the design of institutions such as power pools to facilitate conservation.

CHAPTER V

CASE STUDIES ON SITUATIONAL FACTORS

> Why are not coordination agreements [among electric companies] actively pursued? There seems to be no straightforward answer.[1]

Introduction

The theory that certain situational factors may limit or impede collective action was proposed in Chapter II. In Chapter V three case situations will be analyzed so that this theory can be tested and refined. Methodology will be the chapter's first topic. Consideration will be given to why and how interview techniques were used. Validity of findings and objectivity in this kind of research will also be discussed.

Next, the various hypotheses about situational factors will be reintroduced from Chapter II. These hypotheses will be applied to three Michigan situations: the proposed Michigan Group (MG), consisting of five municipal companies; the Michigan Municipals and Cooperatives Power Pool (MCP), consisting of two cooperatives and three municipals; and the existing power pool of Edison Sault Electric Company (an IOU) and Cloverland Rural Electric Cooperative.

Methodology

Field Studies

When, in the early stages of this research, it became apparent that small electric companies were having difficulty

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[1] Uri, "Spatial Equilibrium," AJAE, p. 654.

achieving coordinative agreements, it was also noted that several case situations existed in Michigan as counter examples. These are cases in which some progress has been made in developing pooling relationships. The cases were investigated by using a field study approach. Field studies have been defined as "*ex post facto* scientific inquiries aimed at discovering the relations and interactions among. . . variables in real social situations."[2] A field study approach was chosen because it offers an ideal method for exploratory research.

Strengths

By studying, in the field, those cases in Michigan in which some collective action to coordinate has already occurred, several research opportunities were created. First, it was possible to learn if the expected situational factors were indeed present as impediments to collective action or if other significant variables also exist and impede collective action. Second, it also was possible to learn from discussions with key participants in the cases how the impediments affect behavior and how impediments were dealt with in achieving that collective action which has occurred. Third, the field studies provided opportunities for tests of hypothetical situational factors. That is, if situational factors were not found in

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[2] Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart, and Winston, Inc., 1964), p. 387. This author provides an analysis of the strengths and weaknesses of field studies. See pp. 387-391.

these case situations, the theory from which the situational factors were deduced, the method of gathering research information, and the representative quality of the cases were all subjected to critical questioning. The final research opportunity created by the field studies was to lay groundwork for future, more systematic, and rigorous testing. Chapter VI will present some ideas for further research, many of which were developed from the field studies.

Field studies may be preferred research tools on the basis of several strengths. They provide realism, richness of detail and the opportunity to study a variety of variables simultaneously. Field studies can be used to subject theories to the test of human action by observing if predicted events actually occur. The studies can also be heuristic or suggestive of further research.

Weaknesses

Some weaknesses in the field study approach are also evident. The approach is *ex post*, leaving no ability for random selections, a priori observations, or control of variables. Richness of detail and variety of variables can create "noise" so that the effect of one independent variable on a dependent variable is unclear. Precision measurements are often difficult in field studies. Finally, field studies may present practical problems, such as feasibility, cost and time.

Case Studies

While case studies and field studies are not synonymous (case studies may be performed in a laboratory), field studies generally involve a case approach. Thus analyses of case methods are relevant to field studies as well.

Leonard Salter describes three types of case study methods and analyzes these by asking how they fit a problem solving approach to research.[3] The first method, which is to "say everything there is to say about a case," is dismissed by Salter as nonproblem oriented. The second method is to study variables within a case context so as to offer "evidential material" on statistical relationships. This second case method, Salter writes, is subject to questions about internal and external validity. Salter's third case method is the study of relations among variables to reveal a case in its "organic unity." By studying an acting unit and the interactions and sequences in its experience, writes Salter, the case method has strong testing force; indeed it ". . . has the quality of testing relations in the only place where they have meaning."[4]

The three case situations for this research, chosen on the basis of progress on coordination, were each observed

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[3] Leonard A. Salter, Jr. A Critical Review of Research in Land Economics (Madison: University of Wisconsin Press, 1967), pp. 39-77.

[4] *Ibid.*, p. 71.

as organic unities. Questions of interest were these: Had collective action actually occurred? If so, were the hypotheses on limiting situational factors not applicable? How had collective action to establish new institutions occurred? To answer these questions, key participants in the situations were interviewed. Conversations with experienced observers of Michigan's electric industry held prior to the field studies revealed a concensus that the managers of the relevant companies constituted the single most important group of participants at the local level. Therefore a series of structured, in-depth interviews were conducted with past and present managers of the relevant companies. Other informal discussions were held with private consultants who are informed about the situations, local and state officials, REA officials, and the Executive Secretary of the Michigan Municipal Electric Association (MMEA).[5]

Focused Interviews

Interviews were chosen over questionnaires for the information gathering technique primarily because of the flexibility which face-to-face dialogue provides. With interviews, questions can be explained; answers may be pursued; complex issues may be discussed. Moreover, the researcher is able to observe

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[5] In retrospect, additional structured interviews with local customers and especially other local officials might have been worth the extra effort. This afterthought is considered in Chapter VI.

more. Uncertainty or hesitation in answering becomes apparent. Finally, subjects are often more willing to set aside the one to two hours required for the personal interviews than they are for answering a written questionnaire.[6]

"Focused interview" was the specific interview technique used in the case studies. This technique has been described and developed by sociologists Merton, Fiske, and Kendall.[7] These authors write that the distinguishing characteristics of the focused interview include the following:

> 1. All the persons interviewed are known to have been involved in a particular situation.
>
> 2. The hypothetically significant elements, patterns, processes, and total structure of this situation have been provisionally analyzed by the social scientist. Through this content or situational analysis, he has arrived at a set of hypotheses concerning the consequences of determinate aspects of the situation for those involved in it.
>
> 3. The social scientist has developed an interview guide, setting forth the major areas of inquiry and the hypotheses which provide criteria of relevance for the data to be obtained in the interview.
>
> 4. The interview is focused on the subjective experiences of persons exposed to the preanalyzed situation in an effort to ascertain their definitions of the situation.[8]

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[6] One problem in using interviews rather than questionnaires is the cost (especially in time) involved. Some would also argue that standardized written questions lend relative validity over spoken questions which inevitably differ somewhat. Yet subjects may well read written questions with different levels of comprehension.

[7] Merton, Fiske, and Kendall, <u>The Focused Interview</u>. See also Selltiz *et al.*, <u>Research Methods</u>, pp. 263-266.

[8] Merton, Fiske, and Kendall, <u>The Focused Interview</u>, p. 3.

The focused interview technique was initially developed in the course of communications research and propaganda analysis, although it has since been extended to study broader fields of human experience.[9] For research on situational factors in pooling, the attempt, of course, was to discern the economic and social processes of power pooling, thus providing evidence on interdependencies created by the situations.

Questions in the interviews were aimed at ascertaining the behavior of company managers or perceptions by company managers about the behavior of others in situations of potential intercompany coordination. Sixteen present or former company managers and presidents were interviewed, one to three times, for a duration of one to two hours for each interview. The company managers, as will be shown, were specifically asked whether the situational factors (developed in Chapter II) affected their behavior or the behavior of others. Follow-up questions were then used to specify the meaning and content of initial answers.

Merton *et al.* provide some methods to help avoid problems in the conduct of focused interviews. Included are suggestions for opening the interview, controlling interview responses, and treating interviewees' questions.[10] In the interviews

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[9] *Ibid.*, pp. 5-11.

[10] *Ibid.*, pp. 171-186.

of electric company managers, however, credibility of answers was generally established through "rules of evidence" similar to the rules used in formal judicial procedures.[11] Since the respondents were describing actual experiences, it was considered useful to ask of their answers: Was the information obtained through direct observation, inference, or hearsay? What bias might the respondent have? How accurate or credible is the information likely to be? How internally consistent are the respondent's answers? And, since others experienced the same situation, how do answers compare?

Tests of Objectivity

Three tests of researcher objectivity are pertinent to the study of situational factors.[12] Indeed, meeting these three criteria has been the goal of the whole of the research effort. The three tests are:

1. Internal Validity. Does the study exhibit clarity of thought and measure? Is it cohesive?
2. External Validity. Does the study correspond with other parallel works? Or (as in the case of studies of situational factors involved in electric company coordination) if other parallel studies do not exist,

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[11] cf. Selltiz *et al.*, Research Methods, pp. 244-274. Formal judicial procedures of evidence are described in John MacArthur Maguire, Evidence: Common Sense and Common Law (Chicago: The Foundation Press, Inc., 1947).

[12] cf. Glenn L. Johnson and Lewis K. Zerby, What Economists Do About Values: Case Studies of Their Answers to Questions They Don't Dare Ask (East Lansing: Department of Agricultural Economics, Center for Rural Manpower and Public Affairs, Michigan State University, 1973).

is the study framed in such a manner that it could be replicated? Does the study satisfy others who share an interest and expertise in the subject matter? If the study's conclusions conflict with other parallel works, are the conflicts revealed and the conclusions defended?

3. The Test of Action. If, on the basis of findings reached in the study, policy action was taken, would the problem be "resolved"? (Whether the findings on situational factors can be used to deal with the problem of establishing small company coordination is, as yet, unknown. Initial attempts have been made to make the findings known to the relevant decision makers, however, and these attempts are described in Chapter VI.)[13]

Situational Factors and Hypotheses Recalled

In Chapter II a process of abduction was used to develop a framework of analysis to fit the bulk power supply problem of small electric companies and to generate some hypotheses.[14]

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[13] Note that these tests of objectivity do not preclude either the employment of values by the researcher or the study of values. An insightful defense of the incorporation of values into research has been written by Robert M. Pirsig, Zen and the Art of Motorcycle Maintenance: An Inquiry into Values (New York: William Morrow and Company, Inc., 1974). A parallel argument, specifically oriented to policy research, has been made by Martin Rein, Social Science and Public Policy (New York: Penguin Books, 1976).

[14] Abduction is the creative thought connection between a felt need or problem and a hypothesis for dealing with the problem. Benjamin Ward suggests that abduction may be used both for generating hypotheses and for research verification. Benjamin Ward, What's Wrong with Economics (New York: Basic Books, Inc., 1972).

More specifically, the framework was shown to be relevant to the problem these companies have in taking collective pooling action. Out of the application of framework to problem, several situational factors were deduced as explanations for the lack of pooling, and hypotheses were developed to test these explanations. The proposed situational factors and their attendant hypotheses are reviewed below.

1. Contracting Costs. The hypotheses were three:
    a. Contracting costs constitute a situational factor which significantly limits the development of coordinative agreements.
    b. The level of contracting costs for each company are inversely related to comapny size.
    c. Contracting costs are inversely related to the amount of previous mutual working experience.
2. Uncertainty and Risk. The hypothesis was: Uncertainty or perceptions of high risk are held by company managers as being inherent in some "issues of concern" in intercompany coordination. These issues are:
    a. reliability of service;
    b. ability to assume financial burdens;
    c. potential loss of individual company control over future choices;
    d. potential loss of control by individual managers; and
    e. opportunistic behavior by other pool members.

3. High Exclusion Costs, Joint Impacts, and Economies of Size. Hypotheses concerning these factors are summarized on page 81. In essence, the following intermediate steps were hypothesized as having products which create difficulties for collective action:
   a. The feasibility study -- Who will pay for it? Who will be the marginal user?
   b. Provision of interchange capacity creating the ability to exchange -- Who will be the marginal investor, i.e., pay only the marginal cost?
   c. Provision of interchange capacity creating the ability to call on reserves -- Who will be the marginal investor, i.e., pay only the marginal cost?
   d. Joint generation facilities -- Who will be the marginal investor, and who will pay how much for the electricity generated?
   e. New legislation to ease joint ventures -- For those who regard such legislation as good, who will pay for it? For all interested parties, who gets to decide the form and content of the legislation?
4. Malevolence. The hypotheses were:
   a. Some small companies act out of malevolence in refusing to enter intercompany agreements which would benefit others more than themselves.

b. Such behavior will be most in evidence when companies of different institutional types are potential pool members.

Michigan Group (MG): A Description[15]

The Michigan Group consists of five municipal electric companies located at Coldwater, Hillsdale, Union City, Marshall, and Sturgis, Michigan. These companies are in the initial stages of developing intercompany coordination. They hired an initial feasibility study on potentials for coordination in 1976.

Information on future needs and alternative courses of action is provided by the study. Historic trends reveal that the communities vary in the expected rate of expansion required to meet future needs. Estimated annual rates of growth were made by the simple assumption that growth rates for the previous ten years would continue unchanged. Table 5-1 below summarizes these growth projection variations by company:[16]

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[15] The initial description of the Michigan Group draws upon a feasibility study prepared by Campbell, DeBoe, and Associates, Report on Study of Joint Power Supply Venture (Toledo, 1976).

[16] *Ibid.*, p. 3.

Table 5-1 Historic Rates of Growth in Peak Demands and Energy Supply for MG

	Peak Demand		Energy Supply	
City	1975 Peak, MW	Estimated Annual Rate of Growth (1966-1975), %	1975 Energy Supplied, MW	Estimated Annual Rate of Growth (1966-1975), %
Coldwater	19.10	7.64	96,834	7.74
Hillsdale	16.70	3.55	81,094	3.87
Marshall	10.55	6.53	49,992	6.95
Sturgis	25.75	7.31	115,599	5.70
Union City	2.28	3.32	10,481	4.12

Although projected future needs, as calculated according to the simple projection assumption, are shown to vary significantly, the consultant who made the study assumes as "appropriate" for purposes of analysis that the companies will have equal future annual rates of growth of five percent for both peak demand and energy supply.[17] The reasoning behind this assumption is unclear. What the assumption, if accepted, does do, however, is to minimize the unequal valuations which companies would place on collective interchange capacity and on joint generation. More equal valuations serve the interests of companies (and consultants) who desire future collective actions to promote pooling. Future estimated needs are than compared in this study with existing facilities to arrive at estimates for new capacity requirements. The proposed program is summarized in Table 5-2.[18]

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[17] *Ibid.*, p. 3.

[18] *Ibid.*, p. 6.

Table 5-2 Proposed Construction Schedule for MG

Step No.	In Service By	No. of Units	Capacity of Each Unit
1	1981	2	50 MW
2	1986	1	50 MW
3	1992	1	70 MW
4	1999	1	80 MW

Allocation of shares in the proposed program are made on the basis of existing facilities and equal five percent growth. The allocation is summarized as follows:[19]

Table 5-3 Projected Allocations for Generating Capacity for MG

City	Step I (1981) MW	Step II (1986) MW	Step III (1992) MW	Step IV (1999) MW	Total 4 Steps MW
Coldwater	21	11.5	18.5	19.5	70.0
Hillsdale	12	14.5	13.5	21.5	61.5
Marshall	15	7.5	11.0	10.5	44.0
Sturgis	46	15.0	25.0	26.0	112.0
Union City	6	1.5	2.0	2.5	12.0
Total	100	50.0	70.0	80.0	300.0

Proposed generating facilities would be coal fired. Base load requirements, the study suggests, should be obtained from the joint units, with existing facilities used primarily for peaking and energy backup.

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[19] *Ibid.*, p. 6.

Cost shares for future expenses are allocated in the report in proportion to the estimated requirements by each city. That is, the method of cost allocation was to sum two kinds of costs for each company, a fixed annual charge for facilities based on the estimated share of generating capacity which each company would need and a variable charge based on the estimated energy which each company would use.[20] This assessment of cost obligations involved a key assumption which was not mentioned in the report. That assumption is:

> Uniform cost and pricing systems will apply to all companies. Each municipal will pay for new capacity and additional energy at the same price. No provision is made, for example, for contributions in-kind, payments during different time periods, different rate structures (perhaps reflecting off-peak purchases), etc. Each of these examples are ways by which prices may be made nonuniform.

Cost and pricing systems need <u>not</u> be uniform within the pool. Costs and prices will be administratively set. And one reason why nonuniform cost and price systems might be necessary is that the companies are unlikely to place the same marginal value on either new capacity or purchased energy.

Some companies would be more able to initiate conservation, purchase wholesale power from an IOU, sell out the facilities at a profit, etc. The expected utility may vary widely by company. If preferences do vary, companies, as

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[20] *Ibid.*, p. 10.

was theorized in Chapter II, will have an incentive to strategize their entry into the pool, cast themselves as the marginal investor, and argue for nonuniform prices.

Using the implicit assumptions of the study, cost shares for individual cities would be as depicted in Table 5-4.[21]

Other alternative courses of action for the Michigan Group which were mentioned but not pursued in the study are joint ownership of facilities with other utilities, either public or private, and a more limited construction plan with additional requirements met through wholesale purchase. Construction of interchange capacity facilities was not a part of the study.

The report proposes that the Michigan Group create an "Operating Board" consisting of representatives of each of the five participating municipals. This Operating Board would employ a professional manager who could be responsible for combined system operations.

Cloverland-Edison Sault (C-ES): A Description

The third power pool case in Michigan, that involving Cloverland REC and Edison Sault Electric Company (an IOU), is unique. Edison Sault is unique among the investor-owned companies of Michigan because of its special relationship

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[21] *Ibid.*, p. 11.

Table 5-4 Cost Shares for Individual Cities in MG[22]

	1981	1982	1983	1984	1985
Coldwater					
Energy, MWH	129,767	136,255	143,068	150,221	157,732
Demand, MW	25.6	26.9	28.2	29.6	31.1
Variable Cost, $	3,335,300	3,607,600	3,927,500	4,270,200	4,662,300
Fixed Charge, $	1,448,500	1,461,900	1,476,200	1,491,200	1,507,100
Total Cost, $	4,783,800	5,069,500	5,403,700	5,761,400	6,169,400
Power Cost, $/KWH	.03686	.03721	.03777	.03835	.03911
Hillsdale					
Energy, MWH	108,673	114,107	119,812	125,803	132,093
Demand, MW	22.4	23.5	24.7	25.9	27.2
Variable Cost, $	2,793,100	3,021,200	3,289,100	3,576,100	3,904,500
Fixed Charge, $	827,800	835,500	843,500	852,100	861,200
Total Cost, $	3,620,900	3,856,700	4,132,600	4,428,200	4,765,700
Power Cost, $/KWH	.03332	.03380	.03449	.03520	.03608
Marshall					
Energy, MWH	66,994	70,344	73,861	77,554	81,432
Demand, MW	14.1	14.8	15.6	16.4	17.2
Variable Cost, $	1,721,900	1,862,500	2,027,600	2,204,600	2,407,000
Fixed Charge, $	1,034,700	1,044,300	1,054,500	1,065,200	1,076,600
Total Cost, $	2,756,600	2,906,800	3,082,100	3,269,800	3,483,600
Power Cost, $/KWH	.04115	.04132	.04173	.04216	.04278
Sturgis					
Energy, MWH	154,913	162,659	170,792	179,331	188,298
Demand, MW	34.5	36.2	38.0	39.9	41.9
Variable Cost, $	3,981,500	4,306,700	4,688,600	5,097,700	5,565,800
Fixed Charge, $	3,173,100	3,202,500	3,233,500	3,266,600	3,301,500
Total Cost, $	7,154,600	7,509,200	7,922,100	8,364,300	8,867,300
Power Cost, $/KWH	.04618	.04617	.04639	.04664	.04709
Union City					
Energy, MWH	20,941	21,643	22,381	23,155	23,968
Demand, MW	4.6	4.7	4.9	5.1	5.2
Variable Cost, $	538,200	573,100	614,400	658,200	708,500
Fixed Charge, $	413,900	417,700	421,800	426,100	430,700
Total Cost, $	952,100	990,800	1,036,200	1,084,300	1,139,200
Power Cost, $/KWH	.04547	.04578	.04630	.04683	.04753
Comparative Purchase Costs, $/KWH	.03479	.03688	.03909	.04144	.04393

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[22] Campbell, DeBoe, and Associates, <u>Report</u>.

with the federal government. Federal hydroelectric facilities have been constructed on waters within Edison Sault's service territory, and the company has been able to purchase inexpensive electricity produced in these facilities from the United States Government.

Inexpensive electricity has been attractive for the company, of course, but the special relationship to the government has also required that Edison Sault sell power to its neighboring cooperative, Cloverland. Early federal pressures during the 1930's, when Cloverland was beginning operations, culminated in a power sale agreement between the IOU and the cooperative, signed in 1938. In 1951 a contract was signed by Edison Sault and the United States Secretary of the Army which served as a base for the development of Cloverland-Edison Sault relations.[23]

The contract was for the sale of electric power generated in a new power plant constructed by the Army Corps of Engineers on the Saint Mary's River. Several provisions of the contract also affected Edison Sault's transactions with Cloverland. Edison Sault agreed to sell electric power from the new plant to Cloverland at a rate of allocation determined by the federal government.[24] The allocation formula was based on the relative levels of peak

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[23] Agreement for Sale of Electric Power Between the United States of America and Edison Sault Electric Company (1951), Contract No. DA-20-064-eng-632.

[24] *Ibid.*, pp. 7-9.

demands in Cloverland and Edison Sault. According to the procedure, Cloverland received 2,725 kilowatts of new capacity and Edison Sault 12,875 kilowatts of new capacity from the power plant.

Rates for electricity sold by Edison Sault to Cloverland were based, according to the contract, upon the price for power paid by the IOU to the government plus transmission costs, provided that Edison Sault earned a "fair rate of return" on the facilities required. Rates were to be determined by mutual agreement between the IOU and the cooperative, with the Michigan Public Service Commission retaining the power of final determination in cases of dispute. Several supplemental agreements since 1951 have raised the rate structure.

A more recent agreement, signed in 1974 by Cloverland and Edison Sault, establishes, in effect, a power pool for these companies. This agreement contains three major provisions. First, Cloverland agrees to offer its "excess" electricity to Edison when the cooperative has more than 9,000 kilowatts of unused capacity. Edison may purchase this excess electricity as supplemental generating capacity or energy, maintenance capacity or energy, or emergency capacity or energy. Each type of sale involves a different rate.

Second, the companies agree to exchange mutually economy energy in their systems. Savings in such transactions ". . . shall be equal to the difference between the Incremental

Cost of the supplying party and the Decremental Cost of the receiving party."[25] Savings, that is, are to be divided equally between the two parties.

Finally, Edison Sault agrees to furnish Cloverland with electricity, when available, for times when Cloverland has emergency outages or maintenance outages. Rates for these sales will be determined by the IOU's incremental costs of provision plus ten percent, plus any proportionate share of charges Edison Sault assumes from its own supplier(s) in obtaining power for Cloverland. Dispatching facilities for these exchanges are, according to descriptions by company officials, provided by Edison Sault. These officials also stated that the companies intend to build upon this latest agreement by jointly investing in generating facilities scheduled for operation in 1980.[26]

Historic details about MG, MCP, and C-ES provide background for the interviews with company managers concerning situational factors. Evidence from MG was gathered in a series of personal focused interviews during August, 1976 with the five managers of the participating municipals. Similar interviews were conducted during the period September to November, 1976 with the five present managers and three

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[25] *Ibid.*, p. 5.

[26] Operating Understanding Between Cloverland Electric Cooperative and Edison Sault Electric Company, May 7, 1974.

former managers of MCP companies and with the manager of a neighboring municipal at Holland. (Holland is a potential but not a present pool member.) In November, 1976 focused interviews were conducted by telephone with the managers of Cloverland REC and the president of Edison Sault. All of these officials, both active and retired, were questioned about their experiences with intercompany coordination and asked to what degree, if at all, certain situational factors served to inhibit the development of their respective pools.

Contracting Costs

Dimensions

Contracting costs, the first of the hypothesized factors, actually involve two dimensions. These are the amount of time involved in contracting and the valuation (opportunity cost) which managers place on that time. The managers' behavior is thought to involve rational action on the basis of valuations of both expected costs (including but not limited to the opportunity costs for time for contracting) and expected benefits, with various degrees of awareness and uncertainty about both benefits and costs. Thus these situational factors -- transactions costs and uncertainty -- are not necessarily independent.

In general, however, the opportunity costs of contracting can be assumed to be known by the managers with a relatively high degree of certainty. Each manager is expected to be able readily to identify and evaluate what he is giving up as foregone activities when he engages in contracting for pooling. The expected outcomes of pooling, both benefits and costs, can be assumed to be relatively less known and less certain.

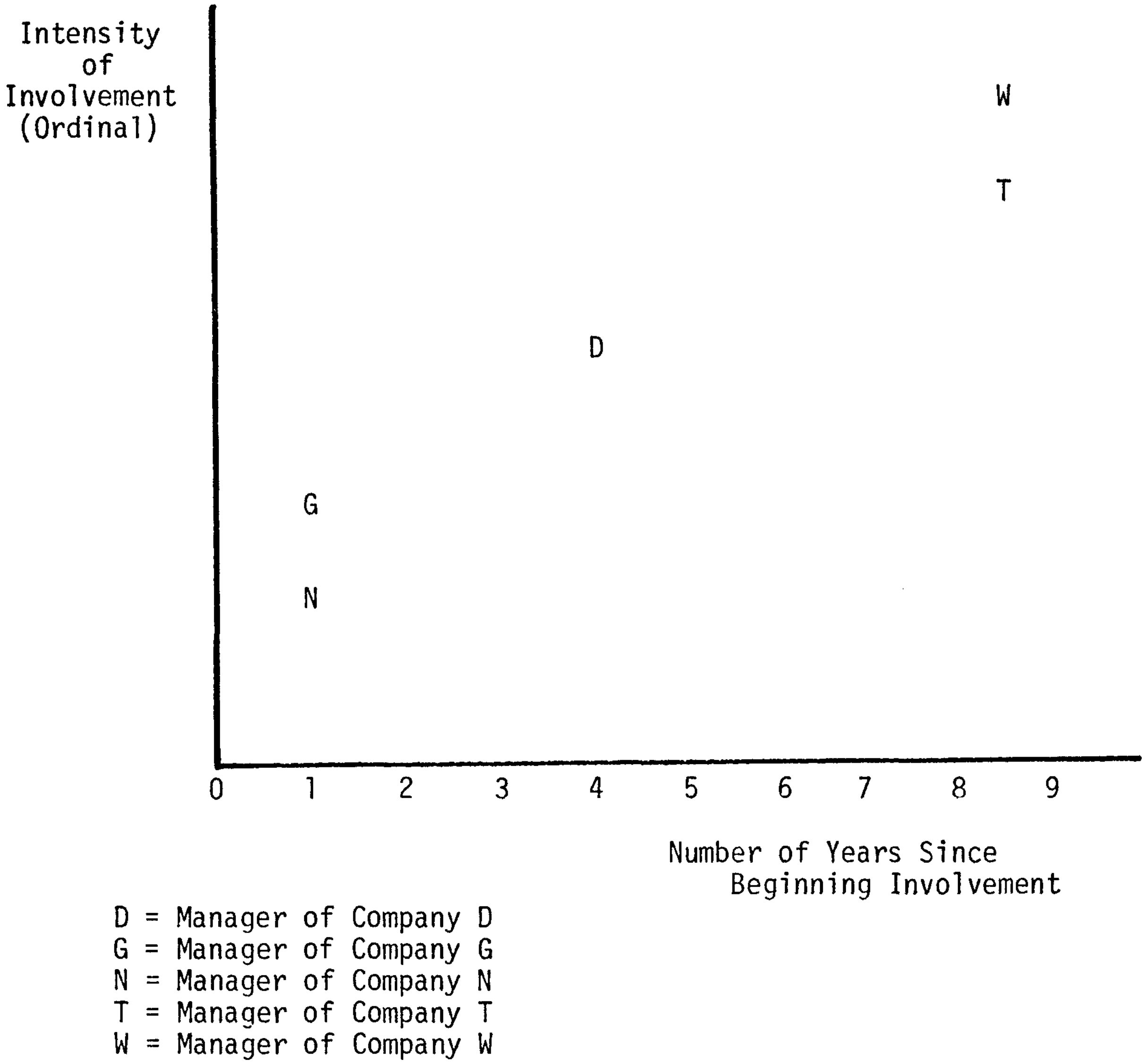
Findings

In order to find whether contracting costs constitute a situational factor, the managers were asked two questions: What amount of time have you spent in developing your power pool? And has that amount of time detracted from other activities to the extent that it has discouraged your participation in contracting efforts? Results of interviews with managers about contracting costs in each of the three case situations are as follows:

Michigan Group

Findings in the interview of MG managers revealed that the amount of time invested in contracting for MG by three men varied widely both by length of period of involvement and intensity of involvement during that period. The following graph illustrates these variations among the Michigan Group managers. (Answers by MG and all other managers interviewed will be coded in descriptions of findings so as to preserve the confidentiality of the interviews.)

Figure 5-1 Amounts and Intensities of Time Invested by Michigan Group Managers



Interviews with the MG managers also revealed that their perceptions of opportunity costs in contracting for pooling varied, although the variation was slight.[27] These variations can also be graphically depicted. Figure 5-2 illustrates an

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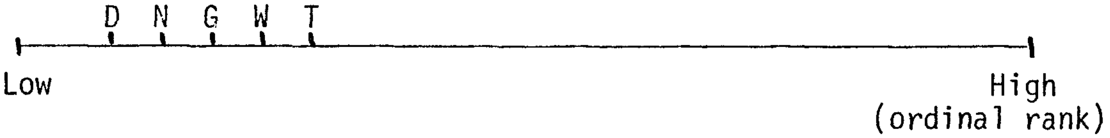
[27] Methods by which managers' answers to interview questions were classified is discussed in Appendix C.

ordinal graph of perceptions by the individual managers of their opportunity costs; it is followed by an analysis of MG managers' responses. The figure is drawn in a manner designed to illustrate the rather low estimation of opportunity costs which all of the managers put on contracting efforts.

Figure 5-2 Expressed Perceptions of Opportunity Costs by Michigan Group Managers Engaged in Collective Action



D = Manager of Company D
G = Manager of Company G
N = Manager of Company N
T = Manager of Company T
W - Manager of Company W

Comments on the Michigan Group Case

The manager at Company W began his involvement in MG with the original conception of the pool. He has invested eight years of effort to contract for MG. He views the development of coordinative agreements as a long, involved process.

A new dimension was introduced to the contracting cost as situational factor hypothesis with the Company W manager's suggestion that internal transactions time requirements may also be substantial. He stated that much of his time was spent informing his own oversight board members about the potentials of coordination and persuading the board to finance Company W's involvement in the project.

He further speculated that such internal transactions time may vary systematically by the type of oversight institution provided by the local general purpose government. Required transactions time between manager and oversight institution are highest, he feels, for city manager and city council oversight structures. City managers, mayors, and councils, he stated, are less able than special boards to build up expertise in the management of electric companies. Consequently, he suggested that the manager who seeks to involve a company in new coordinative agreements will have more difficulty in convincing city managers, mayors, or councils than will the manager who must convince a special board.

While Company W's manager views the time requirements for contracting as substantial, he did not regard the opportunity costs for such time as particularly high. Rather, transactions with other managers and with his governing board were regarded as part of the normal job and were not viewed as a discouragement to developing a power pool. This answer can be interpreted in two ways. The manager either has enough unused resources to devote to contracting without neglecting other managerial responsibilities, or he can combine resources, over the relevant range, in a manner which allows contracting without a substantial opportunity cost.

Company T's manager has also been intimately involved in contracting for MG for the past eight years. According to his answers, he probably ranks the opportunity cost in contracting time slightly higher than does Company W's manager. Thus this second manager referred to the burden of general increases in "outside" demands on his time for transactions with government agencies, other electric companies, private interest groups, customers, etc. In effect, his analysis is that with the other increased demands on his time, the opportunity costs for contracting for coordination have also been rising. Company T's manager, however, did not indicate that the time required for contracting has decreased his contracting activity. Both the Comapny W and Company T managers place a high value on the expected benefits of pooling. The high expectation of benefits seems to explain Company T manager's involvement, even though he did perceive some opportunity costs to such involvement.[28]

Company D's manager has been contracting for MG over a period of "three to four years." His degree of participation appeared by his statements to be less active and more reactive than the Company W and Company T managers. Company D's manager also stated his attraction to the poten-

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[28] Relationships between opportunity costs, time spent contracting, and various expectations of benefits will be discussed in the conclusion to this section.

tial benefits of power pooling, although he stated them less enthusiastically than the previous two managers.

Company D's manager elaborated on his ideas about the opportunity costs of contracting time by stating that more than forty hours of work per week is expected in his position and that the costs do not constitute a burden. He stated, too, that his submanagers were trained to carry on in his absence. The implication of this comment is that the management technique changes the opportunity cost for contracting.

This manager also stated that the time required for contracting for MG has been reduced by the fact that the five municipals meet regularly anyway on a separate matter -- mutual aid. (Mutual aid involves the voluntary provision of assistance from one electric company to another in a time of emergency. Such aid gives each company a potential pool of labor for emergencies.)

One manager stated that the five municipals do not have the only mutual aid group in the state, but that they _do_ have the most active group. The importance of this mutual aid group experience for the development of coordination emerged in every interview. When the mutual aid group formed, approximately ten years ago, monthly meetings were established among the participating companies. More recently, meetings have been held every other month. The mutual aid meetings have, according to the managers, established channels of communications and built mutual trust. Better communications they said in effect, result in lower transaction time. Greater trust seems to affect other potential situational factors as well and will be discussed in further depth later in this chapter.

The managers at Company G and Company N have invested relatively little time in contracting for MG -- each less than one year. Their participation has been in reaction to invitations from other company managers after these others had done much of the early preparations. Neither manager felt that the opportunity costs of contracting time were very high. Both viewed contracting time as part of their work and not an extra effort. The manager at Company N indicated by his comments that he viewed the expected benefits of power pooling less than did the other managers. Even he, however, valued the expected marginal benefits of contracting efforts as greater than the marginal opportunity costs and, thus, was a willing participant in contracting.

Michigan Municipals and Cooperatives Power Pool

The history of MCP goes back almost thirty years to early discussions about forming a pool. Some of the original participants were available for interviews, but others were not. Three of the five present managers were hired after the pool was formed in 1968 and were not involved in prepool contracting.

Members' Experiences

Company Y's manager was involved in contracting efforts to promote MCP twenty years before the pool began. He does not regard the years of effort, however, as an activity which detracted from his other duties. Moreover, he has calculated that his company's fuel costs for generating are approximately seventy percent of the organization's operating expenses. Thus he values highly the potential fuel savings from coordination.

The present manager of Company V felt less certain about the potential payoff from his participation in contracting efforts. He went to Company V after MCP was formed but has participated in meetings to increase or improve coordination among MCP members, as well as meetings on other coordination agreements. Nevertheless, he regards such participation as part of his normal activity. This manager also commented that the internal transactions time required to convince his city council to pursue coordination with other companies is very time consuming. This comment corresponds with the internal transactions time hypothesis suggested by Company W's manager. A corresponding comment came from the <u>former</u> manager at Company V as well. This man, who has experience in several electric companies, both investor-owned and municipal, suggested that municipals overseen by city councils generally have a "major problem" in that the manager must spend large amounts of time transacting with a council reluctant to coordinate with other companies.

The manager of Company I stated his eagerness for continuing contracting efforts to create a statewide pool for small companies.[29] He is aware from experiences in another state that the contracting time required to develop a pool is substantial. He estimated that even after a basic agreement to coordinate existed among small companies, the last year prior to signing a contract would require a manager involved in contract negotiations to spend five evenings and one full day a week on contracting. This comment suggests that the opportunity cost of contracting includes off-job activities as well as on-job activities.

Present managers at Company U, Company L, and Company M and former managers at Company U and Company I all agreed that the contracting process for power pooling was time consuming. They all agreed too, however, that in their own contracting experience, such time spent away from other activities did not entail a very high cost.

Summary of Findings

Findings on contracting costs obtained in the interviews with this set of nine present and former MCP managers can be summarized in tabular form.[30] Tables 5-5 and 5-6 illustrate the managers' reactions to two key questions. The following legend will apply for both tables.

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[29] Problems and prospects for such a pool will be discussed in Chapter VI.

[30] Only the MCP companies are shown in these tables because of the three cases, only the managers in the MCP case have had the experience of transacting to develop an actual power pool.

LEGEND

Responses:

PS: strongly positive (strong yes)
P: positive
O: neither positive nor negative
N: negative
NS: strongly negative (strong no)

Managers:

I_p: present manager at Company I
I_r: retired manager at Company I
M: present manager at Company M
U_p: present manager at Company U
U_r: retired manager at Company U
V_p: present manager at Company V
V_r: retired manager at Company V
Y: present manager at Company Y
L: present manager at Company L

Table 5-5 Consumption of Time for Contracting: MCP

Question: Do you view the contracting process in establishing a power pool as being very time consuming?

PS	P	0	N	NS
I_p				
I_r				
M				
	U_p			
	U_r			
V_p				
V_r				
Y				
	L			

Table 5-6 Opportunity Cost of Time for Contracting: MCP

Question: Based on your previous experience, did the time involved in contracting to establish a power pool among small companies detract from your other activities to the extent that it discouraged participation in such contracting?

PS	P	O	N	NS
				I_p
				I_r
				M
				U_p
				U_r
			V_p	
				V_r
				Y
			L	

Cloverland REC-Edison Sault

The third case situation, that involving coordination between Cloverland REC and Edison Sault Electric Company, is unique in several ways. The two officials interviewed (manager and president) were hired long after the two companies had been put into a close working relationship by federal government policies. Over time, that relationship has come to be viewed as mutually beneficial and has grown accordingly. In 1974 a power pool was formed although the present cooperative manager and IOU president were not involved in contracting for that event. Joint ventures have also been proposed.

Lines of communication, however, have been long established, and it was not surprising to learn that the two officials felt that their pooling relationship was only moderately time consuming. Neither felt that such time detracted heavily from other activities.

Conclusions about Contracting Costs

The total set of officials, from all three coordinating situations, represent a sizable proportion of present and former managers of small companies generating electricity in Michigan. If there were only one retired and one present manager for each such company in the state, the group interviewed would constitute about 20 percent of the population. Moreover, the present and former managers seem to be a very specialized group and quite well known to one another. Therefore, the officials were also asked this question: In your opinion, does the time required to participate in contracting for coordination detract from other activities to the degree that it discourages participation by the managers of small companies? With only minor differences in emphasis the answer was, "No."

The interviews with small company managers and reflections on their answers lead to several conclusions about contracting costs. These conclusions can be summarized in the following three points:

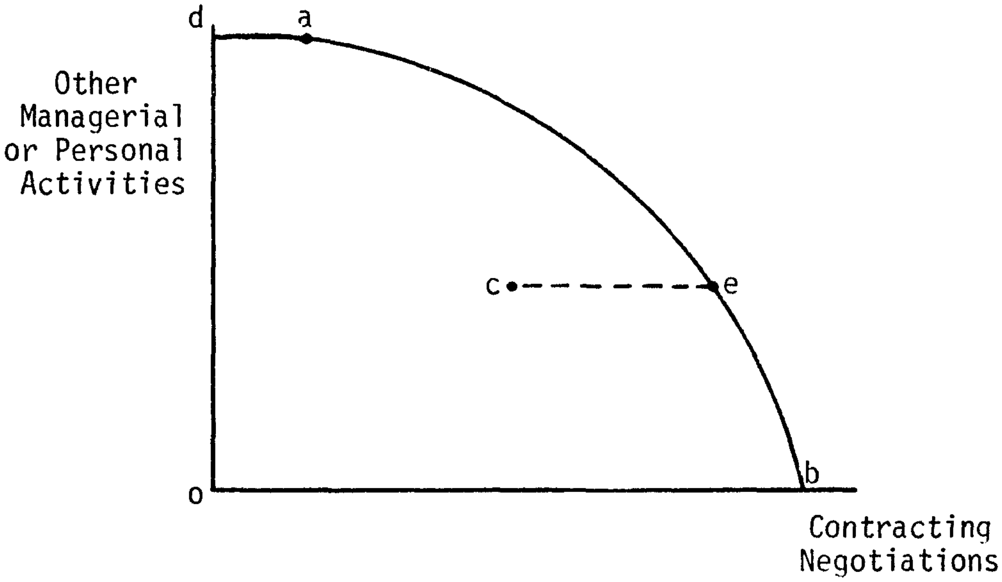
1. Clearer Understanding

A clearer understanding is now possible about the economic content of the hypothesis: "Contracting costs constitute a significant situational factor." The case studies reveal that transactions to form a pool can be very time consuming both in the length of time involved and in the personal commitment required. After eight years, MG is still in the initial stages. MCP took twenty years to form. Pooling began for Edison Sault and Cloverland some forty years after they were forced together. But transactions costs are not the same as span of time. For contracting to coordinate to be personally costly for the managers, it must detract from other activities.

The contracting cost hypothesis actually refers to a trade-off between contracting activity, with the expectation of future benefits, and other activities, either job related or personal. The interview questions on contracting costs were designed to reveal the nature of that trade-off as perceived by the managers.

These insights suggest that the original hypothesis can be better stated. It becomes: The opportunity costs of contracting are such that in the relevant range, they are inversely related to contracting activities for coordination. So stated, the hypothesis can also be graphically illustrated as a transformation function or production possibility curve as shown in Figure 5-3. A manager can allocate his resources to contracting negotiations (horizontal axis) or to other managerial or personal activities (vertical axis). The contracting hypothesis is that over the relevant range of the manager's experience, the transformation curve will be downward sloping -- for example, section ab; in other words, a significant opportunity cost will be present (and perceived).

Figure 5-3 Hypothesized Transformation Function



2. Opportunity Costs Perceived as Low

The interviews revealed that for a variety of reasons, the transformation function between contracting negotiations and other managerial or personal activities was <u>not</u> perceived as downward sloping over the relevant range.[31] One explanation

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[31] One weakness of the interviews, in retrospect, was that information about what <u>is</u> the relevant range was not sought. Some indication of the range was offered by the manager of Company I who volunteered the estimate that serious negotiations would take one day and five evenings a week for one year. The managers could also have been asked whether there is any cost to plant efficiency if they were away one, two, three, . . . hours, days, or months.

is that managers may have slack time; they may be at a point, such as point c in Figure 5-3, and not on the production possibility frontier. Increased allocations of a manager's slack resources to contracting could then move an individual from point c to point e without any opportunity cost for other activities.

A second explanation is that managers can combine resources to increase contracting in such a manner that little or no opportunity costs result. That is, the transformation curve can be horizontal, as in the section da in Figure 5-3. For example, the managers may be able to combine contracting with other activities, such as mutual aid meetings.

3. High Marginal Value Attached to Contracting

Although the managers were not specifically asked, some indicated that their contracting activity reflected a relatively high marginal value for contracting. A manager would be willing to accept an opportunity cost for contracting, given relatively high expected benefits from more contracting activity.

An Hypothesis Restated

The third research hypothesis, in which an inverse relationship between previous working experience and contracting *costs* is expressed, needs to be restated more precisely. If the hypothesis is: "Contracting *time* is inversely related to the amount of previous mutual working experience," then the interviews are supporting. Contracting time and contracting costs, as was demonstrated, are, however, not synonymous. In the MG case, the managers suggested that their mutual aid group had improved communications and thereby reduced transactions time. A similar finding was made in the Edison Sault-Cloverland Pool, where the organizations had been forced to cooperate since the 1930's. In both of these cases, however, the impact of previous working relationships seems more related to mutual trust than to lines of communications. Trust will be considered later in this chapter.

Conclusion

The upshot of this analysis is: interviews reveal that contracting costs are not a significant limiting situational factor and other explanations for the nonexistence of pools or length of time required to coordinate should be sought.

Uncertainty and Risk

Managers in the three case situations were questioned about the presence of risk and uncertainty in their behavior. Inquiries were directed specifically toward the hypothesized issues of concern which include: reliability of service; ability to assume financial burdens; potential loss of company control over future choices; potential loss of control by individual managers; and opportunistic behavior by other pool members. Managers were also asked to suggest additional issues of concern.

For each hypothesized issue, the managers were asked if, in fact, the issue *was* of concern to them. If they responded "No," further questions were posed to determine if their answers reflected *unawareness* about the issue or if their answers reflected some prior knowledge about the issue and a perception that *risk was low*. If the managers answered "Yes," the issue was of concern to them, additional questions were asked to determine whether the managers were concerned but *uncertain* as to the probabilities of negative consequences or whether they were able to form some perception of high *risk* on the basis of subjective or objective perception of the probabilities of potential negative consequences. Distinctions between issues of concern because of perceived high risk and issues of concern because of uncertainty are not completely obvious, of course, and the attempt in the interviews was to determine the *relative* importance of uncertainty and perceived risk in a manager's concern. Attempts to distinguish between uncertainty and perceived high risk strain the capacity of the research to make precise measurements.[32] The distinction is important, however, in that determination of the presence of one or the other factor as inhibitor to collective action suggests different instrumental policies to promote such action.

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[32] See Appendix C for an example which illustrates measurement techniques and allows the reader to make independent measures for purposes of comparison.

Findings

Interview findings relative to the hypothetical issues of concern were as follows:

Loss of Company Control

Potential loss of individual company control over future choices emerged in the interviews as a major concern. When asked whether concern about the loss of company control had inhibited their company's willingness to coordinate, the managers' answers were mixed. When asked whether this concern affected other companies' behavior with regard to coordination, responses were more affirmative. Managers' responses are summarized in Tables 5-7 and 5-8.[33] (The legend below applies to Tables 5-7 through 5-18.)

LEGEND

Responses:

PS: strongly positive (strong yes)
P: positive
O: neither positive nor negative
N: negative
NS: strongly negative (strong no)
DK: don't know

W: present manager at Company W
D: present manager at Company D
T: present manager at Company T
G: present manager at Company G
N: present manager at Company N
X: present manager at Company X
J: present manager at Company J
I_p: present manager at Company I
I_r: retired manager at Company I
M: present manager at Company M
U_p: present manager at Company U
U_r: retired manager at Company U
V_p: present manager at Company V
V_r: retired manager at Company V
Y: present manager at Company Y
L: present manager at Company L

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[33] Again, Holland is included as a potential, not a present, member of MCP.

Table 5-7 Loss of Individual Company Control

Question: Has concern about the potential loss of individual company control over future choices inhibited your company's willingness to coordinate?

PS	P	O	N	NS	
			W		Michigan Group Companies (MG)
			D		
			T		
	G				
		N			
			I_p		Michigan Municipals and Cooperatives Pool Members and Holland (MCP)
			I_r		
				U_p	
			U_r		
V_p					
V_r					
				Y	
			L		
M					
	X				Cloverland REC and Edison Sault (C-ES)
			J		

(For Legend see p. 204)

Table 5-8 Loss of Company Control by Others

Question: Has concern about the potential loss of individual company control over future choices inhibited, in your opinion, other companies' willingness to coordinate?

(For Legend see p. 204)

PS	P	O	N	NS	DK	
W						MG
	D					
T						
	G					
					N	
	I_p					MCP
I_r						
U_p						
	U_r					
V_p						
V_r						
	Y					
	L					
M						
X						C-ES
J						

Reasons for Low Risk Perception

Table 5-7 reveals that among the Michigan Group companies, Company W, Company D, and Company T managers all responded that concern over company control did not affect their companies' behavior with regard to coordination. Further questions revealed that this response was based upon low risk perception by the companies rather than upon unawareness. All three managers expressed an awareness that coordination could affect their companies' opportunities. But they also stated that for several reasons, potential coordination among Michigan Group companies presents a unique, low risk situation for the company members. Three factors were cited as risk reducers. First, all the MG companies are approximately the same size, i.e., small. Homogeneity of size reduces the risk of the occurrence of those potential decisions, such as power plant construction delays, which may be only mildly irritating for a large company with other resources but devastating for a small company with fewer resources. When they cited the size factor as a risk reducer, the managers were expressing a theory that homogeneity of size will lead to an alignment of values among coordinating companies.

The second factor cited was that of prior mutual work experience. The managers' theory is that such experience has created a sense of trust. Mutual aid activities expecially have given these managers experience in situations during which each has been dependent upon the assistance of his fellow managers. Assistance has been forthcoming over the years, thus creating, they say, a bank of mutual trust. Trust reduces the uncertainty about and leads to a low risk perception for opportunistic behavior by other managers.

Third, the managers cited the fact that all the MG companies were municipals. Having all municipal members reduces risk in that it eliminates the probability that a company will act in a predatory manner towards any other company. None of the MG members can realistically desire to serve the territory now served by other members. Other potential conflicts are, of course, not necessarily eliminated by having all municipal members.

Company G's manager, while citing some of the same risk reducing factors in MG, responded that concern about company control had inhibited his company's willingness to join MG. He spoke to the central issue of control which is: "Whose preferences will count?" If MG is to form a pool, a constitutional agreement must be written for the joint agency which will oversee the pool. Rules of representation and rules governing how decisions will be reached must be written prior to the formation of the pool.

Some of the MG managers expressed a preference for single votes for each municipal, with a majority rule for decision making. If common generating facilities are to be built, as is anticipated, however, the electric power obtained will be divided unequally. Some companies will obtain larger blocks of electric power and will likely make larger investments for construction and operations. Thus Company G's manager, whose company is likely to have a relatively large investment cost, perceives a relatively high potential cost for decisions made against his company's desires. Company G's manager is uncertain about what issues might arise to impose costs on his municipal. He is sufficiently concerned, however, to consider delaying coordination until a constitution for the joint agency can be written which incorporates weighted votes reflecting shares of investment and/or more veto power over collective decisions by individual companies.[34]

Among the MCP companies, some differences emerged between cooperatives and municipals on the issue of company control. Cooperatives have not been saddled with the uncertainty created by Michigan law which, until January 1977, prohibited joint ownership of an electric utility by municipals. Although the prohibitive law was circumvented, as illustrated by MCP itself, still the uncertainty of possible legal challenge remained until 1977. Municipals feared that investments, once made, might be legally challenged.

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[34] A similar argument was expressed by an official at Lansing Board of Water and Light. His municipal strongly supports intermunicipal coordination in Michigan, he stated, and was willing financially to support research to that end. However, since Lansing is much larger than any other municipal in the state and would likely bear the largest cost burden of any common investments, his company is unwilling to participate in any joint agency governed by a board of directors with a one company, one vote rule.

At Company V the city council which oversees the municipal electric utility was very reluctant to make joint investments, even though a strong environmental group in this city has fought any expansion of self-generation facilities and increased, thereby, the value of coordination. Present and former managers of the REC members of MCP expressed the difficulty and delay they had in working with municipals concerned about the legalities of joint investments

The former manager at Company V stated that most of the uncertainty expressed about coordination during his time at the municipal was by the city council rather then by the municipal manager. He had observed that council members were especially reluctant to make investments in facilities located outside the city boundaries because of increased uncertainties of control. The present manager at Company V, however, expressed personal concern about the uncertainties of control in joint investments because of the Michigan law.

Comments made by the manager at Company L reinforced the observations made by MG members that previous mutual experience reduced uncertainty. Company L has been involved with a neighboring city in the development of a regional water supply system. Out of this experience the Company L manager perceived that intergovernmental contracting need not be a bad experience. He applied this principle to power pooling among small companies, although the application is not necessarily warranted.

Both the retired and present managers at Company I expressed strong preferences for small company pooling. Their influence upon the city's oversight board has prevailed to the extent that this company has often taken the lead in fostering coordination. Both managers expressed the thought that, based upon their experiences, the risk of loss of company control was low relative to the potential advantages from pooling.

Managers at Companies X and J stated that their long mutual working experience had reduced uncertainties and provided more realistic perceptions of risks involved. For Company J risks about loss of company control were perceived as low and did not inhibit coordination. An official at Company X expressed some uncertainty about coordination agreements between small companies and larger investor-owned utilities. Small electric companies are well advised, he thinks, to be cautious about investing funds into "capital-starved" IOUs.

In general, the managers observed that concerns about company control caused much more reluctance to coordinate in other small companies than in their own. This difference could have been anticipated because the small companies from the three case situations studied have engaged in more coordinating activities than other small companies in Michigan. In addition, rules of evidence set forth earlier in this chapter apply to these responses. Some of the comments made by the managers about the behavior of others undoubtedly was based on inference and hearsay. No reason was found, however, to think that the managers might have been biased in their answers or that their responses were inaccurate.

Company J's manager stated that because of their history of independent operations, small electric companies are highly oriented toward their own territories and away from the uncertainties of coordination. Company I's former manager said much the same about individual company managers by observing that managers were, in general, "trained as operators and not as planners."

Loss of Manager Control

The comment by the retired Company I manager is especially relevant to the second hypothetical issue of concern about the potnetial loss of opportunities by managers themselves. Tables 5-9 and 5-10 illustrate managers' answers to this second issue.

Explanations

Table 5-9 reveals that, with the exception of the present manager at Company V, all officials interviewed replied that their own concern about loss of management control had not been a limiting factor. To a degree, their responses could have been anticipated because these managers have lead in the development of small company coordination

Table 5-9 Potential Loss of Management Control as an Issue for Self

Question: Has concern about the potential loss of your own management control inhibited your willingness to coordinate?

(For Legend see p. 204)

PS	P	O	N	NS	DK	
			W			MG
			D			
			T			
			G			
			N			
			I_p			MCP
			I_r			
			U_p			
			U_r			
	V_p					
			V_r			
			Y			
			L			
			M			
			X			C-ES
			J			

Table 5-10 Potential Loss of Management Control as an Issue for Others

Question: Has concern about the potential loss of management control by other managers of small companies inhibited, in your opinion, their willingness to coordinate?

(For Legend see p. 204)

PS	P	O	N	NS	DK	
	W					MG
					D	
	T					
	G					
	N					
	I_p					MCP
I_r						
	U_p					
U_r						
V_p						
V_r						
	Y					
				L		
M						
	X					C-ES
	J					

in Michigan. In addition, however, rules of evidence discount to some degree the credibility of the answers. The managers' answers about their own behavior were made through direct observation, but bias may have entered their response. They may have been unwilling to reveal personal fears.

Observations by the managers about the behavior of others differed substantially from observations about their own behavior. Application of rules of evidence reveal that some of these responses may have been based on hearsay or inference as well as on direct observation of the behavior of others. Responses are, however, generally consistent, and no reason was found to doubt their accuracy or to suspect bias.

Company L's manager answered that he doubted that concern over management control affected the behavior of other managers because managers have taken the lead over oversight institutions to promote coordination. Company I's manager made a similar statement but noted that some managers became "nervous" (uncertain) about management control in coordination. Company X's manager also responded that managers generally were more willing to coordinate than either oversight institutions (for municipals) or boards (for cooperatives). This manager, although a psychologist by training, made an observation drawn from economic theory by stating that, in his opinion, a manager's willingness to tolerate the uncertainty of loss of control with coordination was inversely related to his work opportunities elsewhere.

A more behavioral hypothesis, one which corresponds with the conservative bias theory of uncertainty proposed by Mack, was offered by the former manager of Company V, who is an electrical engineer. This individual has been a leader in the promotion of small company pooling in Michigan. He has observed that the number of municipal managers in Michigan who impede their companies' involvement in small company coordination has dropped in the last five years from "about thirty" (three quarters of Michigan's municipals) to "about ten." He attributes this change in behavior to rising fuel costs. His hypothesis is that prior to the shock of higher fuel prices, managers employed "techniques" or habitual modes of behavior to avoid the uncertainty of loss of management control in coordination. Because of their influence, the managers were able to promote standard operating procedures in their companies which involve habitual action, not including the consideration of pooling. With the problem of higher fuel prices, the companies and their managers have, according to the hypothesis, reexamined ends and means -- with the result that many managers have reversed their attitudes toward coordination.

Opportunism

The third hypothetical issue of concern is that of opportunistic behavior by other pool members.[35] Concern about opportunistic behavior among other pool members is obviously related to the concern about potential loss of company control. One becomes concerned about the loss of control if he expects other pool members to take advantage of the loss.[36] Not surprisingly, therefore, managers' interview responses on the issue of opportunism paralleled closely those responses on the issue of control. Tables 5-11 and 5-12 summarize the interview responses about the issue of opportunism.

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[35] An example of a potential case of opportunistic behavior in intercompany relations involves several small municipals in southeast Michigan. There, wholesale power which has been provided to the municipals by Indiana Michigan Company may not, according to a letter sent by the IOU to the municipals, be provided in the future. The municipals had previously been assured that wholesale power would always be provided and had planned their systems accordingly. If wholesale power is denied them, the municipals will be under great pressure to sell their systems to Indiana Michigan Company.

[36] When neighboring cooperatives, investor-owned companies, and municipals are involved in a pool, the potential is created for "pirating" of service territories on the basis of pool decisions. As the production costs of each member become more dependent on pool decisions, opportunities develop for strategies which structure decisions so as to weaken one's competitors' financial position.

Table 5-11 Opportunism as Perceived for Self

Question: Has concern about potential opportunistic behavior among other pool members inhibited your company's willingness to coordinate?

(For Legend see p. 204)

PS	P	O	N	NS	DK	
			W			MG
			D			
			T			
	G					
			N			
			I_p			MCP
			I_r			
			U_p			
				U_r		
V_p						
V_r						
			Y			
			L			
	X					C-ES
			J			

Table 5-12 Opportunism as Perceived for Others

Question: Has, in your opinion, concern about potential opportunistic behavior among other pool members inhibited other companies' willingness to coordinate?

(For Legend see p. 204)

PS	P	O	N	NS	DK	
W						MG
		D				
T						
	G					
		M				
	I_p					MCP
I_r						
U_p						
U_r						
V_p						
V_r						
	Y					
	L					
M						
X						C-ES
	J					

Explanations

MG members responded, again, that their concerns about opportunism had been reduced by homogeneity of size, the mutual aid experience, and the all-municipal character of MG. These factors have reduced uncertainties about the opportunistic intent of others and reduced, too, perceptions of risk for opportunism by other pool members in future collective actions. Company G's manager mentioned the heightened risk for his company in construction of joint generating facilities because of the expected disproportionate cost share which his company would bear. This manager's answers, however, reflected more willingness to talk about concern for company control than about concern over opportunism.

Among MCP members, Company V appears to have been most affected by a concern about opportunism. Both the present and retired managers of that city's municipal utility described the suspicion of rural cooperatives voiced by city council members. Although suspicions have delayed coordinative agreements between Company V and other pool members, the managers stated that the past experiences of collective actions have allayed fears by reducing uncertainty and lowering risk perception.

The managers were, in general, more willing to ascribe concern about opportunism as an influence in the behavior of others than they were as an influence in the behavior of their own companies. Both Company W and Company T managers described a common mistrust among municipals about the intentions of Consumers Power Company. Disparity of size and the experiences of previous opportunistic behavior were offered as explanation.

An official at Company U stated that cooperatives were very aware of the risk of losing customers in territories adjacent to territories served by municipal companies. Under Michigan law, cities may annex additional territory or may extend unlimited services outside city boundaries.[37] Company Y's manager stated that in discussions prior to the formation of MCP, the municipals expressed suspicion of the cooperatives' intent. Procurement of an actual cooperative-municipal pooling agreement from Wisconsin for use in the discussions about MCP was instrumental, he felt, in reducing the uncertainty among municipals about the intent of the cooperatives.

Ability to Assume Financial Burdens

A fourth potential issue of concern is the ability by small companies to assume financial burdens. A difference in concern for this issue between RECs and municipals emerged in the interview responses. Differences among the municipals also emerged. Table 5-13 illustrates managers' responses about financial concerns.

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[37] A previous limitation of extraboundary services to twenty-five percent of total services was removed in 1975 by Michigan State Law. See Public Act 296 of 1975.

Table 5-13 Perceptions of Financing Problems

Question: Has concern about the ability to finance joint ventures inhibited your company's willingness to coordinate?

PS	P	O	N	NS	DK	
			W			MG
			D			
			T			
			G			
					N	
				I_p		MCP
			I_r			
				U_p*		
				U_r*		
			V_p			
			V_r			
				Y*		
				M		
			L			
				X*		C-ES
				J		

(For Legend
see p. 204)

*These companies are RECs

Municipal Financing

The large number of mildly negative answers by the municipal managers reflects a concern about financing joint ventures -- but at a level not high enough to act as an impediment. Most of the municipal electric facilities in Michigan have been financed by issuing revenue bonds.[38] Thus, even though one manager said that his city had reached its debt ceiling for general obligation bonds and another talked about the uncertainty of voter passage of bond issues, neither a debt ceiling nor a bond vote is necessary or usual for financing electric utility expansion. Revenue bonds are payable exclusively from the earnings of the electrical enterprise, are not counted in the debt ceiling limitation, and, in Michigan, do not require local voter approval[39]

The concern over financing expressed by municipal managers was, in essence, over costs and complexities. Revenue bond financing is more costly than general obligation bond financing backed by the full faith and credit of the city. Interest rates for bonds are, in general, 0.5 to 0.6 percent higher for revenue than for general obligation type bonds.[40] A difference of 0.5 percent over the usual thirty

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[38] Conversation with Mr. Don Potter, Executive Secretary of MMEA, February 1977.

[39] The debt ceiling for cities in Michigan is ten percent of the city's state equalized valuation (see MCLA 11.4a). Legal reference for general obligation financing is to PA1909, No. 279 (MCLA 117.4a). Legal reference for revenue bond financing is to the Revenue Bond Act of 1933 (MCLA 141.101). A general discussion of local government debt financing can be found in James A. Maxwell, Financing State and Local Governments (Washington, D.C.: The Brookings Institution, 1965).

[40] *Ibid.*, p. 204.

year payment period for a serial bond would change interest costs by about nineteen percent. Other disadvantages of revenue *vis à vis* general obligation bonds are the usual extension of the life of the revenue bond to provide a "safe margin of time" to cover the debt -- which leads to higher interest rates -- and, the inflexibility incurred when a portion of future electric utility revenues must be set aside for the specific purpose of bond payments.

Complexity of financing springs from the unusually huge debts which municipals must contemplate if they are to consider joint venture generating facilities. In the state of Georgia, for example, the state-wide Georgia Municipal Electric Authority went to the bond market in January 1977 with an issue of three hundred million dollars, far and above the usual experiences of single municipal bond issues for electric facilities.[41]

Still, the complexity created by added debt size is a complexity in degree but not in kind. Debt financing is an issue with which municipal managers have some experience, feel able to estimate risks, and feel able to undertake with a high degree of certainty. The strong negative answers expressed by the managers at Company M and Company I about any concern over debt financing reflect the experiences gained by these officials in previous work in another region, where debt financing for municipal joint ventures is common.

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[41] Newsletter of the Michigan Municipal Electric Association, February 1977.

The municipal managers commonly expressed a desire for the passage of provisions of proposed Michigan Senate Bill 1539 (S.B. 1539) which calls for the Michigan Municipal Finance Corporation to issue state general obligation bonds to finance joint ventures by municipal electric companies.[42] Advantages from this bill for the municipals would include reduced interest costs *vis à vis* separate municipal revenue bonds and reduced complexities (transactions costs) for individual city administrators.

REC Financing

Rural Electric Cooperatives (RECs) have other sources of funds for debt financing. Beginning in 1944, the REA provided funds to member cooperatives at a two percent rate of interest with a thirty-five year maximum repayment schedule. In 1973, the Federal Office of Management and Budget announced a curtailment of the two percent direct loan program. Subsequently, Congress enacted new legislation, which provided for a five percent insured and guaranteed loan program with some "hardship" two percent direct loans remaining.[43]

The legislation also allows REA to guarantee private loans. As a result the National Rural Utilities Cooperative

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[42] This bill, in amended form, became P.A. 446 of 1976 and is the subject of Appendix B.

[43] United State Congress, Public Law 93-32, 93rd Congress. See Berlin *et al.*, Perspective on Power, pp. 160-161.

Finance Corporation (CFC), a nonprofit cooperative designed to raise money for RECs through public bond offerings, was created and has grown rapidly. CFC made its first loan in 1970 and has, since its beginning, loaned about 1.6 billion dollars to 793 cooperatives.[44]

Cooperative managers interviewed expressed confidence in their abilities to finance joint ventures and did not view this issue of concern as an impediment to coordination. In fact, two of the REC managers interviewed have subsequently gained commitments for ninety-eight million dollars from CFC as part of the two hundred million dollars they have offered the Detroit Edison Company for a portion of the Enrico Fermi II nuclear power plant.[45]

Reliability of Service

The final hypothesized issue of concern is about reliability of service. Table 5-14 illustrates responses from the interviewed managers for the issue of reliability.

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[44] "A Big Money Tap for Rural Electric Co-ops," Business Week (November 29, 1976), p. 77.

[45] *Ibid.*, pp. 77-78.

Table 5-14 Reliability of Service Concerns

Question: Has concern about the reliability of service in power pools inhibited your company's willingness to coordinate?

(For Legend see p. 204)

PS	P	O	N	NS	DK	
				W		MG
				D		
				T		
				G		
			N			
				I_p		MCP
				I_r		
				U_p		
				U_r		
			V_p			
				V_r		
				Y		
	L					
				M		
			X			C-ES
				J		

By coordinating systems, individual companies trade-off some protection against the hazards of transmission interference for emergency backup protection. In a power pool, the probability that hazards, such as severe weather, will interfere with transmission and thereby affect services in the member companies is increased. But in the pool, companies may aid that individual system requiring emergency power. The a priori hypothesis for the interviews was that the managers would weigh the hazard of interference greater than the benefits of emergency insurance. Perceived high risk or uncertainty about reliability would thus be a limiting factor for coordination. Evidence from the interviews reveals, however, that although managers were aware of the reliability issue, perceived risks were low and the issue was not significantly limiting.

Several managers mentioned recent technological advances in equipment and facilities used to link electric systems which reduce the risk of pool-wide power failures. Many managers recounted their own experiences in having linkages to other systems by which emergency power was provided. The managers' comments suggest that a concern about reliability was not a widespread barrier to coordination. Company V's former manager commented that any manager would be most comfortable with a completely independent reliable system but that any concern in the form of either high risk perception or uncertainty about reliability in a coordinated system would be very rare.

Company L's manager was the one person interviewed who did perceive an added risk in coordination. His comment was that although the technology of interconnection has increased reliability in power pools, so too has the delicacy of electrical machinery and appliances increased. His concern was not about power outage but about voltage levels.

Other Issues of Concern

All the managers interviewed were also asked: Do any other factors exist which inhibit your company's willingness to coordinate? One manager answered that he expected opposition by environmental groups opposed to new construction of joint generating and transmitting facilities to emerge as a constraining factor. By far the most prevalent answer to this question was that the constraining influence of Consumers Power Company created an impediment to small company coordination. Eight of the managers suggested that Consumers' influence has been a significant barrier to coordination among small Michigan companies. Seven of the eight also added, however, that Consumers' opposition to small company coordination has eased recently.

The Role of Consumers Power Company

A United States Department of Justice View. A detailed description and analysis of markets for electricity in Michigan and Consumers' role in those markets is contained in the Department of Justice, Midland Antitrust Brief of 1974.

Evidence was gathered and organized in this brief to make the argument that Consumers, by controlling the power exchange market in its service territory, has effectively reduced competition for wholesale and retail power sales by the two dozen municipals, ten distribution cooperatives, two G and T cooperatives, and one IOU contained within this territory. Consumers' control of the regional power exchange, according to Justice Antitrust Division attorneys, ". . . permits it to foreclose its competitors from the access essential to power exchange services or to grant access only on unreasonable terms."[46] Control over power exchange allows Consumers , according to the brief, the ability to prevent competitive systems from achieving economies of coordination.

Some access to regional power exchange for competitive companies had historically been granted by Consumers through power exchange agreements with municipals on a "mutual benefit" basis. The brief contends, however, that contracts made on this basis were very disadvantageous for the small contractors as compared to contracts in other regions of the country, were regarded as being very disadvantageous by potential contractors, and discouraged participation in regional power exchange. According to the brief: "The 'mutual benefit' demanded by

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[46] United States Department of Justice, Midland Antitrust Brief of 1974, p. 7.

applicant [Consumers] as a prerequisite to granting access to the regional power exchange is nothing more than its insistence upon exacting the advantage of its monopoly position."[47]

The Company Reply. Officials from Consumers answer that to lump power exchange agreements with intercompany transmission or "wheeling" is to "mix apples and oranges."[48] Their contention is that even though the small companies have expressed a perception that Consumers' wheeling policies had changed recently, this was not in fact the case. Consumers the officials stated, has a power exchange policy and a wheeling policy. Several power exchange agreements had been concluded prior to the beginning of the Midland litigation in 1971, they said, but no small company had approached them concerning a wheeling agreement prior to 1971.[49] Their wheeling policy thus developed after 1971. This policy is based on an average cost plus calculation and is as follows:

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[47] *Ibid.*, p. 7.

[48] This analysis is drawn from conversations with two officials, an accountant and a lawyer, with Consumers Power Company, in February 1977.

[49] This statement was directly disputed by several small company spokesmen.

Consumers Power Company

CURRENT POLICIES: Wheeling[50]

As to wheeling:

We recognize that in a period of environmental concern and energy shortages, every effort should be made to maximize the efficiency of electric utility systems so as to provide the cheapest possible service at the lowest possible social cost. Therefore, we are prepared to offer bulk power wheeling services to other utilities, at their request, subject to certain conditions. By the same token, we would expect that our neighboring utilities would reciprocate.

As to conditions on wheeling:

The following four come to mind:

(1) that we have the physical capability on our existing or projected transmission grid to provide the desired service, without impairing service to our existing and projected loads or commitments or endangering our system reliability;

(2) that we be properly compensated for this service. Proper compensation means that we recover our costs, measured by proper allocation of average system transmission costs, so that our other customers do not subsidize the wheeling customer;

(3) that provision of bulk power wheeling service will not result in a significant loss to Consumers Power, directly or indirectly, of existing load or service areas, with resulting idled facilities and social waste.

(4) that provision of bulk power wheeling service will not result in significant loss to Consumers Power of access to interchange power transactions with third parties.

Thus the perception of small company managers that Consumers asked unreasonable wheeling rates prior to 1971 may have been based on hearsay. Even so, the perception could have had a chilling effect on coordination. Small company managers may also have rationalized avoiding

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[50] Enclosure in a personal letter from Wayne Kirkby, Consumers Power Company, Jackson, Michigan (February 15, 1977).

coordination by using the excuse of Consumers' opposition. In any case, the wheeling policy now exists and is generally regarded as being reasonable, if not liberal. As such, the cost of wheeling must be calculated by small companies surrounded by Consumers and contemplating coordination. Thus, cost as part of a wheeling contract with Consumers may constitute a barrier to coordination but not because of any uncertainty or risk attached.

Conclusions About Uncertainty and Risk

Summary of Findings

Field studies on the three case situations provide some evidence on the hypothesized issues of concern. Ability to generalize from the case studies is limited by the small sample and nonrandom selection process.

Table 5-15 summarizes the interview findings for the hypothesized issues of concern. Whether, on the basis of the interviews, cause was found to continue viewing the issue as a limiting factor is stated in the table. Conclusions about the relative presence of uncertainty or perceived risk are also stated. Those factors which were found to reduce concerns either by reducing uncertainty or lowering the perception of risk are also included in the table.

The contrast previously noted, between self-perception of issues of concern and observed behavior of others, is also illustrated in Table 5-15. For the issues of loss of

Table 5-15 Findings on the Hypothesized Issues of Concern

	Hypothetical Issue	Continued Tentative Acceptance?	Relative Presence of Uncertainty or High Perceived Risk	Ameliorating Factors
1a.	Loss of own company control	yes	uncertainty, some high risk	Size, prior working experience, homogeneity of type (all result in trust), organizational type (resulting in more knowledge), managerial training in planning, unanimity rules in joint agencies
1b.	Loss of company control for others	strong yes	uncertainty	
2a.	Loss of own managerial control	weak yes	uncertainty	Job opportunities, changes in opportunity set
2b.	Loss of managerial control by others	yes	uncertainty	
3a.	Opportunistic behavior, self-concern	weak yes	uncertainty, some risk	Same as for # 1
3b.	Opportunistic behavior, others' concern	strong yes	uncertainty	
4.	Ability to assume financial burdens	weak yes	some uncertainty, high risk	Policies to reduce costs, complexities
5.	Reliability of service	no	low risk	

control by companies and managers and for the issue of opportunism, those interviewed expressed lower levels of concern in their own behavior than in the behavior of others.

Two hypothetical issues were found to be of little or no concern to those interviewed. They were the ability to assume financial burdens and the reliability of service. Three issues were found to be of more concern: loss of company control; loss of managerial control; and opportunistic behavior. Managers who were interviewed were generally uncertain about control and opportunism, and some managers were informed enough to have formed perceptions of high risk.

A number of ameliorating factors were also found in the interviews. These factors explain how participant individuals and companies have been able to avoid or overcome issues of concern. The factors have important policy implications and will be reconsidered in Chapter VI when suggestions for avoiding limiting factors and promoting small company coordination are proposed.

Related Works on Behavior and Public Decision Making

Applications of concepts from social psychology to public policy analysis are rare.[51] Ole Holsti suggests a reason for such a rarity: ". . . By the time one has taken into account

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[51] Ole R. Holsti, "Cognitive Process Approaches to Decision-Making: Foreign Policy Actors Viewed Psychologically," American Behavioral Scientist, Vol. 20, No. 1 (September/October 1976), pp. 11-32; Thomas G. Walker, "Microanalytical Approaches to Political Decision Making," American Behavioral Scientist, Vol. 20, No. 1 (September/October 1976), pp. 93-110; Samuel A. Kirkpatrick, Dwight F. Davis, and Roby D. Robertson, "The Process of Political Decision-Making in Groups," American Behavioral Scientist, Vol. 20, No. 1 (September/October 1976), pp. 33-64.

systematic, societal, governmental and bureaucratic constraints on decision-makers, much of the variance in . . . policymaking has been accounted for; attitudes of the individual decision-makers are thus often regarded as a residual category which may be said to account for the unexplained variance."[52] In language drawn from the framework of analysis presented in Chapter II, Holsti's point is that some analysts feel that once institutional variables are known, performance can be sufficiently explained. But the framework of Chapter II provides also for behavioral variables, what Holsti terms ". . . beliefs, perceptions, styles of information-processing. . ." and ". . . strategies for coping with uncertainty."[53]

Holsti suggests that consideration of behavioral variables is necessary, if not sufficient, in explaining participant performance in certain policy situations characterized by:[54]

1. nonroutine decisions which require more than standard operating procedures;
2. decision makers free from organizational constraints;
3. long range decision making;
4. ambiguous situations;
5. information overload;
6. unanticipated events;
7. complex circumstances.

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[52] Holsti, "Cognitive Process," ABS, p. 17.

[53] *Ibid.*, p. 13.

[54] *Ibid.*, p. 20.

Many of these characteristics apply precisely to the situations which decision makers in small electric companies face when they consider intercompany pooling.

Surprisingly, the few applications of psychology to public policy also exhibit a diversity of ". . . conceptualization, sources of theory, research site, subject, and 'data-making' (categories, coding rules, data analysis procedures) operations."[55] Such diversity provides the opportunity for a nonpsychologist researcher to draw out those analytical tools which seem most appropriate and useful when applied to his specific research problem.

Two premises, however, are shared by all the applications of psychology to public policy, including this analysis of uncertainty and risk in intercompany power pooling. First, a general suspicion exists that simple "black box" formulations are insufficient bases for understanding decision outputs either of individuals or groups. Second, an assumption is made that the structure and content of ". . . belief systems, information processing styles, strategies for coping with stress, and the like are systematically related to the manner in which leaders perceive, diagnose, prescribe, and make choices, especially in situations of uncertainty. Both shared and idiosyncratic attitudes and processes are of interest."[56]

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[55] *Ibid.*, p. 21-22.

[56] *Ibid.*, p. 23.

Concepts used in this study (bounded rationality, risk and uncertainty, the conservative bias of uncertainty) were drawn from the works of economists Mack and Williamson, who have found them useful in their economic analyses. The roots of the concepts go back, however, to theoretical literature from several subdisciplinary fields of social psychology including cognitive psychology, communication theory, game theory, decision theory, and deterrence theory. While by definition no nonpsychologist can claim expertise in these fields, an attempt has been made in this research to establish that the concepts and theories used do not conflict with the theoretical literature of social psychology.[57]

High Exclusion Costs, Joint Impacts, and Economies of Size

The three case studies also provide evidence to test hypotheses involving goods with high exclusion costs, joint impacts, and other charactersitics which cause interdependencies. Four intermediate steps -- purchase of a feasibility study, provision of interchange capacity, construction of joint generating facilities, and the effort to obtain desired state legislation -- were all investigated. Managers were questioned as to whether problems had arisen over who should pay and/or who could be the marginal investor in these four steps. Managers

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[57] A very useful summary of cognitive processes approaches the public policy analysis is provided in the September/October 1976 issue of American Behavioral Scientist, Vol. 20, No. 1.

were also asked whether other steps in the development of power pools had involved the same problems. Each of the three cases will be analyzed in turn.

Michigan Group

Feasibility Study

Information, the product of a feasibility study, was analyzed in Chapter II and shown to exhibit certain characteristics. That is, such information was shown to be an optional use, positive, but probably unevenly valued, joint impact good with an exclusion cost which may or may not be high. Among Michigan's municipal companies, exclusion costs for feasibility studies are significantly increased by Michigan's public exposure laws which allow public access to government information.

Findings

For these reasons, some difficulty was anticipated in deciding who should pay for the purchase of a feasibility study. But little conflict was found in MG. The five municipals divided the twenty thousand dollar cost of the study evenly and without, according to the managers, any strife. While it cannot be stated that this group purchased the "optimal level" of information desired, it did purchase sufficient information to proceed with further coordination planning.

Explanation

The idea of sufficiency has implications for human interdependencies. Feasibility studies are "lumpy" rather than perfectly divisible goods. It is impossible to purchase one-half or one-quarter of a feasibility study. Payment for such a study is conditional, depending on whether the study contains sufficient (or more) information to meet the purchaser's needs.[58]

Because a feasibility study is nondivisible, choices among MG members were reduced and simplified. The choice for each individual manager came down essentially to helping purchase _a_ study or having _no_ study. MG is small enough so that each member would realize the impact of his own participation in purchasing a study, yet the cost was such that the study could probably not have been purchased by any one of the participants.

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[58] Different types of feasibility studies for power pooling are evident. One report may combine studies of engineering, financial, or political variables. Quality of information provided by a feasibility study may also vary. Nevertheless, the "lumpy" nature of a study remains. This analysis departs from Mancur Olson's seminal work on group provision of goods with high exclusion costs. See Olson, _The Logic of Collective Action_. Olson assumes that such goods are provided in divisible units. Whether the goods are divisible or lumpy seems to have implications, however, for behavior.

Friendships built among the managers on the basis of mutual aid provide social incentives to contribute to the purchase of the study. Mancur Olson writes that social status and social acceptance are "individual noncollective goods" which may be used to mobilize reluctant contributors.[59] When the choice is yes or no, have the good or not, such incentives are probably strengthened significantly.

Ultimately, the group did finance a study, and each company made an equal cost share of four thousand dollars. Valuations of information provided by the study were probably different among the five managers, although answers provided in the interviews do not reveal sharp differences. Olson's hypothesis that high exclusion cost goods will be more readily supplied in groups where the fraction of individual member gains differ substantially was neither supported nor denied by the managers' answers.

Key factors which emerged as explanations for why the group experienced little difficulty in deciding who would pay for the study were: small number of participants; relatively low cost of the study; lumpiness of the good; and social incentives.

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[59] *Ibid.*, p. 61. By "noncollective" goods Olson means goods for which exclusion cost is low.

Schelling's Focal Point Concept

The equal division of costs for the MG feasibility study is significant. By using the simple rule of equal cost shares, the MG members were able to avoid extended transactions in deciding how to allocate costs. Moreover, the equal shares rule has a connotation of equity, and its adoption creates peer pressures to agree to an apparently equitable solution to the division of the cost problem.

Interviews with participants in collective actions among electric companies revealed that simple cost sharing rules are often adopted to avoid lengthy transactions about how to divide costs. These rules correspond closely with phenomena observed by Thomas Shcelling which he termed "focal points." Focal points, according to Schelling are clues for coordinating behavior and for creating mutual expectations.[60]

In the field studies, participants were observed to coalesce around simple rules of cost sharing as focal points when these rules cut through transactions by offering apparently equitable solutions to sharing problems. Consultants were also observed as playing a key role by suggesting focal point rules from previous experience. For example, a consultant might advise: "From my previous experience, you should divide the costs equally." Or another common proposal is: "Shares should be divided according to the size of the member systems."

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[60] Thomas A. Schelling, The Strategy of Conflict (Cambridge, Mass.: Harvard University Press, 1960), pp. 52-80.

Focal point rules for cost sharing simplify transactions by avoiding the problem of somehow valuing a priori the eventual good to be derived by each individual contributor. And, the apparent equity of these rules creates social pressure on each participant to contribute its share.

Focal point cost sharing rules will be considered again in Chapter VI. They provide ways for companies to avoid the breakdown of collective actions.

Interchange Capacity

MG members have not reached that point in collective action where they must begin to contribute to the purchase of interchange capacity by constructing central dispatch facilities. They have, however, reached the stage wherein they can contemplate who will pay for such facilities. A working hypothesis developed prior to the interviews was that because the ability to exchange energy and the ability to call upon reserves are joint impact goods (or at least have sharply declining marginal cost) with expected uneven values for the participants, difficulties would arise over the question of who should pay for these goods.

Findings

Difficulties have not arisen over who will be the intramarginal and who the marginal investors, or, in general, over who should pay what for interchange capacity. Further questioning of MG managers reveals, however, that these difficulties have ingeniously been avoided. Interchange capacity and the goods it provides (abilities to exchange power and call upon reserves) and generating facilities and the good provided (electricity) are, of course, separate and distinct steps in power pooling. Moreover, the goods provided by interchange are joint impact in nature while electricity is not. For the purposes of investment planning by the MG managers, however, interchange capacity and generating capacity are fused.

This erasure of distinction between the two steps allows for the investment rule that a company will invest in dispatching facilities in the same proportion as it invests in generating facilities. Once again, a simple focal point rule has been employed. Because MG is planning to construct both dispatching and generating facilities, the companies could link the two investments and avoid difficulties in deciding who should pay for dispatching per se. In other case situations (both MCP and Cloverland-Edison Sault), planning for dispatching and joint generation was <u>not</u> coincidental, and this solution not available.

Mixing Goods Strategy

Analysis of the dispatch-generation investment linkage bears a striking resemblance to organization strategies analyzed by Mancur Olson. Olson hypothesizes that organizations which provide "collective goods" to their members and which do so without exploiting large benefactor members to support other members, survive by mixing noncollective benefits in with the collective services. This allows Olson to explain, for example, why some farm organizations which sought higher prices or new federal legislation (both goods have high exclusion costs and joint impacts) did not survive while other farm organizations, such as the Farm Bureau, did survive by combining their lobbying activities with the provision of noncollective services. In MG, apparently, the managers have similarly avoided the difficulty of deciding who should pay for central dispatch by linking this investment with a noncollective good -- the amount of energy which members will receive from the pool's generating facilities.

Joint Generating Facilities

At this stage of MG development, payment has not begun for the construction of joint generating facilities. Very basic decisions have not yet been made about what form the power supply agreement between joint agency and individual municipal will take.[61] Thus while the managers have begun

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[61] Essentially, two basic forms of agreement are said to be possible: 1) "Take and Pay Contract." Under this contract form, the parties agree to buy all additional energy requirements for their systems from the joint generating facilities. The parties pay on a rate basis for energy which they receive. 2) "Take or Pay Contract". The parties may obtain additional energy by other means. Blocks of generator capacity, however are paid for by the parties, and some payment must be made regardless of how much energy is actually obtained. The feasibility study prepared for MG suggests a combination of these two types of contracts.

to consider payments, they have not thought seriously about their interdependencies in investment.

Moreover, an assumption made by the consulting engineers tends at this stage to "paper over" any cracks of dissension. The assumption (previously described as unwarranted by historical trends) is that the five municipals will have *equal* future annual rates of growth of five percent for both peak demand and energy supply. This assumption implies that the municipals will place similar value on additional sources of electricity and/or that costs for needed generation will be proportional to the current size of the five systems.

The working hypothesis on joint generation facilities was that because of the existence of economies of size in construction and economies of size and utilization in operation, intercompany difficulties would arise about who would be the marginal investor. The study of this case reveals, however, that consideration of interdependencies and potential strategies has not been made by the managers. Two explanations emerged in the interviews. First, not much thought has been given at this stage to the actual power supply contract for electricity. Second, what difficulties might have emerged have been suppressed by the assumptions made in the feasibility study.

New Legislation

All five MG members are also members of their statewide association, the Michigan Municipal Electric Association (MMEA). This association has an Executive Secretary who acts as the principle lobbyist for the municipals. Lobbying, the expression of partisan interest in new legislation, yields benefits with special characteristics -- high exclusion costs and jointness of impact. Thus it was hypothesized previously that lobbying efforts will involve the problem of who pays. Interviews with the MG managers, managers of municipal members of MCP, and MMEA's Executive Secretary all lend support to this hypothesis.

Findings

The interviews revealed that seven of forty municipals in Michigan are not members of MMEA. Comments on the behavior of these nonmembers suggest that they desired the advantages of the lobbying effort without the burden of contributing to the association's costs. During a sustained effort by MMEA in 1976 to obtain passage of S.B. 1539, all members of the association were assessed a special fee. Thirty thousand dollars was budgeted by the association for this special lobbying effort. Not all members paid their assessments, however, and contributions left the association about five thousand dollars short of the budgeted amount.[62]

Two Strategies

Comments by MMEA members and officers reveal that two strategies have been devised to overcome the problem of who pays. First, the association provides informal consulting

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[62] Comments made by participants during a special meeting of MMEA in February 1977.

services. If a municipal manager has a management problem of any sort, he can call upon MMEA, and other experienced managers will organize a visit of assistance. Such services do not exhibit the characteristics of either jointness of impact or high exclusion cost.

A second strategy is to use a focal point rule and assess annual dues according to the size (annual sales) of the municipal. The association's annual budget for 1977 will be approximately fifty thousand dollars. Of this, the smallest municipal member will be assessed approximately three hundred seventy-five dollars, while the largest member will pay about two thousand six hundred twenty-five dollars. Assessment of fees on a size basis is justified mainly by an "ability to pay" rationale. Such assessment may also correspond, however, to a perceived distribution of the benefits of the association.

Indeed, it is noteworthy that both of these strategies have special appeal for smaller municipal members. Managers of smaller companies, without substantial internal resources, would be more likely to call upon outside advice. These strategies are useful, thus, in preventing an exploitation of big municipals by small. Small companies remain as members of MMEA and lend support to the lobbying effort. In return, the larger companies pay more for lobbying and subsidize consulting services for small company use.

Michigan Municipals and Cooperatives Power Pool

Feasibility Study

MCP represents a very unusual case in that no overall feasibility study was ever done for the pool. Informal agreements between individual companies were made prior to 1968. When in 1968 a formal agreement was proposed, three separate power supply feasibility studies were done -- one for the two cooperatives, one for Grand Haven, and one for Traverse City. The latest member of the group, Zeeland municipal, joined the pool in 1976 without benefit of a feasibility study.

By assuming the additional costs of paying for three feasibility studies rather than one, the companies were able to avoid the hypothesized difficulty in deciding who will pay. Zeeland was able to take advantage of the certainty of an existing pool and enter without any expense of a study whatsoever.

Central Dispatch Facilities

Yet another method was used to circumvent the problems of who should be the marginal investor and who should pay for central dispatch facilities. These facilities, which involved an initial investment cost of fifty-four thousand dollars and have an annual operating cost of about eighty thousand dollars were provided by Wolverine REC. Wolverine assumed all costs from the beginning of the pool in 1968 until 1974, when Northern Michigan REC began paying part of the operating cost. In late 1975, a policy was begun whereby operating costs were divided among the pool members on a relative size basis.[63]

Joint Generating Facilities

No joint generating facilities have been constructed within the pool so that the hypothesized difficulty of the marginal investment strategy is not apparent. In the feasibility studies prepared for Grand Haven and Traverse City in 1968, the consulting engineers suggested that the cooperatives, which were chronically short of electricity, should subsequently construct their own generators; indeed, this individual construction was done. Very recently the cooperatives have concluded a two hundred million dollar agreement as a joint venture with Detroit Edison Company in the nuclear plant Fermi II. Grand Haven is currently undertaking a feasibility study for an eighty megawatt generating unit. Traverse City, which faces the opposition by environmentalist groups against any further local generating facilities, is purchasing ever increasing amounts of power through MCP.

Cloverland-Edison Sault

This power pool represents, of course, a case involving the smallest possible number of coordinating companies -- two. Mancur Olson hypothesizes, and the case supports his view,

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[63] A focal point rule is used. Peak demands over a time period among the five members are summed. Then each member is assessed a cost share for that period in proportion to its share of the summed peak demands.

that the problem of who pays increases directly in relationship to the number of participating members in a group providing collective goods.

Feasibility Studies

Both company representatives stated that once the companies reached the point of considering joint actions such as feasibility studies, little conflict was involved. Apportioning costs on a size (KWH) basis seemed a fair proxy, i.e., a focal point in lieu of the true values which the companies attached to the studies.

Central Dispatch Facilities

The larger of the two systems -- Edison Sault -- has assumed all costs of providing a central dispatch facility.

Joint Generating Facilities

The potential for a marginal investment strategy for construction of generating facilities is, of course, reduced by having only two participants.

Conclusions about High Exclusion Costs, Joint Impacts, and Economies of Size

Whenever two or more individuals or groups consider a collective action which requires resources, consideration must be given to the decision of who will pay. Previous studies have analyzed special difficulties which attend to products of individual or collective actions having the characteristics of high exclusion cost, jointness of impact, and economies of size.[64] Because several intermediate steps to power pooling exhibit such characteristics, hypotheses were formulated about difficulties which would attend the decisions of who will pay for the intermediate steps.

The findings are, in essence, that difficulties have been circumvented or avoided by a variety of means in the three case situations. By these means the companies involved have achieved collective action. Intermediate steps and the means by which situational factors have been avoided in the various case situations are illustrated in Table 5-16.

Malevolence

The hypothesis that malevolence per se functions as a barrier to coordination was established in Chapter II. In order to test this hypothesis, those officials interviewed were asked two questions -- the first directed toward their own behavior and the second toward the behavior of other companies. The two questions and the officials' responses are illustrated in Tables 5-17 and 5-18.

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[64] See especially Olson, The Logic of Collective Action and Schmid, Property, Power and Public Choice.

Table 5-16 Summary of Findings on Product Characteristics

Intermediate Step	Case Situations	Explanations for Avoidance of Failure
A. Feasibility Study	MG	1. Social incentives used to gain funding for this "lumpy" product 2. Small number of participants 3. Relatively low cost 4. Used focal point rule of equal shares
	MCP	1. Separate studies 2. Zeeland waited for certainty
	C-ES	1. Small group 2. Used focal point rule of shares based on KWH
B. Central Dispatch	MG	1. Linked to joint generation
	MCP	1. Wolverine paid
	C-ES	1. Edison Sault paid
C. Joint Generation	MG	1. Not yet considered seriously 2. Assumption in the feasibility study of equal needs
	MCP	1. No joint generation
	C-ES	1. Small group
D. Necessary Legislation	MG and municipals in MCP	1. Used MMEA consulting services 2. Assessment by size of municipal

Table 5-17: Own Malevolence

Question: Would your company ever by unwilling to coordinate with some or certain other companies even when you would expect to gain economic benefits?

(For Legend see p. 204)

PS	P	O	N	NS	
			W		MG
				D	
		T			
			G		
			N		
			I_p		MCP
				I_r	
			U_p		
			U_r		
			V_p		
			V_r		
				Y	
			L		
			M		
			X		C-ES
			J		

Table 5-18 Others' Malevolence

Question: Do any other companies, in your opinion, refuse to coordinate even when economic advantages would be mutual?

(For Legend see p. 204)

PS	P	O	N	NS	
	W				MG
			D		
	T				
			G		
			N		
		I_p			MCP
	I_r				
	U_p				
	U_r				
	V_p				
	V_r				
	Y				
		L			
			M		
			X		C-ES
		J			

These tables of responses reveal, again, differences between managers' descriptions of their own behavior and their descriptions of the behavior of others. One explanation for the differences, cited previously, is that the managers interviewed are unrepresentative of the population of small company managers and are, in fact, more inclined toward coordination. An alternative explanation is that the managers were unwilling to reveal aspects of their own behavior which might reflect poorly on themselves or on their managerial capabilities.

Even with the pattern of positive responses revealed in Table 5-18, however, it would be difficult to conclude that strong evidence for malevolent behavior among small electric comapnies exists. In retrospect, the questions on malevolence were phrased too broadly and failed to focus on malevolence per se. Follow-up questions put to those officials who responded positively when asked the question in Table 5-18 reveal that the respondents believe that several "noneconomic" rationale explained refusals by others to coordinate. Managers at Companies T and W stated that investor-owned companies often failed to capture benefits by refusing to coordinate with small municipals. These managers could not deny, however, the proposition that the investor-owned companies could be following the strategy of foregoing small benefits in the hope that the small municipals would sell out, thereby providing the investor-owned companies with larger benefits with the additional markets.

Similarly, the retired manager at Company U spoke about the intent of Consumers Power Company to "destroy the credibility of [Company U]" by not coordinating. Again, however, an economic incentive existed for such behavior by Consumers. Both the present and retired managers at Company V referred back to the uncertainty held by managers as another non-economic rationale for refusal to coordinate.

In sum, thus, the interviews failed to provide convincing evidence that malevolence influences intercompany coordination or the lack thereof. Further research on this hypothesis would need to develop a clearer test for the presence of malevolence, especially by distinguishing uncertainty and long run economic strategies from malevolence per se.

Conclusions About Situational Factors

Findings on the Existence of Limiting Factors and the Ways to Avoid Such Factors

Interviews conducted among participants in the three case situations in Michigan wherein collective action has occurred lend supporting evidence to hypotheses that limiting factors obstruct collective action. In general, however, the field studies revealed more about how participants have avoided limiting factors.[65] Additional evidence for the presence of limiting factors can be developed by presenting several case observations of relationships among municipal companies in Michigan.

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[65] Thus a logical follow-up effort would be to study situations wherein attempts at collective action have failed.

While this dissertation was being written, the Michigan State Legislature passed S.B. 1539. On January 13, 1977 the bill was signed by Governor Milliken and became Act Number 448, Public Acts of 1976 (P.A. 448 of 1976) -- the "Michigan Energy Employment Act." A detailed examination of this act is included in Appendix B. At this point it is important to know that the act removes any uncertainty about the legality of municipal participation in coordination.

Two important steps have been taken by MMEA since the act was signed. First, a general letter was sent by the executive secretary to all members, describing major considerations for municipals should they make efforts to establish power pools. This letter is included as Appendix D. Second, a meeting was called by a special subcommittee within MMEA for all members to consider whether and how to proceed on power pooling efforts. Both the executive secretary's letter and a description of the meeting present strong corroborating evidence for the existence of limiting factors. The internal letter is important, too, in that it is an independent piece of analysis made by participants trying to overcome barriers to the collective action of power pooling.

Letter to MMEA Managers from the Executive Secretary

Parallels with Other Findings

Nearly all of the hypothesized situational factors which gained continued tentative acceptance in the interviews are mentioned in the executive secretary's letter. Much emphasis is placed on problems of uncertainty about several issues of concern previously hypothesized -- financing large sums of money, opportunism by other pooling partners, and a loss of "autonomy." Another potential issue of concern mentioned -- "how to get organized" -- seems a sort of "catchall" category.

Emphasis is placed, too, on the difficult questions of who will pay for intermediate steps (page three of the letter), what marginal investors should pay (pages three and four), and how the economies of size gained from joint generating facilities will be distributed among investors (pages three and five). This letter thus closely parallels the conceptual theories and findings gained in the case studies on situational factors.

Discrepancies

Three discrepancies between the letter and the findings need to be explained. First, the letter does not distinguish between concern about the loss of management control and concern about the loss of *company* control. Either concern may be implied from the phrase, "a certain loss of autonomy," used in the letter.

Second, no mention is made in the letter about difficulties in deciding who will pay for central dispatch facilities. It seems logical to conclude that this difficulty is being avoided in planning for new power pools in the same manner in which the difficulty was avoided in MG, i.e., by using the focal point rule of tying the products of central dispatch together with the product of joint generation facilities. In this manner, products which have high exclusion costs and jointness of impact (ability to exchange and ability to call upon reserves) are linked with a product which has neither of these characteristics (electricity); the problem of deciding who will pay is thus eased.[66]

Finally, additional intermediate steps to power pooling are described in the letter -- obtaining general and special legal counsel, obtaining bond and other financial counsel. Indeed, if huge pooling projects, such as the one for Georgia described in the letter, are to be undertaken, these additional intermediate steps are essential. What these steps will provide, however, is specialized information not unlike that information provided by consulting engineers in their feasibility studies. Thus all of these early start-up steps to provide information are conceptually related. Although the three case studies on MG, MCP, and C-ES were oriented toward obtaining knowledge about difficulties in deciding who should pay for feasibility studies, all of the early information gathering steps are sufficiently similar that the findings logically apply. This conclusion is supported by the letter itself which lumps these early information gathering activities within the notion of "start-up steps" and refers, again, to the difficult question of who will pay for them.

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[66] Joint generating facilities do involve economies of size with attendant interdependencies and potential for conflicts in collective actions.

MMEA Meeting

On February 10, 1977 a meeting of MMEA members was held to discuss new opportunities and constraints provided for municipals in P.A. 448 of 1976. This gathering was organized by a special committee of MMEA designated to lobby for the passage of S.B. 1539 and to report back to the full membership.[67] Speakers -- a general attorney, a bond attorney, and an engineering consultant were invited to present formal remarks on P.A. 448 and on municipal coordination experiences in other states. A question period followed the presentations. Also present at the meeting were other interested bankers, financial consultants, engineers, and attorneys.

Consultants' Suggestions

Mr. Seth Burwell, a general attorney who had participated in lobbying for S.B. 1539, discussed major legal points in the act. He emphasized that the legislation required, first, a feasibility study funded by individual municipals. Mr. Burwell suggested that a common pattern to follow would be to create a nonprofit corporation to hire the study and then to dissolve upon the study's completion. Membership in the corporation should be "committed municipals," he stated, and not "the curious." Provision was made in the act for "late comer members," but he suggested that consideration be given

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[67] The special committee consisted of the managers from municipals at Bay City, Grand Haven, Hillsdale, Holland, Lansing, Petoskey, and Traverse City.

to financial penalties for such action. Mr. Burwell also suggested that the feasibility study include participation by engineers, financial counsel, general legal counsel, and bond attorneys. This process would take time, he said, and should begin soon. Finally, Mr. Burwell emphasized that any joint agency, if formed, would "intrude" upon the freedom of action for each municipal member. The time to recognize the intrusion and to begin explaining its dimensions to the local governing body was now, he stated.

The second speaker, Mr. Charles Wilson, a bond attorney, placed emphasis on meeting the tests of the act, especially hiring a feasibility study. He too suggested a nonprofit corporation to hire the study and estimated the cost at about fifty thousand dollars and the time at about six months. Assessment of costs on a municipal size (KWH) basis appealed to him as "equitable." After the feasibility study, if municipals decide to proceed with one or more joint agencies, six additional months would be required, he expected, to draft articles of incorporation and bylaws, hire additional consultants, and hire a manager. Another eight months would be required to develop a detailed plan of action. The development would involve high costs for administration, engineering consultants, attorneys, and contingencies. The final product would be a "power sales contract" with which the agency could proceed to sell bonds.

Mr. William Mayben, a consulting engineer, endorsed the idea of creating a nonprofit corporation to hire a study. He described like efforts in other states. Municipals in Michigan could proceed on project by project joint ventures or establish a plan whereby an agency would supply the total requirements of the member municipals, he said. Like Mr. Wilson, Mr. Mayben suggested a focal point rule for cost sharing which would include a size factor.

Special Committee Recommendations

Finally, the special committee on S.B. 1539 made its recommendations known. They suggested that the MMEA members should:

1. recognize the critical power supply problem for Michigan's municipals;
2. recognize that individual and common municipal needs require examination;
3. realize that economies of size exist;
4. consider the possibility of joint agencies and joint ventures;
5. be prepared to commit resources and to trust each other;
6. hire a statewide feasibility study;
7. establish a nonprofit corporation outside of but linked to MMEA to do the actual hiring of the study;
8. realize that time is "precious;"

9. return home and begin talking to local oversight bodies;
10. meet again in one month.

Situational Factors Emerge

In the question-answer period which followed, several issues emerged which could have been predicted on the basis of the case studies on MG, MCP, and C-ES. Why is the KWH basis of assessment for the costs of the feasibility study equitable, it was asked. Does not equity for payment depend on how much the municipals need (value) the study? One MG member asked if their group members would need to pay for the future feasibility study since they had hired one of their own previously. One individual asked if the feasibility study would be done and available to all, regardless of whether all municipals contributed. That is, he speculated that benefits would be general and the exclusion cost high. What emerged in the question-answer period, thus, was the intuitive realization that information provided by a feasibility study was a joint impact, high exclusion cost good. Moreover, difficulties began to arise over who should pay.

Strategic Vote

Before the meeting ended, the chairman of the special committee stated in a surprise move that a roll call vote would be taken to see which municipals would contribute to the feasibility study. Each municipal was asked to answer by saying either "yes" or "no." This move was strategic because it put social pressure on each manager to vote "yes." Before the roll could begin, the managers of two small municipals exited from the meeting room.

The vote then began. However, the committee's strategy was undermined when, on the fourth vote, Coldwater's manager stated "undecided." Nine more "undecided" votes were cast, and the final tally stood at fifteen MMEA members "yes," two out-of-room, and ten "undecided." The tally by municipal is shown in Table 5-19 below, and it reveals that generally the larger utilities voted "yes" and the smaller, "undecided."[68]

Analysis of the Vote

Voting followed a rational pattern first hypothesized by Mancur Olson [69] Municipal companies are of unequal size; the larger utilities can be expected to gain larger proportions of the benefits to be derived from the feasibility study. Sensing this, the small company managers would be rational in leaving the room or in voting "undecided" and exploiting the situation. The managers of the larger companies, however, were in the position of realizing that if their municipals did

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[68] An exception was Detroit Municipal Lighting whose delegate voted "undecided" in lieu of delegated authority from his city.

[69] Mancur Olson, The Logic of Collective Action, p. 35.

Table 5-19 Initial Vote on a Feasibility Study for a Municipals' Power Pool

MEMBER	VOTE				
	Yes	No	Undecided	Out-of-Room	Absent
Bay City	X				
Bessemer					X
Charlevoix	X				
Chelsea	X				
Clinton					X
Coldwater			X		
Croswell	X				
Detroit			X		
Dowagiac			X		
Escanaba			X		
Gladstone					X
Grand Haven	X				
Harbor Springs	X				
Hart			X		
Hillsdale			X		
Holland	X				
L'Anse					X
Lansing	X				
Lowell					X
Marquette					X
Marshall			X		
Newberry				X	
Niles			X		
Pawpaw					X
Petoskey	X				
Portland	X				
St. Louis	X				
Sebewaing	X				
South Haven	X				
Stevensville					X
Sturgis				X	
Traverse City	X				
Union City			X		
Wyandotte			X		

not contribute to the study, the probability that the study would be undertaken was substantially decreased. These managers, thus, would be rationally forced into voting "yes," even though it meant they would pay for the benefits to be derived by the smaller utilities. The question as yet unanswered is: Have enough municipals committed themselves to paying for the study so that it will be done?[70]

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[70] At a second meeting held on March 11, 1977, nineteen municipals agreed to fund the feasibility study. Committees were established to investigate the problems of bylaws and articles of incorporation, nominations for officers, dues structure, selection of consultants, and budget.

In July, 1977, fourteen municipals formed a nonprofit corporation to finance the feasibility study.

CHAPTER VI

OBSERVATIONS AND FINDINGS, AND THEIR IMPLICATIONS FOR POLICY, RESEARCH, AND METHODOLOGY

> In going forward we have to remember that our knowledge is imperfect and that the world is always changing. The conceptual models economists like to use ignore such complexities. As surprising as it may seem to a layman, economists often spend their time searching for the best possible answer to some very simplified problem rather than simply trying to devise a good answer for the real problem. While such exercise may have some value as a place to begin, we should not confuse the real world with highly stylized mathematical formulations. The real problem is not to find the best possible outcome. What precisely is possible cannot even be unambiguously identified in any realistic situation. The real policy problem is a sequential search problem. We are usually happy just to find a way to achieve a better outcome. And we want to build a capacity to gather data and to improve our decision-making into the search process.[1]

Introduction

Fossil fuel prices, rapidly escalating since 1972, have created a special problem for small electric companies. Because such companies lack size and market diversity, fuel costs are especially onerous.

Arguments may be advanced for preserving the remaining institutional diversification and decentralization of the electric supply industry. These arguments constitute suggestions for further research more than they do conclusive evidence about such preservation.[2] Primary arguments for preserving the

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[1] Marc J. Roberts, "Energy and the Environment: Research Needs," Energy and the Social Sciences: An Examination of Research Needs, ed. by Hans H. Landsberg *et al.*, (Washington, D.C.: Resources for the Future, 1974), pp. 445-6.

[2] Bases for further research on the arguments are set down in Chapter III and Appendix A.

viability of small electric companies, most of which are municipals and cooperatives, include the following:

1. Institutional diversity and prevention of further concentration allow for comparisons of rates, services, and management techniques by consumers and public officials.
2. Prevention of further concentration may also preserve a degree of competitive behavior among companies and guarantee some measure of consumer choice through the location of households and firms.
3. Small companies or nonprivate companies may create new consumer-company relationships which affect rates, services, environmental impacts, and other consequences of electric company operations.
4. A decentralized electric power system may be technically preferable because of its ability to reduce the undesired impacts of natural and man-made problems.

If small companies <u>are</u> to remain viable members of the power supply industry, they must reorient their operations to capture economies of size and market diversity by relating to other companies. A variety of means of reorientation are available, including joint ventures with large companies, wholesale purchases from large companies, a national power grid, and collective actions among small companies to pool their systems.[3]

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[3] A national grid would involve using the nation's transmission lines as common carriers of electricity, much the same as rail lines now serve as common carriers for rail traffic. Power pooling involves interconnections and coordination of operations and planning among individual electric systems.

The last option for reorientation-- power pooling -- has unique attractions in that, unlike joint ventures and wholesale power purchases, small company power pooling can be pursued with a minimum of large company involvement and the uncertainty that involvement engenders. Large company involvement is particularly reduced when municipals and cooperatives are adjacent. Small company power pooling can also be pursued by individual small companies without their becoming involved in the complexity and conflict which surrounds the national grid proposal.

Research on small company power pooling is made more challenging by the fact that public utility economists have been puzzled at the slow pace and lack of coordination among all electric companies. Two potential sets of explanations were pursued in this research.

First, the advantages of power pooling, especially pooling among several small companies, may not be large enough to attract participation. This explanation was examined by performing a cost effectiveness study of a small power pool which includes three municipals and two rural cooperatives -- the Michigan Municipals and Cooperatives Power Pool (MCP). The first part of this final chapter presents the findings on mutual but unequal gains to pool members studied. Research and policy implications for the Michigan electric industry are also traced in the first section of this chapter.

A second potential explanation for the slow pace and lack of pooling involves a complex set of economic and behavioral reasons. Impediments to collective actions may be implied by uncertainty and by interdependencies surrounding certain product characteristics. The second part of this chapter focuses on the results of field studies and case analyses. Conclusions on impediments to collective actions, i.e., situational factors, are examined first. These conclusions also have implications for policy and for economic research and methodology. Next, findings on ways to avoid situational factors are discussed. These findings are used to suggest policies for groups who are interested in and capable of promoting collective action among small electric companies in Michigan

Part three of this chapter concludes this dissertation. This section very briefly reviews the research findings and implications. Then the ways in which the research synthesizes and extends concepts used by other economists are discussed. The chapter ends with a note on how this research can be applied. A claim is made that the research can be used to help solve the cost of inputs problem among small companies in Michigan. The research should also be useful for suggesting a priori hypotheses for solutions to other problematic situations which involve impediments to collective action.

Cost Effectiveness Study of MCP

Findings

Mutual Gains

The study of MCP operations for the period 1968 through 1975 reveals that although shares of savings were unequal, all members of the pool had reduced costs. Reductions in costs were demonstrated for actual cooperation as compared to the hypothetical, more costly case of isolation. Estimated real net savings for the period of study ranged from $780,775 at Grand Haven municipal to $6,107,531 at Wolverine REC.

Net savings as a percentage of the total net production costs for isolation were also calculated. Grand Haven reduced costs by an estimated 6.0 percent over the eight year period; Northern Michigan REC reduced costs 9.7 percent; Wolverine REC reduced costs 16.1 percent; and Traverse City municipal reduced costs 16.2 percent. Zeeland municipal reduced costs 19.0 percent over that municipal's one year period of membership.

Over the total eight year period, the members shared nominal savings of more than thirteen million dollars. Bargaining transactions involving energy interchange accounted for about eight million dollars in mutual savings. Energy interchanges allowed the MCP participants to capture various economies, including technical economies of size and utilization, economies of location, and the ability to spread fixed costs of production, by employing generating capacity which would otherwise have been idle. Over five million dollars in savings resulted from shared reserves which allowed for delays in construction of additional generating facilities.

Unequal Gains

Various explanations were provided for the findings that savings among members are unequal, even when adjustments are made for relative size of company operations. Unequal shares of savings result from various rules within the pool for pricing exchanges, for dividing savings, and for providing investment and operating funds to create and operate the pool.

Buyer Advantage in Energy Interchanges

An attempt is made within MCP to divide the savings from "economy energy" transactions equally between buyer and seller. (Economy energy is exchanged by a selling member who has a comparative advantage in the marginal cost of production with a buying member who has a comparative disadvantage in marginal cost.) Actual savings are, however, unknown to the pool because true marginal costs are not used in deciding which generator to use. Other types of energy interchanges are priced on a seller cost-plus basis. The other interchanges involve energy for emergencies or for purposes of generator maintenance.

The hypothesis that buying members gain more than selling members was subjected to a statistical test and accepted at a Type I Error tolerance level of $\alpha = 0.1$. The test results imply that pricing rules for energy interchanges systematically favor buyers.

Mathematical models used in the research to estimate savings within the pool did not, however, differentiate between economy energy transactions and other types of energy interchanges. Therefore, no final empirical determination could be done to discover why buyers are at an advantage. Instead, a detailed analysis of rules was conducted. The analysis reveals that the methods which MCP uses to divide the savings resulting from economy energy interchanges apparently work in favor of the buying parties in transactions. This results from the tendency of the pool to systematically (and unintentionally) use a proxy calculation which is lower than true marginal costs.

Unequal Shares of Savings from Delayed Construction

MCP rules were also shown to favor those members who were relatively short of generating reserves during the first eight years of the pool as compared to those members who had relatively more excess reserves. A transfer payment (capacity charge) is used within the pool whenever a member company is unable to provide its own share of the pool's overall minimum level of seasonal reserves of generating capacity. Capacity charges are payments by a company which is short of generating reserves to a company which agrees to provide such reserves. The transfer balances somewhat the savings which members may capture by depending upon one another for reserves and thereby delaying added construction of generating capacity. The capacity charge is very low, however, when compared with the alternative of investing in new generating equipment. Moreover, it is only applied when a member has a severe shortage of capacity. Capacity charges, according to the current rules, are insufficient, therefore, to create a more equal sharing of savings from delayed construction.

Unequal Shares of Costs to Create and Operate MCP

Another source of unequal savings among MCP members results from the fact that some members have played the role of benefactor in the establishment and operation of the pool. The rural cooperative members were especially instrumental in promoting the development of the pool by accepting a heavy burden of the initial costs of interconnection. Wolverine REC also accepted sole responsibility for construction and operation of central dispatch facilities until 1974.

Research and Policy Implications for the Electric Industry

Power Pools Involving Small Electric Companies

Demonstrated savings in MCP suggest that power pools among small electric companies can be used by such organizations to reduce the costs of supplying power. Small electric companies are at a cost disadvantage relative to large companies because their load factors tend to be low, they generally have fewer and poorer options for plant locations than do large companies, and they have not been able to use new technology which has provided significant economies of size for large companies in the electric industry. This last disadvantage becomes even more burdensome in a time of rapid fuel cost increases because small generators use relatively more fuel per KWH.

Other New Relationships to Reduce Costs

Wholesale Power Pooling

Power pooling, as demonstrated by the study of MCP, is a potential means for dealing with the problem of high energy supply costs for small companies. Other means also exist in the form of alternative intercompany institutions for previously isolated small companies.[4] One possibility is for power agreements between large IOUs and small companies. The small companies, as purchasers, could use their own generating capacities for peaking purposes only.

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[4] "Isolated company," as the term is used in this sentence and throughout this chapter, is a relative rather than an absolute concept. "Isolation" will generally involve an emergency agreement for power but will not include a wholesale firm power agreement or pool membership. Only one completely isolated system with no emergency agreement exists in Michigan in 1977 -- at Bessemer in the Upper Peninsula.

Wholesale agreements were not extensively studied in this research project for several reasons:

1. Consultant studies done for MCP members Grand Haven and Traverse City prior to membership in the pool showed that wholesale agreements were uneconomical relative to membership in MCP.
2. Numerous officials from municipal companies and cooperatives in Michigan stated their unwillingness to become dependent on IOUs, especially Consumers Power, by buying wholesale power and retaining peaking capacity only. This unwillingness stemmed from a perceived risk of opportunistic behavior by the IOUs as demonstrated by the history of relations among public, private, and cooperative companies in the state.
3. Consumers Power officials offered to assist in the analysis of MCP by helping estimate what the cost of supplying power would have been had MCP members been purchasing their power wholesale from Consumers. The type and quality of data required for the estimates, however, would have involved a long and costly effort, so the offer was not accepted.

Whether wholesale power purchase agreements constitute an attractive way for small companies to resolve cost problems hinges on two questions: How willing are IOUs to pass along economies in generation? And, can investor-owned wholesalers deprive power to dependent small buyers? The second question is especially relevant to Michigan because some municipals in the state have received letters within the past three years from their wholesale power source -- Indiana and Michigan Power Company -- stating that they will be deprived of their wholesale power in the future.

Joint Ventures

Another possible relationship for isolated small companies involves joint investments between small and large companies. The current example in Michigan is the joint investment by Wolverine REC, Northern Michigan REC, and Detroit Edison Company in a nuclear power plant at Monroe, Michigan. But questions arise, again, about what the nature of the IOU-small company relation will be. Will large companies see joint investments as opportunities to "take advantage of small companies"? Given the extreme uncertainty of large investments in generating facilities, how will the costs of unintended, unpredictable contingencies be shared?

Combinations of New Institutions

Wholesale purchase, joint ventures, and power pools need not be mutually exclusive. Some advantage may be gained by small companies who strategically combine new institutions. For example, managers of the cooperatives in MCP stated that it was only <u>because</u> their small power pool existed that they have been able to sign a wholesale power agreement with Detroit Edison Company, plan a joint venture with that company, and purchase wheeling services from Consumers Power in order to buy energy from Detroit Edison and from Lansing's municipal, Lansing Board of Water and Light.

It is also apparent that, for many municipals, the geographic realities of their locations would require the purchase of wheeling services from investor-owned companies before these companies could participate in a powerpool. Most municipals in Michigan are surrounded by large investor-owned firms. Exceptions are found where cooperative transmission lines are adjacent to municipals. The legal issue as to whether a cooperative could construct a transmission line across the service territory of an IOU to link with a municipal is not, according to Mr. Tom Hancock of the Michigan Public Service Commission, a settled legal issue.

Research on Wholesale Purchases and Joint Ventures

Concentration of effort in this research on the issue of small company power pools means that new wholesale purchase and joint venture arrangements for dealing with the bulk power supply problem of small companies were not thoroughly investigated.[5] Thus a logical extension of this research would be to consider these alternative arrangements. For example,

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[5] Another reason for concentrating initial research effort on power pools rather than either wholesale purchases or joint ventures is because the general question of why power pools have not formed has perplexed public utility economists.

a research project could be undertaken to investigate the growing number of joint ventures among public, private, and cooperative power companies. Relevant questions for the research would include the following: How did the ventures develop? What obstacles were overcome? How were relationships structured? What rules were instituted? How did rules adapt to changing circumstances? How did rules affect how participants behaved and who got what?

Research on Power Pools for Small Michigan Companies

For Michigan, extension of research on the power pooling alternative seems highly relevant. Several promising situations wherein additional small company power pooling could occur are ripe for consideration. These situations are:

1. New potential members may be added to MCP. Coldwater municipal, from the Michigan Group, has made a formal application to joint MCP. Other potential members whose systems lie even closer than Coldwater's does to MCP are Holland, Petoskey, Charlevoix, St. Louis, and the Thumb REC. All of these potential MCP members with the possible exception of Holland, would require wheeling services by Consumers Power Company. If the Thumb cooperative were to join MCP, two other municipals at Sebewaing and Croswell -- which lie about twenty miles from the Thumb REC transmission lines, might also be able to join MCP.

2. In the Upper Peninsula, many small companies are involved in the power business. Coordination of small systems seems possible and might prove to be highly advantageous for all the companies. In April 1977, Cloverland REC and Edison Sault signed a contract for joint transmission facilities. Cloverland is also negotiating a pooling agreement with the municipal at Newberry. The manager at Cloverland, Mr. Jack Holt, expressed an interest in coordinating systems with other municipals, especially the municipal at Marquette. Such coordination would require wheeling or participation by the Upper Peninsula Power Company, however, and no contacts with this company have as yet been made.
3. Several municipals in the Lower Peninsula are planning to form a nonprofit corporation and finance a feasibility study on the possibility of forming a power pool. In early 1977, twenty-two of the twenty-eight municipals in the region were committed to financing the study. But many of those originally committed have now decided not to participate. As of June 1977, fourteen municipals appeared willing to participate. Findings from this research, which will be discussed later in this chapter, suggest a number of situational factors which may be inhibiting participation in this pooling effort. Ways by which such factors have been overcome in the past and might be overcome in the future are also discussed.

4. Some of those municipals which decided not to participate in the Lower Peninsula nonprofit corporation have decided to pursue their own collective action. As of June 1977, this group includes the original Michigan Group (MG) -- except Sturgis -- and municipals at Niles, Paw Paw, and Portland. The group is updating their original feasibility study and will make a decision on whether to form a pool by September 1977.

Informing Decision Makers

Methods and findings from the MCP cost effectiveness study suggest guides for extension of knowledge to participants in other situations wherein the possibility for power pooling exists. Potential decision makers, such as local public officials and citizens served by municipals, rural cooperative boards and members, small IOU officials, and state officials, can be informed about the structure of power pooling and the possibility it holds for cost reductions. Since most technical feasibility studies are likely to be done by consulting engineers, the potential decision makers will need nontechnical information on: basic methods of power pools; the sources of savings in pooling arrangements; and, most especially (because consulting engineers are unlikely to discuss this at all),the way rules to set prices, to share advantages, and to share costs will affect who gets what from the pool.

Michigan's state government is a natural target for information on small company power pools. The state government is already involved through the Michigan Public Service Commission in regulating protected electric utility markets wherein extraordinary economies of size exist, duplication of facilities would be wasteful, and exploitation of consumers is possible. If, because of high costs of isolation, utilities become financially burdened and/or if rates must be increased, the state government has a long standing concern for the welfare of both providers and consumers.

Michigan, moreover, is an appropriate state for the consideration of new policies for small electric companies. Michigan and Texas are, according to an official with the Rural Electrification Administration, the two states where coordination among small power companies is least developed.[6] The time is appropriate, too, in that Michigan's Governor Milliken, in May 1977, proposed a new Department of Energy, with policy functions to include energy planning. Specific legislative proposals are expected in July 1977, and a target date of January 1, 1978 was set by the Governor for initiation of the new department -- given the required legislative approval.

State policies to promote small company power pooling may be an early example of a public attempt to promote behavioral

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[6] From a telephone conversation with Mr. William Morris, May 1977.

adjustment in an emerging era of increasingly scarce oil. If small oil burning electric companies are unable to change behavior after increases in fuel costs (due to uncertainty, product characteristics, or other limiting factors), the state may consider policies to promote adjustments. As a social problem becomes recognized or felt, government is inevitably involved either in protecting status quo rights and the present and future distributional implications of those rights or in changing rights and thereby effecting changes in who gets what.

Summary of Findings on Costs in MCP

Consideration of limiting factors moves the argument of this chapter beyond the direct implications of the cost effectiveness study of MCP. That study, on its own, reveals three findings of import for future research and policy concerning small electric companies. The findings are: (1) sizable mutual savings are obtainable from small company power pools, even pools without joint generating facilities; (2) the magnitude of the savings are affected by a variety of factors including delayed construction through reserve sharing and energy exchanges based on comparative cost advantages such as economies of size and utilization and unused generating capacity; (3) the distribution of savings are determined by intrapool rules including those rules which set prices for energy interchange, those rules which determine the division of savings from postponed construction, and those rules for the division of costs to establish and operate the pool.

Information developed in this research on the ways by which pricing and cost sharing rules affect the distribution of gains in MCP will be offered to officials in that pool. Distributional implications of most rules were previously either unknown or vague. Such information may promote conflict in that rules guide the distribution of gains toward some and away from others. The rules operate within the context of transactive relationships, however, and that company short of capacity today (and thus at an advantage) may be relatively long on capacity in the future. In any case, the ultimate choices for sharing the gain will be more informed on the basis of findings from this project.

Field Studies and Case Situations

Findings on Situational Factors

Sources of Evidence

Interviews with managers in the three case situations described in Chapter V and with other participants in the power industry reveal that certain blockages to the collective action of power pooling exist. The blockages explain the slow pace of collective action evident even in situations where, atypically, efforts to pool systems have been more or less successful. These blockages, or situational factors, exist even in relationships where mutual gains are possible. In order to promote collective action, a variety of methods have been used to circumvent the limiting influence of situational factors.

Evidence obtained from analyses of managers' answers to interview questions was supplemented and corroborated by observations of efforts by Michigan's municipal managers to organize the collective action of a municipals' power pool in the Lower Peninsula. The Michigan Municipals Electric Association (MMEA) meeting of February 10, 1977 revealed conflict over who would pay for a feasibility study. That study, once completed, would provide information to those who paid for its development, would provide the same information at a minimal cost to additional users, and could be kept secret by its purchasers only at a very high cost.

Supplemental corroborative evidence was also obtained from an internal letter circulated by the executive secretary of MMEA to all municipal managers in Michigan.[7] While it is brief, that letter is an important piece of evidence because it documents the efforts of participants to identify those situational factors which impede their collective action to pool municipal systems. Moreover, the contents of the letter reveal that the executive secretary has independently identified, in a brief, descriptive manner, the same situational factors which emerged in the field studies.

Situational Factors Identified

Uncertainty over Issues of Concern

Uncertainty emerged as a situational factor in the field studies described in Chapter V in that its presence was

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[7] See Appendix D.

identified in several issues of concern held by those managers interviewed. Managers were uncertain about how intercompany coordination would affect their companies' control over resources and events, their own managerial control, opportunities for others to behave opportunistically, and, to a lesser degree, their companies' ability to assume financial burdens.

Theories of behavior developed by psychologists and applied by economists Cyert and March, Mack, and others to economic choice reveal a conservative bias in uncertainty. When applied, thus, to the potential collective action of power pooling, the theory of conservative bias suggests that uncertainty about pooling issues will impede collective action. Because managers are uncertain about issues of opportunism, control, and financing, they are likely to perceive selectively, to ignore ambiguous evidence, and to avoid the potential negative consequences of pooling. Managers are also likely to fear management mistakes because of the high visability of mistakes relative to "right" management decisions. Similarly, they are likely to be aware that costs are more easily quantifiable than benefits. All these behavioral tendencies make uncertainty a limiting factor to collective action.

While uncertainty about issues of concern was found in managers' answers about their own behavior, stronger statements were made by the managers about the presence of uncertainty in the behavior of other managers. To a degree this finding is expected since those managers interviewed were involved in situations which exhibit more collective action than is usual in Michigan. An additional observation which is more speculative is that the managers, in their comments about the behavior of others, may have been projecting some of their own deeper feelings of uncertainty.

Products with High Exclusion Costs

Two of the intermediate steps required to pool electric systems have products which exhibit the characteristic of high exclusion costs, i.e., nominal "owners" of these products would have difficulty preventing their use by others. These two intermediate steps whose products exhibit high exclusion costs are feasibility studies and changes in Michigan state law.

Feasibility Studies. Information, the product of a feasibility study, is often difficult to police, i.e., keep secret. Costs of exclusion from information are also very dependent upon community rules. For example, in Michigan, public disclosure laws raise the exclusion cost for information obtained by municipal electric companies. In Michigan, feasibility studies can be obtained by the public upon demand.

New Michigan Law. Prior to the enactment of P.A. 448 of 1976, individual municipal electric companies in Michigan were prohibited from entering into joint investment ventures with other organizations, including other municipals. While the ban on joint ventures was circumvented by keeping joint investments physically distinguishable, the restriction did constitute a barrier to collective action.

The product of new legislation to lift the restriction is a set of amended rights and exposures for the parties involved. P.A. 448 of 1976 gives municipals opportunities to create joint agencies and joint ventures. Those parties which opposed the act are exposed to the potential which municipals now have to strengthen their systems and make themselves more competitive.

That set of new rights created by P.A. 448 of 1976 for municipals has the characteristic, among others, of a high exclusion cost. Those who paid for the lobbying effort to obtain the law would find it expensive to prevent non-paying municipals from enjoying the new opportunities to create joint agencies and joint ventures.

<u>Behavioral Implications of High Exclusion Costs.</u> When potential exists for the production of a desirable good with high exclusion costs, a certain behavioral incentive may exist. That incentive is for those who desire the good to conceal demand, await production by others, and eventually "ride free." Thus the presence of high exclusion costs as a product characteristic would become a situational factor insofar as that presence limited potential collective action to produce the relevant good.

Evidence. Most of the evidence on the functioning of high exclusion costs as a situational factor was found in attempts at collective action by Michigan's municipals. During the field studies, municipal managers commented on difficulties which MMEA has had in retaining dues-paying members for the association's lobbying activities. Difficulties were also observed during the research in efforts by MMEA officers to collect extra contributions from regular members in 1976 to mount an expensive campaign to lobby for the passage of P.A. 448.

During the strategy meeting of municipal managers on February 10, 1977, the high exclusion cost characteristic of information, as would be provided by a feasibility study, was explicitly discussed. The feasibility study for a municipal power pool in the Lower Peninsula would be funded by a nonprofit corporation made up of potential pool members During the meeting, however, several of the smaller municipals decided not to provide financial support for a feasibility study. Information which the study would provide would be available to all municipals whether they paid or not. Thus the incentive was to conceal demand for a feasibility study and await production by others.

The three cases observed in the field studies were atypical in that collective action toward power pooling has already occurred. That collective action affected the answers provided by company managers. Those interviewed had little to say about free rider problems in paying for feasibility studies. What their answers did reveal were ways by which they had avoided free rider problems. Their answers provide ideas about how to circumvent behavioral implications of the high exclusion cost characteristic.

But findings on the existence of situational factors and findings on ways by which situational factors are circumvented are distinct. And both kinds of findings have research and policy implications. Describing and analyzing the existence of situational factors is the objective of this section of Chapter VI. The subsequent section will involve description and analysis of ways by which limiting factors are circumvented.

Two additional kinds of product characteristics -- economies of size or utilization and jointness of impact -- were identified in the field research as influences on electric company interdependencies. Each characteristic will be described and findings will be summarized.

Products with Economies of Size or Utilization

Economies of size occur when new capital inputs lower the average cost for a unit of product. The relevant example from electric power production is that of economies of size in power generators. As larger generating units replace smaller units, average costs per KWH decline over a relevant range.

Similarly, economies of utilization occur when additional variable inputs cause average costs per unit of output to decline. For electric power services, economies of utilization are created either by technical factors, e.g., machine efficiency improves as a generator is run at a faster rate, or by spreading fixed costs, e.g., adding new customers at a low marginal cost to a fixed electrical system already in place reduces average cost per unit of product.

Incentives Created. Both economies of size and economies of utilization create economic incentives. Small power companies, for example, have incentives to create power pools to capture both kinds of economies. If several small systems link together in a pool, they may create a demand of a magnitude sufficient to make a joint investment in a large generator economical. In this manner economies of size could be achieved. Similarly, the pooled systems, under conditions of noncoincidental peaks and other nonsimultaneous needs for reserve capacity or power, may exchange both electricity and reserve capacity. Through such exchanges the pool members could capture economies of utilization.

But another kind of incentive exists simultaneously with the economic incentives to capture economies of size and utilization. This is the incentive to be viewed as the marginal participant, the member whose participation reduces average cost per unit of output to its minimum.

That member who is viewed as the marginal participant is at a bargaining advantage to shift costs onto other (intramarginal) participants.

For example, Company A joins with Companies B, C, and D to capture economies of size and utilization in a power pool. Company A is able, however, to cast itself as the marginal investor in the pool. By using its reputation as the marginal investor, Company A may be able to bargain for a reduced share of costs for construction of interchange and generating facilities. Company A may also be able to have its contributions "overvalued" to meet its cost shares, or it may be able to bargain for reduced purchase rates or for other advantages.

The incentive to become the marginal member suggests that companies may strategize or delay participation. Certainly the incentive implies some friction in the collective action process. One becomes the marginal participant by being the last in, the entrant who creates that extra measure of advantage. In this manner, the characteristics of economies of size and utilization tend to become situational factors which limit collective action.

Evidence. Various research findings demonstrate the existence of economies of size and utilization in the provision of electric services and the conflicts and interdependencies which these product characteristics engender. The experiences of Wolverine REC previously described, its new industrical customer, and a distribution cooperative provide an example of how economies of utilization affect interrelationships.[8] Rules which guide the division of shares of economies result in interdependencies and may engender conflict. In the case example, Wolverine's new industrial customer was able to cast itself as the marginal buyer because of its own capacity to self-generate electricity. Rates were adjusted so that Wolverine, which was able to capture economies of utilization, sold power to the industrial customer at a mutually beneficial price. The price left Wolverine's own distribution cooperative paying a higher rate for power, however, than that paid by the industrial user. The distribution cooperative was cast in the role of an intramarginal customer whose rate for electricity included a payment to cover fixed costs. Conflict ensued because the distribution cooperative considered its intramarginal position inequitable.

A second example, the MMEA internal letter to municipal managers, also reflects a concern about the question of marginal entrants to collective actions. Thus in reference to required investments to create a pool infrastructure so as to capture economies of size and utilization, the letter states: ". . . a decision must be made about start-up costs. Who will pay what? Will the monies paid to get the project off the ground be refundable, capitalized, or considered an

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[8] Chapter II, pp. 76-77.

operating expense? What sort of financial tab will late comers be expected to pay?"[9]

During the MMEA meeting of February 10, 1977 the same problem of marginal investors emerged. One speaker, a lawyer who had lobbied for P.A. 448 of 1976, suggested that the municipals adopt a rule to penalize "late comer" entrants into collective actions by fining them. No conclusion was reached, however, by the managers present. Indeed it would be to the managers' individual short run disadvantage to establish such a rule if they considered that the opportunity to cast themselves as the marginal entrant was a viable option.

Consumers Power Company's policy position on wheeling[10] provides another illustration of interdependencies created by economies of utilization. By selling wheeling services, Consumers may capture economies of utilization. In general, the marginal cost of using transmission lines already in place to wheel power should be quite low.

But the allocation of shares of costs for transmission services is not determined in nature. Allocations are determined by man-made rules. A variety of decision rules could be proposed on the basis of equity arguments. Some participants may have been early entrants who assumed the burden of paying for fixed transmission investments. Others

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[9] MMEA letter, pp. 3-4. See Appendix D.

[10] See Chapter V, p. 236.

may have been late entrants whose participation clearly reduced average unit transmission costs. Some may be frequent users,others infrequent. Some may value the service highly while others do not. Whatever the arguments, allocation of cost shares will require the man-made choice of whose preferences count.

Yet Consumers, in its policy position paper on wheeling, states that ". . .we [expect to] be properly compensated for this service. Proper compensation means that we recover our costs, measured by proper allocation of average system transmission costs, so that other customers do not subsidize the wheeling customer."[11] The Department of Justice Brief on the Midland Intervention concludes that this policy position has been used by Consumers to "chill" small intercompany energy exchanges and to "exact the advantage" of Consumers' monopoly position.[12] Certainly the policy position as stated by Consumers reserves the right for that IOU to decide whose preferences should count.

These several experiences in the Michigan electric power industry illustrate how economies of size and utilization in generation and transmission of electricity create interdependencies and, often times, conflict. Anticipation by individual companies of opportunities to capture these

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[11] Enclosure on wheeling in letter from Mr. Wayne Kirkby, Consumers Power Company, February 15, 1977.

[12] Brief and Proposed Findings of Fact of the United States Department of Justice: Before the Atomic Energy Commission Docket Nos. 50-329A, 50-330A (Consumers Power Company, Midland Units 1 and 2 - Antitrust), October 8, 1974.

economies creates the incentive for collective actions such as power pools. Rules on cost shares, prices, and the values of contributions in-kind all must be made, however, by the participants. Therefore, a concurrent incentive is created for the individual companies to become recognized as the *marginal* participant. Such recognition would give the marginal company opportunities to make *its* preferences count. Strategizing among participants desiring to become the marginal entrant is likely, however, to involve intercompany friction and delay. Therefore, when the products of collective action such as joint transmission and generation are characterized by economies of size and utilization, limiting situational factors are often created.

Joint Impact Characteristic

The joint impact characteristic is associated with a certain kind of good. That good has a quality such that once it is produced, additional people may use it at zero (or very minimal) cost.

Behavioral Implications. Behavioral implications of the joint impact characteristic are complex and not readily perceived. Complexity arises because interdependencies created by joint impact goods depend also on other additional product characteristics. Thus, to understand the interdependencies and behavioral implications of a joint impact good, an analyst must also know whether the good is positively or negatively regarded by those involved, the costs of avoidance, the level of exclusion costs, and the degree of equality of effect which the good will have on participants.

The easiest way to understand the behavioral implications of the joint impact characteristic is to reason through the interdependencies of those involved in the production or potential production of some joint impact goods. Several intermediate steps to power pooling yield products which, once produced, could be used by others for zero or minimal cost. Each of these intermediate steps creates a set of participant interdependencies because of the joint impact nature and other characteristics of the step's product. The relevant steps are: feasibility study; new legislation in Michigan; and the ability to exchange electricity and call upon reserves.

Feasibility studies and new legislation have been discussed previously in this chapter because they have high exclusion costs as well as joint impacts. But high exclusion costs and joint impacts do not *necessarily* occur in the same good. Moreover, the behavioral implications of these two characteristics are also distinct. Thus these intermediate steps can be reexamined to discover why they involve joint impacts and what the implications of that characteristic are.

Feasibility Studies. Information, the product of a feasibility study, is somewhat difficult to police, depending on circumstances. That is, exclusion costs often exist, especially if the particular bit of information would be commonly valued. In Michigan, however, public disclosure laws prohibit municipal electric companies from keeping feasibility studies secret. Therefore, exclusion costs are invariably high because of a rule, and a free rider situation is implied.

Information also has a joint impact and other associated characteristics. In a state without public disclosures laws, a municipal utility might hold the results of a feasibility study on a potential power pool secret. But the purpose of the study would be to provide information to all participants, so the company would be foolish to hoard the study.

If one company in a potential pool did hire a study, other potential pool members could use the information at zero marginal cost. That is, the information does have a joint impact quality. Other relevant characteristics of such information are the likelihood that it would be positively valued by all participants and the likelihood that it would also be unevenly valued by all participants.

The set of joint impact and associated characteristics suggest behavioral incentives for potential pool members. Since the marginal cost of an additional user is zero, being recognized as the marginal user places a company in the position to avoid costs. Moreover, companies are likely to value the new information unevenly even if all do place a positive value on it. Therefore, division of costs is not easily decided. Each potential member has an incentive to strategize, delay, and cast itself as the marginal user.

Evidence on interdependencies caused by the joint impact nature of feasibility studies is not completely distinguishable in Michigan from the implications of high exclusion costs. Information provided by feasibility studies in the state involves both characteristics. Analysis *does* reveal that municipal companies are currently finding it difficult to obtain financial commitments to fund the study of a Lower Peninsula power pool. The reasoning above suggests that frictions and delay would occur even if exclusion costs were not particularly high. Field studies of case situations where collective actions in the direction of pooling have already occurred suggest a variety of ways by which frictions and delays over feasibility studies can be overcome. Those findings will be analyzed later in this Chapter.

New Legislation. P.A. 448 of 1976, the legislation which allows Michigan municipals to participate in joint ventures and joint agencies, has certain product characteristics. Again, exclusion costs are high, and a free rider situation for lobbying efforts is implied.

The legislation also exhibits joint impact and other associated characteristics. If several municipals had successfully lobbied for the enactment of the legislation, other municipals could use the opportunities provided by

P.A. 448 of 1976 at zero additional costs. New municipals could also enjoy the opportunities at no additional costs.

Not everyone is likely to value the legislation in a positive manner, however. Consumers Power Company fought enactment. New rights for municipals mean that IOUs may fact stronger, more viable competition. Cooperatives were somewhat ambivalent about P.A. 448 of 1976, but one REC dropped its opposition after the Lansing Board of Water and Light agreed to sell inexpensive power to that cooperative. Moreover, the costs of avoiding the impacts of the legislation were high for all participants. P.A. 448 of 1976 has unavoidably remade the opportunity sets of all electric companies in the state.

The joint impact characteristic, along with other associated characteristics, suggest behavioral implications. Those participants who value the legislation positively, but unequally, have an incentive to strategize, delay making any contributions to lobbying efforts, and cast themselves in the position of the marginal user. Those who value the legislation negatively have an incentive to fight against it and/or to bargain with their opposition for a return good.

The history of P.A. 448 of 1976 suggests this analysis is correct. Municipals had difficulty collecting contributions to lobby for the act; Consumers Power fought it; the REC traded its opposition for inexpensive power. The particular experience of municipals and P.A. 448 of 1976 has been repeated often. Lobbying efforts are not readily supported. MMEA, the municipals' lobbying organization, does not contain all of the state's municipals and has some difficulty in collecting dues from those municipals which are members.

The Ability to Exchange Electricity and Call Upon Reserves. Construction of interchange facilities and the development of a central dispatch system provide member companies in a pool with the ability to call upon each other for exchanges of economy energy, for emergency energy and maintenance energy, and for reserve capacity. Such ability, once created, can be shared by new members at a relatively low additional cost. That is, the ability has a joint impact characteristic.

Other associated characteristics are also involved. Members or potential members are likely to value the ability positively but unevenly. Exclusion costs are not high. New members are accorded the ability to exchange or to call on reserves with the consent of those who originally produced that ability.

Certain incentives are implied. Being the marginal user gives one a cost share advantage. Delay in participation is suggested.

The MCP history provides a case example. Zeeland joined the pool in late 1975 as a marginal member. Intramarginal companies -- the other pool members -- satisfied that Zeeland's membership would create mutual advantages to all, did not ask the new municipal to share in previous costs of interconnection or dispatch. Some of those costs were many years old. Wolverine had been paying for central dispatch since 1968. Traverse City had interconnected with Northern Michigan in the mid 1950's. The two cooperatives -- Northern Michigan and Wolverine -- had also begun interconnections in the 1950's.

When the pool was formed in 1968, another municipal -- Grand Haven -- was, in effect, the marginal member. Wolverine paid for the interconnection to Grand Haven. Grand Haven shared in Wolverine's connection to Northern Michigan and through Northern Michigan with Traverse City at zero cost.

The history of the development of MCP reveals the advantage of delay. A participant who enters late can bargain from strength, especially if its entry will create additional mutual advantages. Zeeland's participation was obviously a benefit to all because such participation provided greater opportunities for all pool members to capture economies of size and utilization. Therefore, Zeeland was added to the pool at zero cost. Wolverine provided the interconnection facilities between that municipal and the pool. Because first Grand Haven and then Zeeland were able to enter the pool as marginal latecomers, they paid less than the others. The joint impact nature of the ability to exchange and to call upon reserves afforded the two municipals that cost share advantage.

Policy Implications

Small company power pools provide opportunities for members to share in mutual gains. But the existence of situational factors in the collective action required to establish such pools implies that pools will develop slowly, if at all. Uncertainty and the three product characteristics -- high exclusion costs, economies of size and utilization, and joint impact characteristics -- will tend to impede collective action. Potential pool members will need to plan ways to overcome these limiting factors in order to speed the process of collective action. A subsequent section of this chapter will contain a description of the ways electric companies in Michigan have in the past and may in the future overcome limiting factors to collective action.

Research and Methodological Implications

The presence of situational factors in intercompany relations and the findings that such factors may inhibit collective action to obtain mutual gains, even though participants are aware of and desirous of the potential gains, has implications for economic theory and methodology.

A Note on Economic Theory

Economists interested in applying their theory to problems which involve situational factors will perceive that conventional economic theory may be insufficient to explain and predict behavior. Conventional economic theory has been applied to some instances of situational factors. Mancur Olson has traced the behavioral implications which goods with high exclusion costs have for collective action.[13] The works of Katona, Boulding, and Mack are noteworthy for their analyses of the implications of psychology for economics.[14] But generally, the concepts of economic theory used to deal with situational factors seem unrefined. "Public goods" are sometimes identified in the literature. No differentiation is made in the "public goods" concept between high exclusion cost characteristics and joint impact characteristics, each of which has its own distinct behavioral implications. "Market failures" are similarly grossly identified. Moreover, the identification of a "public good" or "market failure" sometimes seems to imply the legitimization of government production. Ironically, even economists whose statements would otherwise imply a belief in strict limitations on public production are given to using such concepts as "public goods" and "market failure."

The analysis of situational factors which impede collective action to pool small power systems suggests several unconventional guides for research by economists interested

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[13] Mancur Olson, The Logic of Collective Action.

[14] Katona, Psychological Analysis; Boulding, The Image; and Mack, Planning on Uncertainty.

in informing decisions to resolve practical problems. These guides are set forth below:

1. Theories of learning as well as of advantage are appropriate to research. Electric company behavior was found to change over time as the companies gained the experience of working with one another.
2. Conflict is a necessary concept for explaining behavior, even in situations which involve the possibility for mutual gain. In the research, conflicts emerged over the shares of benefits and costs in collective action. Third parties, such as Consumers Power Company, who would have been adversely affected by primary parties' gains, intervened to delay and impede.
3. The assumption that rights and institutions are fixed must sometimes be relaxed. Development of power pools are efforts in institution building. Methods employed by the companies to make progress in the establishment of pools require decisions about who will be given rights to mutual advantages and on what cost share bases.

Uncertainty and Project Analysis

One of the situational factors used in this research -- uncertainty -- is particularly complex for both its behavioral and distributional implications. Oliver Williamson's work[15]

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[15] Williamson, Markets and Hierarchies.

and this research on electric companies suggest that the presence of uncertainty creates discernable incentives and behavioral patterns. The incentives can be for the creation of authoritative transactions where bargaining transactions have existed (Williamson) or for retaining authoritative transactions when bargaining transactions constitute an economically attractive alternative (this research). Works by psychologists and economists using principles of psychology were also cited to show that uncertainty can lead to *ex post* over-conservative economic behavior.[16]

One area which seems ripe for further thought and research is how to deal with uncertainty in public program analysis.[17] Mack defines three kinds of impacts created by uncertainty, only one of which is always explicitly recognized in conventional literature on benefit-cost analysis. The first and commonly recognized impact of uncertainty is the preference for sure outcomes over unsure ones. This legitimate and proper preference is conventionally handled through the discounting of valuations over time.[18]

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[16] Basic works on the impact of uncertainty on organizational behavior may be found in Cyert and March, A Behavioral Theory, especially pp. 114-127 and Cohen and Cyert, Theory of the Firm, especially pp. 305-327.

[17] Thoughts in this section on uncertainty and public program analyses were influenced by Mack, Planning on Uncertainty.

[18] Differences do exist, however, on whether market references are appropriate in calculating the discount rate. For a discussion see Agnar Sandmo, "Discount Rates for Public Investment under Uncertainty," Benefit-Cost and Policy Analysis 1972, ed. by William Niskanen *et al.*, (Chicago, Aldine Publishing Company, 1973).

A second and costly impact of uncertainty is the tendency of uncertainty to exacerbate unintended disadvantages. In the presence of uncertainty, it becomes easier to ignore potential unintended, undesired consequences of public programs. Complexities and uncertainties of environmental impacts, for example, have made it easier to ignore potential environmental hazards of water projects. A third and again costly impact of uncertainty is the one emphasized in this research, i.e., a tendency toward befuddlement and over-conservative behavior.

Discounting is an appropriate technique in program analysis to reflect the preference for sure outcomes. But discounting does not prevent the other implications of uncertainty, i.e., exacerbation of unintended disadvantages and over-conservative behavior. Other tools of analysis are required to overcome these latter impacts of uncertainty. Some suggestions for new or reemphasized tools to deal with the latter two impacts of uncertainty follow:

1. The need for open and explicit project analysis should be reemphasized.[19] Such analysis serves three purposes. It reduces the potential for ignoring unintended disadvantages, lessens the chances that decisions will be passively made

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[19] cf. Daniel W. Bromley, A. Allan Schmid and William B. Lord, Public Water Resource Project Planning and Evaluation (Madison: Center for Resource Policy Studies and Programs, University of Wisconsin, September 1971), especially pp. 1-11.

according to a conservative standard operating procedure, and increases awareness of trade-offs among potential projects.

2. More probabilistic analyses are desirable. Range estimates and distributions could be employed in predicting future project use, prices, unemployment levels, indirect monetary impacts, etc.[20] By using probabilities, the analyst could provide information on contingency planning. For example, an analyst might reveal that there is a thirty percent chance that unemployment will be eight to ten percent in five years; he then could ask of the decision makers whether that fact suggests making provisions for additions to a project.
3. Analyses and designs for built-in learning processes and redecision cycles are also desirable. The emphasis would be on process, on the design of decisions to deal with increments and differences, rather than on wholes. Analysis could include information on the costs of waiting rather than on deciding at once. Experimental trails could be utilized.[21] Projects

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[20] cf. I.M.D. Little and J.A. Mirilees, Project Appraisal and Planning for Developing Countries (New York: Basic Books Inc., Publishers, 1974).

[21] Alice Rivlin argues cogently for more planned experiments as well as for studies of random institutional innovations. Alice M. Rivlin, Systematic Thinking for Social Action (Washington, D.C.: The Brookings Institution, 1971), especially pp. 86-119.

could be "fractured" into intermediate steps in order to view the incremental choices and consequences of those choices. For example, an analysis of an electric power pooling project might be fractured into the sequential steps of emergency interconnection, wholesale exchange, energy interchange with central dispatch, and joint construction of generation. Each intermediate step presents new decision options.

Also, consideration should be given to the design of systems by analysts to provide future sources of information. For example, an analyst might suggest environmental monitors for proposed power generating units which would afford better information when the next new generation becomes an object of analysis.

4. Finally, more thought is needed on how to shape our future behavior and thus make it more predictable. Taxes, regulations, and user participation in analysis could be made part of project designs which could create more certain future behavior. For example, adjustable peak load pricing of recreation facilities might be considered as a way to control for uncertain future peak demands on facilities.

These four suggestions for new or reemphasized tools of program analysis offer different ways of reducing unintended disadvantages and over-conservative behavior in public programs The suggestions are ways of minimizing the undesired consequences of uncertainty in public decisions.

Findings on Ways to Avoid or Overcome Situational Factors

Field studies on electric power companies provide information on ways by which situational factors may be avoided or overcome. These include sets of resources, participant experiences, and rules or institutions which were found to be instrumental in achieving electric company collective action. The ways to avoid or overcome situational factors are rarely isolated as single instrumental variables; very often, several resources, experiences or institutions serve to explain collective action. This intermingling of instrumental variables requires that the researcher place emphasis on understanding and explaining the logic of how collective action was achieved.[22]

The two objectives of this section of Chapter VI are, first, to describe how and why certain sets of resources, experiences, and institutions are related to overcoming situational factors. Second, prescriptive approaches will be offered to participants who are likely to be interested in promoting small company collective action. Target participants are small company managers, Michigan state agencies, and company trade associations.

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[22] The requirement that a researcher understand and explain the logic of situations reflects the fact that *ex post* field study methods were employed. For research techniques in which a priori observations may be made or when the researcher can control the experiment, relatively more emphasis is placed upon revealing statistical relationships between independent and dependent variables. In this latter research approach, "noise" interference between variables can be more readily controlled and fewer demands are placed on the researcher to explain why the relationships should exist.

Results of the Field Studies

Ways to Avoid or Overcome the Problems of Uncertainty

Recall that managers were found to be uncertain about several issues of concern over pooling, particularly about the issues of opportunism, company control, and manager control. Previous research has revealed that because actors tend selectively to perceive choices and because actors' aspiration levels for goals are conditioned by previous experiences, uncertainty tends to result in over-conservative standard operating procedures. *Ex post* analysis reveals that actors tend to fail, under conditions of uncertainty, to maximize opportunities. Several ways were found by which electric companies have successfully overcome uncertainty. Each of these ways is briefly reintroduced below.

Kinds of Companies Involved. Interviews with managers of the Michigan Group revealed that the intensity of uncertainty was reduced by the fact that all the companies were municipals of about the same size. The tendency to view other participants as threats was dampened and made more manageable. Values and objectives among the members were perceived as better known and more aligned.

Similarly, in the Michigan Municipals and Cooperatives Power Pool, uncertainty was found to be intensified by the fact that the group is a heterogeneous mix of municipals and cooperatives. Intercompany objectives are less well known or aligned. A history of competition for customers exists in Michigan between municipals and cooperatives. Previous competition makes later attempts at collective action more problematic.

Small company power pools which include municipals will, however, usually require the involvement of either cooperatives or IOUs. Municipals must have access to transmission facilities in order to participate in power pools. At a minimum, municipals would need to purchase wheeling services from a cooperative or IOU in order to participate in a power pool.

Municipals seem more similar to cooperatives than to IOUs, at least in Michigan's Lower Peninsula. They share a small company perspective and a similar view about the behavior of Consumers Power Company, i.e., a view that Consumers has behaved opportunistically. Some movement of managerial personnel between municipals and cooperatives has also occurred.[23]

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[23] No systematic attempt was made in this research to study prior training and individual experiences of key participants. In retrospect, such an attempt might have proved useful. It is known, for example, that the manager at Wolverine REC, an individual who played a key role in the development of MCP, had previous management experience in the municipal company at Hart, Michigan.

Complementary Experiences. Examination of the histories of small company interrelationships reveals that some common experiences complement the collective action of pooling. Perhaps the most clear cut example of a complementary experience is the mutual aid activity among Michigan Group companies. The mutual aid experience taught the MG managers that they could depend upon each other and that by doing so, they could all benefit.

Other examples of complementary experiences also exist. Several of the MCP members had emergency interconnections prior to the start of the pool. Edison Sault and Cloverland REC were originally forced to transact by the federal government. Then, after years of contact, the two companies began voluntarily to expand their interrelationship. In all the cases cited, managers expressed the opinion that complementary experiences had reduced the uncertainty of opportunism and increased their knowledge about potential common benefits from collective action.

Unanimity Rule. Before a formal power pool agreement is signed, each potential member of the collective action controls the degree of outside collective authority it will accept from other potential members. Each company may voluntarily chose to participate, or not. Such individual company control can, however, be preserved in a formal agreement only by the use of a unanimity rule for group decisions. A unanimity rule allows each member the opportunity to veto undesired group decisions.

Unanimity rules characterize both the Operating and Planning Committees of MCP. In P.A. 448 of 1976, however, a requirement is established that joint agencies among municipals make decisions on the basis of majority rule. This requirement had an effect on MG company interrelationships. One manager anticipated that his company would make a relatively large financial contribution to the MG pool. That manager also expected that the pool would be administered by a joint agency, since all the members would be municipals. But the fact that a majority rule is required for joint agency decisions intensified the manager's uncertainty about loss of control. His company would make the largest contribution yet each member would have but one vote, and a majority of the group would rule.

An official of Lansing's Board of Water and Light expressed similar concern about Lansing's participation in a joint agency among Michigan's municipals. Lansing has agreed to make a financial contribution to fund a feasibility study on a municipals' power pool for the Lower Peninsula. The official stated, however, that because his municipal anticipates that its relatively large size would imply a relatively large contribution to such a pool and because the pool would be governed by a joint agency with majority rule, Lansing is unlikely to join a joint agency of municipals.

Buchanan and Tullock demonstrate that a unanimity rule minimizes expectations of undesired group decisions imposed upon individual members of a formal group. They also demonstrate, however, that by minimizing such expectations, participants trade-off the ability to reduce transactions costs.[24] The finding among small Michigan electric companies, however, is that a unanimity rule may, at times, be necessary in order to promote even the minimum amount of group participation.

Information Resources. An untested assumption of this research is that small company managers share in the common knowledge that mutual economies are possible through collective action. Numerous conversations and interviews with small company managers revealed no evidence to discount the assumption. In retrospect, firmer evidence could have been found by sampling the population of all small company managers or all such managers in Michigan. In addition, evidence on the extent to which politicians who oversee municipal companies or consumer boards who oversee cooperatives share in the knowledge of economies would be helpful.

Even if participants have some general knowledge about economies in the electric industry, however, specific information on the sources of economies from joint action may be useful in reducing uncertainty about potential gains from

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[24] Buchanan and Tullock, The Calculus of Consent, pp. 63-84.

collective action. For example, such information would demonstrate the large potential for mutual gain among individual systems with noncoincidental peaks (such as cooperatives and municipals) or among systems with large reserves and those with very limited reserves.

Information on rules by which gains are shared and the distributional implications of such rules may also be useful The findings on pricing rules and cost sharing rules in MCP make explicit how an ongoing pool has been able to share costs and benefits and how the rules, sometimes without knowledge or intention, have determined the distributional outcome.

Information on the product characteristics of feasibility studies, interconnections and central dispatch systems, and joint generating facilities may also reduce the uncertainty of pooling. Such information would allow potential participants the opportunity to anticipate interdependencies resulting from high exclusion cost, economies of size or utilization, and joint impact good characteristics. Findings on these characteristics will be discussed in the next sections of Chapter VI.

Caution should be exercised, however, against making the simple assumption that added information will necessarily lead directly to reductions in conflict or even to reduction in uncertainties about collective action. In any of the institutional alternatives open to small companies -- wholesale purchase, joint venture, or power pooling -- potential gains from trade exist. That is, arrangements wherein no participating party loses and at least one party gains are potentially available. Yet third parties will generally be affected. Small company power pooling, for example, may prevent large company purchases of the smaller systems. Moreover, such pooling, if successful, would impose pecuniary externalities on fuel suppliers, small generator manufacturers, their laborers, etc. Any new institutional innovation necessarily involves conflict.

But even among the prime participants in a situation in which mutual gains are possible, new information may promote rather than reduce conflict. Psychologists Fouraker and Siegel have used laboratory experiments to test hypotheses about bargaining in a group context. Their findings, concerning behavior in bargaining situations wherein potential gains from trade are available, are relevant. One conclusion they reached is that an increase in information does not necessarily improve relations among prime participants. It may, instead, cause rivaling behavior.[25]

A method which, in the laboratory, served to reduce rivalry was a system of communication and planned steps to improve the position of each participant in sequential

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[25] Lawrence E. Fouraker and Sidney Siegel, Bargaining Behavior (New York: McGraw-Hill Book Company, Inc., 1963). Conclusions are found on pp. 209-210.

movements toward a Pareto optima. That is, each intermediate step to reaching an agreement would involve some mutual gain and communication of that gain. The problem of sharing gain is more related, however, to product characteristics as limiting factors than it is to uncertainty. Consideration will now be given to product characteristics and ways to overcome difficulties created by these characteristics, beginning with economies of size and utilization.

Ways to Avoid or Overcome Conflicts Resulting from Economies of Size and Utilization

Recall that when economies of size or utilization are available through collective action, an incentive is created for actors to strategize, delay, and become the marginal investor. The marginal investor is in an advantageous bargaining position to reduce his costs of participation relative to costs for intramarginal investors. Several ways exist by which such strategizing behavior and the delays which may accompany it can be avoided.

Sequential Development of Community and Sharing. It seems possible for a group of electric companies to plan the development of relationships in a sequential fashion. The history of Edison Sault and Cloverland REC provides the best example among those cases studied.

This two member group was originally forced together by an outside party. Yet their group is now voluntary and viewed as mutually beneficial. The change in attitudes and approach came over a forty year period on the basis of a number of planned relationships, each one more complex.

Originally, Edison Sault sold wholesale power to Cloverland. Then in 1974, a power pool with central dispatch provided by Edison Sault was formed. In early 1977 an agreement was made to construct common transmission facilities. Common generating facilities are also being planned.

Both common transmission facilities and common generating facilities exhibit economies of size and utilization and may, therefore, engender marginal investor strategies. Yet, relations between Edison Sault and Cloverland are smooth, according to the managers. The managers' answers indicate that previous experiences have been the basis for later collective actions.

The history of Cloverland-Edison Sault corresponds with the laboratory experiments of Fouraker and Siegel. Transactions occurred in sequential steps, and each step accorded recognized mutual benefits to the participants. Two important attitudes which tend to promote further collective action may be learned from planned sequential steps. One attitude is a sense of community. If group members learn to regard others as brothers, they are less likely to seek the role of marginal investor for projects with economies of size or utilization. If Company A feels a high sense of community with companies B and C, A must know that a successful strategy to become the marginal investor would force B and C to become intramarginal investors.

A second, similar attitude which may be learned is a sense of sharing. Sharing involves the positive willingness to grant resources. If Company A feels a high sense of sharing with Companies B and C, A will willingly accept either company as a marginal investor in a collective action. This sense of sharing seemed evident, for example, among MCP members when they willingly accepted Zeeland into the pool as a late marginal member and did not require any contribution by that municipal for previous investment costs. Again, this sense of sharing developed on the basis of previous experience. Zeeland sold wholesale power into MCP for several years before becoming a full member of the pool.

Focal Points on Investment Shares. Another way by which conflict and delay over investments are avoided involves the use of focal points. Recall that focal points provide sharing formulae which are perceived as apparently equitable among potential investors in a collective action. Focal points reduce transactions over deciding what is an equitable sharing and create peer pressures to agree to an apparently fair solution to the question who should pay what.[26]

Joint generating facilities, such as those proposed for MG, involve economies of size. Such facilities, therefore, create the possibility that potential investors will adopt

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[26] See Chapter V, p. 246.

marginal investor strategies. In MG, however, conflict has been avoided through the use of a focal point for allocating cost of investment shares. Cost shares per unit of generating capacity are to be allocated on an equal basis. According to this cost sharing formula, if projections revealed, for example, that Union City's electric system will require ten percent of the proposed generating capacity, then Union City would pay ten percent of the estimated investment costs.

The allocation is apparently equitable, but it actually ignores the fact that potential members may value unit shares of new generating capacity quite unequally. Each company faces a distinct set of choice alternatives for generating capacity. That set would involve consideration, among other things, of alternative sources of capacity and wholesale power and consideration of expectations of future needs.[27] Each MG member is likely to have different opportunities and expectations. The focal point of equal cost shares per unit of capacity, however, provides an allocation formula which reduces complexity and which is apparently equitable to all. MG members can coalesce around the focal point and avoid conflict.

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[27] Examination of the engineering consultant's report for MG as previously described in Chapter V assumed arbitrarily that future growth rates among the systems would be equal.

Ways to Avoid Free Rider Problems Given High Exclusion Costs

Recall that when a good has a high exclusion cost, its production is problematic. The high exclusion cost characteristic creates a free rider incentive. Those consumers who would be willing to pay for the good, if they could be excluded, will tend to conceal their demand and wait for free provision. High exclusion cost characteristics were identified in two intermediate steps to pooling -- a feasibility study and new legislation. Several ways were identified in the research which Michigan electric companies have used successfully to avoid being stymied by free rider problems.

Mix of Goods. One partially successful strategy has been to mix goods with and without high exclusion costs. Thus the MMEA, which provides lobbying services to its member municipals, also provides consultation services to individual municipals in need of assistance. While lobbying services involve a high exclusion cost, consultation services do not.

By providing a joint product with two kinds of services, the trade association is especially effective in maintaining a membership of diverse sized municipals. If only lobbying efforts were provided, smaller members would have a significant incentive to conceal demand for this service and expect that larger municipals would finance the effort regardless. But smaller municipals are precisely those members most in need of consulting services. Thus a counter incentive is created for small municipals to maintain membership and to continue paying dues to MMEA.

Heightened Sense of Community and Sharing. Several ways exist by which electric companies have been able to create a heightened sense of community and sharing. First, small groups of companies seem more successful than large groups in community building efforts. The attempt to bring all twenty-eight municipals in the Lower Peninsula together to finance a feasibility study has not been fully successful. As of June 1977, only fourteen municipals seemed willing to contribute. Small groups make communication easier. Members can more easily recognize the importance of their own and every other member's contribution to goods with high exclusion costs. Incentives are created to reveal demand and/or contribute in excess of one's self-perceived fair share.

Complementary experiences again seem relevant. The mutual aid experience of the MG companies heightened the managers' perceptions of others as brothers and led directly into financing the feasibility study.

Finally, the degree of divisibility of the good which has high exclusion costs seems to affect behavior. Those goods which are lumpy or not easily divisible seem more readily provided, in spite of the high exclusion cost. Incentives are created for all members of a group to contribute to a single given effort. That effort may be seen as a test of community membership.

While feasibility studies may be divided by type or quality, a feasibility study for a proposed power pool is, in a sense, indivisible. One study of sufficient scope and quality is required to assess a potential pool. The lumpy character of such studies has probably contributed to their provision. Similarly, most -- but not all -- members of MMEA contributed beyond their normal annual dues for a single extra effort to enact P.A. 448 in 1976.

Ways to Avoid Marginal User Strategies When Joint Impacts are Present

When the marginal cost of an additional user of a good tends toward zero, an incentive is created for expectant users to cast themselves in the marginal role. The marginal user is in a strong position to bargain for use at a low price. But all expectant users cannot be marginal; in that case, the good will never be provided. Two intermediate steps to power pooling were found to involve goods with joint impacts -- feasibility studies and interconnection and central dispatch systems. Several means have been employed by Michigan's electric companies to avoid being thwarted in collective actions to provide these joint impact goods.

Focal Points. One way by which companies have developed financial support for feasibility studies and interconnection and central dispatch systems is by creating focal points for cost shares. An example is found in MG where the allocation of cost share for the feasibility study was equal, at five thousand dollars for each member. Equal shares are viewed by the managers as apparently equitable.

Equal cost shares seem most appropriate as a focal point when group members are approximately the same size. When a heterogeneous group of unequal size companies considers collective action, finding a focal point for cost shares becomes more problematic. When the municipals of the Lower Peninsula considered who should pay for a feasibility study, one outside consultant present at the meeting suggested a formula which included size as a factor.[28] This formula became a focal point in that no municipal manager at the meeting disagreed with the apparent equity of the formula; it was adopted as the appropriate method for cost allocation.

A third focal point was developed in MG for allocation of costs for interconnection and central dispatch. Actually, this focal point is only implicitly contained within the feasibility study prepared for MG. Allocation of costs for interconnection and central dispatch would be made, according to the study, in the same proportions as costs for joint generating facilities. In this manner the ability to exchange power and call upon reserves, which involves a joint impact

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[28] The formula was: shares of cost in proportion to annual sales, with a ceiling of $\left(\frac{2}{\text{total number of members}}\right)$ X total cost.

characteristic, is fused with generating capacity, a good which does not have a joint impact characteristic.[29] The allocation formula is apparently equitable and serves to prevent marginal user strategies.

Heightened Sense of Community and Sharing. Again, small group situations and previous complementary experiences in which all members explicitly gained seem important in promoting community and sharing. Interconnection facilities among MCP members developed originally as interconnections between pairs of companies rather than among the four original members simultaneously. Wolverine REC and Grand Haven municipal had connected, Northern Michigan REC and Wolverine had connected and Traverse City municipal and Northern Michigan had connected -- all before they created MCP.

After the small groups united to form MCP, Wolverine REC, which required some central dispatch facilities of its own, agreed also to provide central dispatch for the pool. Similarly, Edison Sault, on the basis of previous complementary experiences in which both that IOU and Cloverland REC had shared mutual benefits, agreed to provide central dispatch for their two member pool.

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[29] Joint generating facilities do involve interdependencies because of economies of size. The way by which MG members have avoided problems created by those interdependencies was previously discussed in this chapter.

Zeeland's municipal had sold power into MCP before becoming a member in 1975. The previous experience had been mutually beneficial for both Zeeland and the MCP members. Zeeland was admitted, shared in the ability to exchange electricity and call upon reserves, but was accorded the role of marginal user and was not required to contribute to previous investments.

Imposition by an Outside Party. A final way by which an impasse over a joint impact good was avoided among the companies studied was the requirement by the federal government which forced Edison Sault and Cloverland REC to transact. By requiring Edison Sault to transmit power from a Federal project to Cloverland, an interconnection was built which later served as a facility for the two member pool. Voluntary joint efforts followed the initial forced link between the systems, but the origins of this pool can be traced to the decision imposed by the federal government.

Conclusion on Ways to Avoid or Overcome Situational Factors

A number of different resources, experiences, and rules have now been revealed as instrumental in decreasing the intensity of situational factors. The resources, experiences, and rules are suggestive for policy; they can be used by participants who desire to promote collective action among small electric companies. The next section of Chapter VI describes some participants who are likely to be interested in promoting small company power pools. Proposals are then made for policy strategies which these participants could use to incorporate the findings of this research and to promote small company power pools.

Policy Implications

Likely Interest Groups and Their Resources

Small Company Managers. Some individual managers of small companies are expected to be interested in ways to promote power pools. In bargaining with their own local oversight institutions and with those responsible for other companies, these managers of small companies have several resources available to them. First, individual managers may have knowledge about the sources of potential savings from pooling. Second, and more important, individual managers may have power to commit their companies to agreements which will be of benefit to others.

Michigan State Agencies. Two state agencies are likely to have an interest in the development of small company power pools -- the Michigan Public Service Commission and assuming that the necessary legislation will be forthcoming, the proposed Michigan Department of Energy. Small company pools would lend themselves to two objectives of state agencies -- financial viability among electric companies operating in the state and energy conservation.

The Public Service Commission and Department of Energy will have several resources at their disposal to influence the development of small company power pools. First, both agencies will have analytical capabilities to determine which combination of companies and which methods of systems coordination will yield economies; thus the agencies will have knowledge as a resource. Second, both agencies will have the power to publicize. The Public Service Commission has the power to approve rates for cooperatives and IOUs but not for municipals. The Department of Energy is likely to have some financial resources to subsidize electric company projects.

Trade Associations. Michigan's municipals have a trade association -- the MMEA. This organization has several resources at its disposal. It can publicize information, offer informal consulting services to its members, and, according to reputation, effectively lobby in the state legislature.

A member of the Farm Bureau organization, headquartered in Lansing, represents cooperatives in Michigan. His duties, however, are limited in general, to providing logistical support. An association of managers of Michigan electric cooperatives also exists. Small investor owned companies do not have a distinct trade association in the state.

Policy Suggestions for the Interest Groups

This section of Chapter VI is prescriptive. It assumes that small companies should attempt to coordinate their systems to achieve economies. It also assumes that several groups exist which are interested in promoting small company power pools and that these groups have resources to make their interests effective. Prescriptive suggestions for each of the interest groups -- state agencies, individual managers, and trade associations -- are categorized according to four intermediate steps to pooling -- a feasibility study, new legislation, interconnection and dispatch facilities, and joint generating facilities.

Promoting Feasibility Studies.

State Agencies. State agencies could promote feasibility studies for power pools among small companies in Michigan by following one or more of these policies:

1. Establish and publicize awards for companies and officials who are outstanding economizers. This policy would reinforce tendencies to economize in municipals, RECs, and small IOUs. The awards would provide new opportunities for managers to capture personal rewards for economizing. Politicians would also be rewarded for promoting economizing behavior, since publicity can often be turned into political capital. Rewards could be granted to companies who undertake feasibility

studies and/or take other actions in pursuit of pooling.

2. Investigate, in a preliminary fashion, situations which could involve significant savings. Prime areas of consideration already identified in this research are the Upper Peninsula, the Thumb Area, and the municipals in territory surrounding MCP. This policy would involve an expense for the Michigan taxpayers while the benefits would be to the small companies investigated and to their customers. Costs would depend, of course, on the extent of the studies. For example, a complete feasibility study on a power pool for all twenty-eight municipals in the Lower Peninsula is expected to cost fifty thousand dollars in 1977.
3. Subsidize feasibility studies. Again, the general taxpayer would pay while the benefit would be concentrated among the affected companies and their customers.
4. Promote other kinds of collective action among small companies. Complementary experiences were shown to be important methods for reducing the intensity of limiting factors. Such experiences tend to reduce uncertainty and engender a sense of community and sharing. Active mutual aid groups could be promoted Other collective actions could also be fostered. For

example, in this time of flux and change in the electric industry, companies are likely to be interested in sharing experiences about new technologies, innovative rate structures, and conservation measures.

5. Exert pressure for coordination through the rate approval process. State rate approval authorities, including the Michigan Public Service Commission, have begun to subject regulated electric companies to internal management audits and pressures to change management practices.[30] A parallel exercise of authority would be to exert pressure on regulated companies to amend their external relationships with other companies.[31]

By implication, the Michigan Public Service Commission has an interest in influencing the bargaining position which IOUs and RECs take on selling wheeling rights to isolated companies. Although specific regulatory authority over wheeling is confined to the Federal Power Commission, the Michigan Public Service Commission has an interest in suppliers and consumers of electricity in the state. This research has demonstrated that the ability to exchange electricity and

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[30] Both Consumers Power Company and Detroit Edison Company have undergone management reviews.

[31] Michigan's municipals are not presently regulated by the Michigan Public Service Commission and are likely to resist any attempts to change their independent status.

generating capacity (for which most small companies will be dependent upon another company for their access to wheeling) can significantly influence small companies' costs. Through its rate approval authority, the Michigan Public Service Commission may be able to insure that the bargaining position of IOUs and RECs who can supply wheeling services does not constitute an impediment for small companies seeking to coordinate their systems.

Individual Managers. Those managers who have an interest in promoting small company power pools can benefit from several findings of this research. Specifically, their efforts at inciting feasibility studies should include the following strategies:

1. Begin with a small homogeneous group of potential members. Members of a small group are more likely to be aware of the impact their own contribution will have on the provision of the study. When a group is homogeneous by size and type, e.g., all small municipals, values are likely to be common and observable by the participants.
2. Use previous complementary experiences and build on those experiences. Previous experiences such as mutual aid groups reduce uncertainty and heighten the sense of community and sharing. Other complementary experiences can be built into attempts to promote feasibility studies from the beginning. Make the gatherings social affairs and thus create social pressures to participate.

Again, the sharing of experiences on rate structures technological innovations, conservation measures, and management techniques might be included as complementary experiences. It is important to plan the sequential development of collective action on steps by which all participants explicitly benefit.

3. Consider focal points for cost shares. Anticipate some difficulty over the decision of cost sharing. Choose one or more focal points as alternatives to reduce transactions and conflict. Consultants who bid for contracts to do feasibility studies may be asked to submit cost share formulae which have been used for other studies. If the members are equal in size, equal cost shares might be proposed. Consideration should be given to how the focal points will distribute burdens and why the distribution is equitable.

4. Use the unanimity rule. By using this rule, fears by managers about loss of control are reduced. The trade-off, however, is the probability for more costly transactions prior to collective action. Compromise rules between majority and unanimity are possible, e.g., two-thirds or three-fourths rules may be used. Or a group may decide that certain types of collective decisions will require unanimity agreements and other decisions will require less than unanimity.

5. Mix goods. Goods with high exclusion costs and joint impacts, such as feasibility studies, create disincentives for provision. It may be possible, however to combine goods with these characteristics with other goods and thereby promote collective action. For example, contributions to a feasibility study could be regarded as capital contributions to future investments in generating or central dispatch facilities.[32] A rule could be created that eventual pool members who did not contribute to the original feasibility study will not be able to deduct any portion of its cost from their future investment shares.
6. Find a benefactor, if possible. It may be possible to convince one or more potential members that by subsidizing the participation of others, the benefactors will also gain. State agencies may also subsidize the financing of a feasibility study.
7. Work within trade associations to organize rewards for outstanding economizers. Such rewards will tend to increase the number of benefactors in the industry.
8. Educate other participants about the nature of pooling and anticipated difficulties. General information about how pools are formed, why they provide economies

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[32] Both generating and central dispatch facilities create other interdependencies which may be problematic. Thus the questions of how to share costs for these facilities will also eventually need to be resolved.

and how rules will affect the distribution of savings will be useful, especially to responsible officials with nontechnical training. Anticipated difficulties in achieving collective action should be exposed. This research reveals that when goods are characterized by high exclusion costs, economies of size, and joint impacts, problematical interdependencies are created. By exposing these potential problems, participants will be made explicitly aware of how their behavior affects others. And free riders, marginal investors, and marginal users could then pursue their strategies only with the full knowledge of those adversely affected by these strategies.

Trade Associations. Only one effective trade association -- MMEA -- now exists. Officers from that association assisted municipal managers in the Lower Peninsula to begin efforts on a municipal power pool for the region. With two new policies, the association could foster collective action among its members to finance feasibility studies on power pooling. The policy suggestions are:

1. Establish a recognition and reward system for outstanding economizers among municipal managers and responsible local politicians. This plan, which is similar to one suggested for state agencies, would reinforce incentives to innovate and economize. New incentives would be created for potential

recipients because they are likely to be attracted by an improved image and because more information would be injected into the labor market for managers and politicians.

2. Promote complementary activities such as those previously suggested and for the same reasons. Special consideration should be given to collective activities among Upper Peninsula municipals. Those municipals are relatively isolated, are moving relatively slowly toward pooling arrangements, and, because of travel distance, tend now to be less involved in MMEA functions.

Lobbying Activities. With P.A. 448 of 1976 now enacted, the major legal impediment to municipal participation in power pooling has been removed. The municipals can continue to use MMEA to monitor legislative action and, when needed, to lobby for their interests.

Michigan's rural cooperatives, unlike cooperatives in some other states, do not, however, have an active statewide organization. No representative is stationed in Lansing to monitor or lobby for legislation, to interact with the Public Service Commission, or to function in other capacities. This void requires cooperative managers, their assistants, or paid consultants to travel to Lansing when representation in the state capital is required.

One cooperative manager expressed the opinion that the lack of a permanent representative for cooperatives in Lansing deprives these organizations of opportunities. For example, many outsiders attended the two meetings held by municipals to plan for a Lower Peninsula municipals' power pool. No cooperative representative attended the first meeting, and only one cooperative manager, with a special personal interest attended the second. Cooperatives may have lost an opportunity for an early expression of interest and participation in the pool.

Thus cooperatives may benefit from having a permanent representative at the state level. If they do consider a representative, this research implies one idea which should not be overlooked. That is, the cooperatives should mix different kinds of functions in the state office. Some of the functions already suggested -- monitoring and lobbying for legislation, for example -- have both high exclusion costs and joint impacts. Thus they create incentives for participants to become free riders and marginal users.

To avoid difficulties in obtaining support among the cooperatives of the state, functions which have neither high exclusion costs nor joint impacts should be designed. One possible function is the provision of consulting services similar to those offered by MMEA. Although many consulting services are already provided by REA, some management problems are unique to Michigan. For example, cooperatives in recreation areas are having problems with serving the combined interests of two types of members: those with recreational residences who are unhappy with relatively high cooperative rates and those permanent residents who are unhappy with the added costs of services created by recreational residents who buy power only intermittently. Cooperative managers have expressed a desire for assistance in examining this problem and the general problem of consumer-management relations in cooperatives with changing memberships.

Promoting Interconnection and Dispatching Facilities. Several of the previous policy suggestions for promotion of feasibility studies apply also to promoting the development of interconnection and dispatching facilities. State agencies and trade associations could reinforce innovative behavior with recognition and rewards. Both state agencies and trade associations could also foster complementary collective actions among small companies. The Michigan Public Service Commission might use the power of its rate approval process to promote construction of interconnection and dispatch facilities and to insure that wheeling services are reasonably priced.

State subsidies for construction of pooling facilities might involve a large outlay of funds. Again, state taxpayers in general would contribute while benefits would be confined to recipient companies and their customers. Costs for electric power facilities are rising rapidly. A consultant who is knowledgeable about small company costs in Michigan estimates that in mid-1977, new transmission lines to replace those in use in MCP would cost about thirty-five thousand dollars per mile. Cost of an appropriate size generator for a small company power pool would be nine hundred to one thousand dollars per kilowatt.[33]

Individual managers interested in promoting investments in interconnection and dispatch facilities should anticipate uncertainty and marginal user strategies. If the groundwork has previously been laid before and after the feasibility study, the group will be building on complementary experiences, improved knowledge of interrelationships, and more shared values. Investments in facilities can yield another step of collective action by which all members explicitly share new benefits from the ability to exchange electricity and to call upon reserves.

A decision is required on cost shares for new facilities. This decision can be anticipated by considering one or more focal points. Perhaps, as in the Michigan Group, cost shares could be tied to eventual shares of required generating capacity. The distributional implications of such a rule could be calculated and discussed for its equity.

At this stage of collective action, knowledge about expected benefits and the heightened sense of community may convince some members to invest large shares. Like the

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[33] Conversation with Mr. Al Hodge, Daverman Associates, Inc., June 1977.

cooperatives of MCP, the larger investors may consider that such grants are necessary to promote collective action and are likely to be exceeded by future savings.

Promoting Joint Generating Facilities. Previously suggested policies for groups interested in promoting feasibility studies and interconnection and dispatch facilities also apply, in general, to promoting joint generating facilities. Individual managers with an interest in collective action to build generating facilities should anticipate difficulty in allocating cost shares. Because joint generating facilities involve economies of size, potential investors have an incentive to cast themselves in the role of the marginal contributor.

If a group has previously been able to finance a feasibility study and make joint investments in interconnection and dispatch facilities, those experiences are likely to be complementary to further joint investments in joint generating facilities. Joint generating capacity can be planned as a further step with explicitly mutual benefits.

Difficulties in allocating cost shares can be anticipated by considering focal point allocations. One possible focal point is that used by the Michigan Group; allocations were made there according to projected needs for capacity. The Michigan Group method could be amended by relaxing the assumption that all systems will have the same rate of future growth. Another amendment which might be considered is an adjustment in expected needs for future capacity to reflect different opportunities for alternative sources of power among the members.

Conclusion

Review of Findings and Implications

This chapter has provided a description of major findings and a discussion and analysis of research and policy implications of those findings. The cost effectiveness analysis of MCP demonstrated that a small company power pool without joint generation can provide members with savings of about ten percent. Savings are based on reserve sharing and on energy interchanges which allow members to capture economies of size, utilization, and location. The MCP study also revealed that internal pricing and cost allocation rules determine the distribution of savings, sometimes in unintended directions. The results of research on MCP imply that small company power pooling presents an attractive method for reducing costs, that the sources of savings can be explained, and that decision makers can be informed about the distributional consequences of alternative rules.

Field studies on why small company power pools have not developed more rapidly reveal that even when barriers to wheeling services are not evident, a number of factors serve to limit the development of pools. These limiting factors characterize the situational interdependencies of small electric companies attempting to pool their systems. The most significant barriers found are uncertainty over the issues of opportunism and control and several product characteristics inherent in intermediate steps to power pooling. The product characteristics are high exclusion costs, economies of size and utilization, and joint impacts. These findings imply for research and policy that group interdependencies, i.e., situational factors, can serve to thwart collective actions even when all participants are likely to gain.

The field studies also reveal a variety of resources, experiences, and rules which can be used to reduce the intensity of limiting factors. Chief among the ways which seem instrumental in overcoming barriers to collective action among small electric companies are the following:

1. selection of group members who are homogeneous by size and institutional type;
2. decision rules, e.g., unanimity rule;
3. information on the benefits and distribution of savings;
4. sequential complementary group experiences in which all members explicitly gain, thereby creating a sense of community and sharing;
5. mix of goods with and without high exclusion costs and joint impacts to make a joint organizational product which creates incentives for group cohesiveness;
6. small groups wherein the impact of individual contributions is recognized and monitored; and

7. focal points which reduce transactions on how to share costs or benefits and which are apparently equitable formulae for sharing.

Findings on instrumental ways to avoid or overcome limiting factors suggest policy approaches for groups with an interest in and resources for the promotion of small company power pools.

Significance of This Research

A final note on the significance of this research is appropriate. In a sense, the research represents a synthesis and application of concepts previously discussed be engineers and economists. Extension of concepts and methods are also involved. Engineers and, more recently, economists have analyzed, in theory, how power pools yield economies. The cost effectiveness study of MCP, however, provides an empirical examination of a small company pool. More importantly, the study reveals how internal rules can and do affect the distribution of economies.

Several economists have contributed thoughtful analyses of factors which serve to inhibit collective change. Mack and others have drawn on psychology to demonstrate how uncertainty creates a conservative bias to economic behavior in groups. Hirschman, Leibenstein, and Cyert and March have developed the concept of organizational slack or X (in)efficiency and attribute it, respectively, to nonfunctional images of change, incomplete knowledge, and intraorganizational bargaining processes. Mancur Olson analyzed how high exclusion costs serve to inhibit collective action. Schmid has revealed the importance of distinguishing clearly between high exclusion costs, joint impacts, and other product characteristics such as economies of size, all of which create distinct interdependencies and behavioral incentives. This research on electric company relations collects and synthesizes the barriers to group change under the term situational factors, i.e., impediments to collective action which serve to limit the opportunities of some to liberate other interdependent actors.

A parallel collection and synthesis of factors which create incentives to group behavior has been done by Williamson. But Williamson's analysis is restricted to factors which create incentives for companies to replace market transactions with hierarchies. His interest is in factors which <u>prompt</u> institutional change rather than limit such change.[34] The research on electric companies, however, deals with incentives to retain hierarchies, avoid market transactions, and lose potential mutual gains.

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[34] Some of the same factors, e.g., uncertainty, serve both to promote and to limit institutional change. This apparent contradiction is explained by the fact that Williamson assumes that in the beginning, there are markets, while the research on electric companies takes a situation in which in the beginning, there are hierarchies. In both cases the factors bias the choice of institutions toward hierarchies (new or retained) and away from markets.

Some conceptual work has been done previously by economists interested in the question: What ways exist to overcome obstacles to mutually beneficial collective action? Mancur Olson has described how an organization which provides goods <u>with</u> high exclusion costs can retain members by mixing other goods <u>without</u> this characteristic into the organization's product. Buchanan and Tullock analyze the unanimity rule and how it eliminates the problem of group members' fear of imposed decisions only at the expense of more costly transactions. Schelling discusses the idea of focal points and how they serve to bring parties together for group solutions to problems. Fouraker and Siegel used laboratory experiments to learn that previous collective experiences in which all members of a group explicitly gain (complementary experiences) serve to promote change toward a Pareto optimum.

The research on small electric companies serves to collect, synthesize, and expand knowledge of resources, rules, and experiences which may be used to avoid or overcome situational factors. While this knowledge might be extended to other problem situations which are similar in that collective action for mutual benefits is thwarted, no specific claim for the extension will be made in this conclusion. Findings from this research <u>will</u> prove useful in suggesting a priori research hypotheses for problem situations in which participants can mutually benefit through collective action but have not.

The experience of studying the problem of and prospects for collective action among small companies in Michigan suggests that detailed, situation specific knowledge is required of the researcher. Each problem situation will be unique, a creature of distinct experiences, institutions, personalities, and resources. Two contributions are envisioned by this research: assistance to small electric companies in Michigan to solve their bulk power supply problem and a theoretical framework which can be used to suggest a priori hypotheses for finding solutions to parallel but unique problems of collective action.

APPENDICES

APPENDIX A

GUIDES FOR RESEARCH ON ELECTRIC COMPANY PERFORMANCE

Introduction

There are two objectives for this appendix. The first is to describe and analyze works by Marc Roberts, Donald Whitesell, and Walter Primeaux. These works were chosen for review because they exhibit insights and difficulties which should be noted before one undertakes future research on electric company performance. A second objective is to suggest, on the basis of both readings and interviews, several criteria to be used in performance evaluation. The criteria were chosen on two bases: relatively low research cost and relatively high information conveyed about the impact of electric companies.

Description and Analysis of Three Previous Works

Marc Roberts' research on electric companies[1] is important for several reasons. It includes both institutional and behavioral factors as explanatory variables in the hypotheses developed. It moves beyond the gross public versus private debate and research approach to explain electric company

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[1] Roberts, "An Evolutionary and Institutional View," AER.

performance by the use of more subtle institutional and behavior variables. And it suggests that productive research will necessarily require that an investigator obtain detailed knowledge of relationships among participant actors within case situations. Roberts' hypotheses are as follows:

1. The stronger the control system[2] in an organization, the more impact the values and beliefs of top management will have on the organization's choices, if top management so chooses.

2. The weaker the control system and the more the organization relies on developing an ideology for control purposes, the more difficult it will be for top management to alter the organization's choices. In such cases, change occurs only slowly or not at all, even in the face of substantial external pressure. The gap between top management's goals and actual outcomes will depend in part on the content and flexibility of the corporate ideology and on the relationship of these to the particular aims being sought.

3. When the control system is weak and the organization does not possess a well developed ideology, authority will often be delegated with little supervision since middle managers have no incentive to do otherwise. As a result, the values implicit in a decision will vary, depending upon the particular individuals who make the choice in question. Such situations are only functional when the organization is relatively free of external pressures.

4. Information and decision costs, organizational imperfections, and bad luck mean that organizations will not optimally achieve *ex post* minimum costs, maximum profits, or any other goal subscribed to by top management.

5. A weak control system, without a counterbalancing ideology, will lead to effort-reducing capital investments, overmanning, and a failure to minimize

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[2] By control system Roberts means "all personnel, promotion, and compensation practices that mete out rewards and punishments to members of the organization as a result of their choices and behavior." *Ibid.*, p. 416.

costs in routine operations. A corollary to this hypothesis and hypothesis 2 above is that organizations subject to strong external pressures (e.g., survival threats) will not exhibit this structure-behavior problem.

6. The assumptions implicit in professional training, plus more or less conscious self-interest, mean that groups typically view the organization's problems in ways that place special importance on their own responsibilities and skills.

7. Where promotion is vertical and seniority important, an individual's prospects for advancement depend heavily on the growth of the unit to which he is attached. In such circumstances, bureaucratic units will tend to become cohesive groups. In contrast, where horizontal and diagonal mobility are more frequent, broader information and different incentives decrease the cohesion of bureaucratic units.

8. The influence of various group's will be enhanced by: the number of group members; the amount of work assigned exclusively to them; the position and personal stature of the group's senior executive; the number of group members in top management or in other bureaucratic units; and the extensiveness and coherence of prior professional training and distinct work experiences among group members.

9. The balance of group perspectives within an organization will have more influence on its choices when the available policy options are more numerous, uncertain, apparently similar, and difficult to evaluate. In such instances (e.g., choice of a new technology), strategies that lack group advocates will seldom be adopted.

10. Because the categories "public" and "private" include organizations that exhibit a wide (and overlapping) set of internal features and external circumstances, that distinction contains little predictive information about behavioral differences.

11. To the extent that legal arrangements raise the transactions costs that political actors face in attempting to control an organization, the organization will confront relatively less restrictive limits.

12. Since individuals generally prefer to be identified with socially acceptable organizations, changing social attitudes will tend to result in some changes in an organization's behavior, provided that other pressures or beliefs do not have different implications.

13. Changes in an organization's structure undertaken to facilitate the accomplishment of chosen policies not infrequently leads to unanticipated changes in these policies.

14. When an organization's chosen strategy appears to be unsatisfactory, the initial response often is to make an effort to change one of the binding external constraints.

Roberts' hypotheses are provocative even if they lack some specificity. He writes: "To get more specific implications, one needs to postulate more specific conditions."[3] The challenge to follow-up research involves attempts: to replicate Roberts' hypotheses; to combine hypotheses, as he suggests, for application to specific conditions; and to attempt to generalize for statistical confirmation. Roberts' point is well taken: that for such pioneer research on institutional performance an intense case study method is appropriate. But follow-up research will also require that additional performance variables, beyond environmental practices, be included.

Because his work concerns the behavior of large companies, Roberts places much stress on internal factors such as the organizational structure and the organizational control system.

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[3] *Ibid.*, p. 426.

A study of smaller companies would require a shift of emphasis onto institutional variables in the external environment. William's Organizational Failures Framework and/or the concepts of Chapter II of this dissertation may prove useful. A study of small companies would increase, too, the problem of accounting for the impact of particular individuals and their idiosyncrasies. This problem suggests more emphasis on an historical approach to determine company behavior over time. An historical approach would help to isolate the impact of contemporary individuals by noting company behavior before their arrival, thus establishing a without/with natural experiment.[4]

Fortunately, a general description of Michigan's municipal electric companies, the most numerous of the three categories of small electric companies in the state, was carried out by the Michigan Municipal League in 1934.[5] Donald M. Whitesell, the author of the Municipal League Bulletin, provides descriptive data in a number of performance categories. Thus comparisons between present performance and the 1934 performance of Michigan's municipal electric companies could be made by:

1. Cash contributions and service grants from municipal electric companies to their respective local governments.

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[4] For pitfalls to avoid in an historical approach see Donald G. Campbell and J. C. Stanley, Experimental and Quasi-Experimental Designs for Research (Chicago: Rand McNally, 1966).

[5] Whitesell, Municipal Electric Utilities.

2. Municipal financial policy -- whether the company was run as a self-sustaining and self-expanding enterprise or a revenue producing enterprise. Similarly, the size of investment or contingency funds.
3. Rate structure for customer type and for the level of purchase.
4. A customer service -- different quality publications of customer rates distributed by municipal electric companies.

Whitesell also describes the breakdown of the companies according to two structural variables -- formal relationship between local governments and their electric companies and contracting relationships between municipal electric companies and investor owned companies selling wholesale power. In both cases he offers an opinion about "advantages and disadvantages" of alternative institutional relationships.

Whitesell favors the special board as a means of local government control over its electric utility because he feels that in comparison with control either by the city manager or by the city council, the special board appears to minimize political influence or interference. Among his rationale for the purchase of wholesale power are: smaller initial investment; smaller staff; and higher quality service. As disadvantages to wholesale purchase of electricity he lists the cost of power, interruptions in services because of longer transmission lines, and a lack of bargaining power without self-generating capacity.

Whitesell's early work could contribute to a contemporary study of small electric companies in two significant ways. First, he provides historical data on the performance of municipals which can assist in isolating the idiosyncratic impact of contemporary personalities on the performance of these same municipals today. That early data should help distinguish what part of performance is a function of contemporary personality and what a function of institutional arrangement.

Second, where municipals have changed institutional arrangements by restricting the relationship, say between the utility and the local government, Whitesell's data should provide insights into the consequences of a natural experiment. The question for research when such an experiment occurs is: Was performance different with (after) the change in institution than without (before) the change?

DeAlessi, it has been noted, has surveyed the numerous empirical studies on public versus private electric company performance. His summary statement quoted in Chapter III seems a fair and accurate distillation of the findings of these studies and of the weakness of patterns of inferences which may be drawn from them. One of the studies, analyzed by DeAlessi, requires additional discussion, however, because it would have special implications for further institutional research on small electric companies. This is the study of competitive situations carried out by Primeaux.[6]

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[6] Walter J. Primeaux, Jr., "A Reexamination of the Monopoly Market Structure for Electric Utilities," Promoting Competition in Regulated Markets, ed. by Almarin Phillips (Washington, D.C.: The Brookings Institution, 1975).

Primeaux's objective was to test an a priori hypothesis that competitive situations would induce cost reduction efforts among electric companies. For evidence he turned to the approximately fifty situations in the United States where, in cities with populations of 2500 or more, a municipal and a private electric company compete. In these cities the competition is such that customers may choose between the two sources of electric power.[7]

Using FPC data, he matched competitive municipal electric companies with "similar" municipals chosen on the basis of same state location, size (same size or larger), and source of power. Primeaux then developed multiregression analyses using FPC data on total cost (less taxes and grants) per annual sales in thousands of kilowatt hours as his dependent variable. Independent variables were constructed for scale, type of generation, capacity utilization, fuel and wholesale power costs, mix and density of customers, self-generating capacity, and a dummy variable for competition.

Primeaux's findings seem to reveal that competition causes the average cost curve for municipal electric companies to shift down and the slope of the total cost curve to increase. He interprets the lower average costs as a result of the

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[7] Choice here refers to situations of actual duplicated facilities wherein each consumer could purchase electricity from either company.

competitive environment. He hypothesizes that the higher marginal cost may be attributed to diseconomies of size introduced by the complexities of competition in larger systems or to a lessening of the discipline of competition in larger companies.

Several questionable assumptions reduce one's faith, however, in Primeaux's findings. First, Primeaux appears to assume that his data includes the total population of competitive situations in United States cities with populations of 2500 or more. Yet a check with FPC records reveals that approximately fifty percent of the municipal electric companies do not make an annual report to this agency. It seems reasonable to expect that those reporting are the larger, more financially solvent companies.[8]

Second, Primeaux assumes either that all of the municipal companies use the same cost accounting procedures or that different procedures are randomly distributed. Cost accounting is very complex in municipal electric companies since many of the factors of production, e.g., facilities, equipment, labor, and management, are shared with other city functions, or a city may offer gratis services to its utility.

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[8] For Michigan, Primeaux included the competitive municipals at Allegan, Bay City, Dowagiac, Ferrysburg, Traverse City, and Zeeland. For an unexplained reason, competitive municipals at Coldwater and Marshall were not included. Bessemer, which also has a competitive municipal, did not report to the FPC.

Finally, like many authors writing about electric companies, Primeaux makes the simplifying assumption of a homogeneous product (measured in kilowatt hours) with zero technical externalities. Yet the product of electric power companies has a significant service dimension -- including installation, standard and emergency repairs, billing procedures, and very often electrician services, among others. Primeaux himself suggests that competition may affect (improve) the services. But in neither his article nor apparently in any other has a systematic and comparative analysis of the service dimension in electric power been undertaken.

Technical externalities in the provision of electric power involve environmental and health dangers in generation and unsightly equipment in transmission and distribution. Again, Primeaux suggests that competition may affect (reduce) such technical externalities. Yet which companies have incurred added costs by "internalizing" such externalities is unknown.

Three conclusions are suggested by Primeaux's work and the critique of his assumptions. First, competitive situations offer opportunities to study company behavior given the unusual external institutional variable of competition in the product market.[9] Competition may affect what competitive

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[9] A second set of "competitive" situations also exists in cities where more than one supplier of electricity exists, but separate territories are defined, and consumers must be located within a company's service territory to purchase that company's electricity. Individual consumer choice between suppliers is more costly in this situation than that analyzed by Primeaux (physical relocation is necessary) but less costly than in the more typical third type of situation where only one supplier

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companies do and how much they pay to do it, but Primeaux's research is suggestive rather than conclusive. Second, secondary data on municipal power companies should be treated with caution. Finally, aggregated costs figures without the knowledge of product or of nonpriced consequences are suspect. This last conclusion suggests again that detailed disaggregated study of the performance of electric power companies is a research item with expected payoff.

Performance variables may be chosen because they were included in previous works and thus afford opportunities for cross comparison of results, or they may be chosen because they have not been included in previous studies yet convey information on the impact of the companies. In any case, the performance variables will need to be available to a researcher at a reasonable cost. With these objectives for finding researchable performance variables in electric companies established, a number of criteria for performance evaluation will now be considered.

Suggested Criteria for Performance Evaluations of Electric Companies

Performance evaluation in this appendix refers to the inquiry into relations between institutional variables (patterns of rights, rules, organization roles) or behavioral

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[9] (continued from previous page) provides a city's electricity. Information costs on comparative performance is, however, reduced in this second set of situations, and an hypothesis can be made that comparatively low information costs will affect company performance.

variables (standard operating procedures, techniques for handling uncertainty) and performance variables (who gets what over time). Examples of performance evaluation are found in the main body of this research. In Chapter IV the inquiry focused on how a new institution (MCP) and the rules of that institution affected the size and distribution of cost savings to members over an eight year period. In Chapter V the inquiry was directed toward how product characteristics and uncertainty create barriers to changing performance.

Performance evaluation requires detailed knowledge of participant actors, their relationships, and their behavior. Such knowledge is often obtained by a case study approach. Case studies also may suggest relations between institutional variables and performance variables. Statistical techniques can then broaden the inquiry and provide more generalizable knowledge about those relations -- provided there is an appropriate concern for experimental design.

A key element in the successful performance evluation is, however, the ability to create measurable criteria of performance. Measurable criteria are required either in cross sectional studies to determine the relations of different institutional variables to performance or longitudinal studies to determine how changes in institutional variables affect performance or how different institutional variables affect performance over time.

Methods of Obtaining Performance Measures

Three ways are open for obtaining information on the performance of electric companies.[10] The first involves actual physical measures of company performance. For example, if environmental degradation is chosen as a criterion, the investigator may take air and water samples from nearby a company's power plants.

A second method involves surveys of participant actors -- citizen-consumers, employees, oversight boards, etc. For example, the investigator might choose consumer satisfaction with billing practices or with company response to emergency calls as criteria and measure by a sampling of consumers on these issues.

The investigator may also use a third method -- gathering data from company records. Criteria proposed in this appendix would be measured, in general, using primary or secondary data from company records. Participant surveys would sometimes be complementary, however, and may become the primary approach given significant limitations on company record availability or quality.

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[10] Elinor Ostrom (1977) describes these three ways in a defense of the citizen survey approach to obtain output (performance) measures. Elinor Ostrum, "Why Do We Need Multiple Indicators of Public Service Outputs?" Paper presented at the National Conference on Nonmetropolitan Community Services Research (Columbus: Ohio State University), January 11-13, 1977.

Suggested Performance Criteria

A large body of literature which is part of the public versus private electric company debate in this country provides suggestions for performance criteria to use in a more disaggregated institutional approach. Thus some criteria which are already part of the public literature are included in this appendix. Other potential criteria for the appendix were developed in conversations with electric company managers. The managers also provided insights into the costs of obtaining data about alternative performance categories. Potential performance criteria include the following:

Rates and Costs

Rate structures and levels are, of course, standard, much used criteria of performance among providers of electricity. Rates may be measured according to levels of different amounts of use for different categories of consumers.[11] For those states which do not regulate municipals and/or cooperatives,

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[11] Some gross institutional comparisons on rate structure are possible. Richard Morgan *et al.* write that IOUs in 1974 charged their residential customers forty-two percent more per KWH than they did their commercial and industrial customers. Comparable figures for cooperatives and municipals were thirty-eight percent more and eighteen percent more per KWH respectively. Richard Morgan, Tom Riesenberg, and Michael Troutman, Taking Charge: A New Look at Public Power (Washington, D.C.: Environmental Action Foundation, 1976), pp. 20-21.

rates must be obtained directly from these providers rather than through the state regulatory agency. At the national level, in 1974, residential customers of municipals paid thirty-seven percent less for electricity than did residential customers of IOUs. Residential customers of cooperatives paid twenty-one percent less than those who bought their power from IOUs.[12]

Rate levels may also be measured relative to company costs. Data on various cost categories are available from two federal organizations, the FPC and the Rural Electrification Administration (REA). The FPC publishes annual reports of costs (with a two year lag time) on both public and investor-owned companies. Only about half of the country's municipals submit the "required" reports, however, so this source of information is incomplete. The REA's annual report on borrowers includes all the country's G and T and distribution cooperatives.

Range and Quality of Services

Although a common assumption is that electric companies produce a homogeneous product, the assumption is demonstrably false. Electricity itself differs by degrees of continuous availability and by degrees of sustained voltage. Two technical measures of electrical supply are the number,

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[12] Morgan *et al.*, Taking Charge, pp. 17-18. These national figures are not complete in that FPC data on municipals was used.

duration, and location of outages and the number, duration, and location of voltage drops.[13] These technical measures present analytic problems, however. Small municipal companies are unlikely to maintain records on outages and voltage drops. Moreover, the measures would be inappropriate as absolute indicators of service. Electric companies differ by number of consumers per mile of distribution line (customer density) and by difficulty of transmission line terrain. The technical measures would need to incorporate these differences or hold them constant in order to become meaningful indicators of performance.

A less technical meausre of the quality of service is company response to consumer calls for assistance. Response could be investigated in two ways. First, response <u>time</u> could be used as a criterion. This approach involves two difficulties: company records are likely to be inadequate and, again, companies differ by customer density. An alternative measure which would take these difficulties into consideration would be to calculate <u>inputs</u> to response. Company records on manned vehicles available for response during various times of the day could be obtainable directly from the companies. If manned vehicles available per hour

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[13] A third technical measure, related to costs or waste, is "line loss," the difference between KWH generated for sale and KWH purchased.

were divided by customers per miles of transmission and distribution lines, a corrected measure of response potential would be derived.

A second approach to using company response as a criterion would be to classify standard response procedures. For example, are priorities of response given to number of customers, type of customers, or geographical area affected? Priorities and amounts of resources devoted to response to customer calls from different groups of customers are potential indicators of cross subsidization and discrimination.

Another indication of the nonhomogeneous nature of the electric company product is the existence of joint services. Some companies, Deteroit Edison Company and Lansing Board of Water and Light (LBWL) for example, provide incandescent light bulb exchange programs. The LBWL also has other programs which reveal a variety of services.[14] Appliance cords and fuses are also exchanged. A small appliance repair service is available at a nominal charge, provided the appliance is brought in for repair. Large appliance repair services on-site for electric ranges, dryers, and water heaters is provided at a nominal charge. A home economist is employed by the municipal to answer consumer questions and to provide group programs on appliance

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[14] Information on LBWL was provided by Mr. Joe Wolfe, Director, Electric Operations Division.

operation -- especially for new appliances such as microwave ovens. Standard procedure for repairmen sent on outage calls by LBWL is for the repair personnel to enter buildings where outages have occurred to investigate the sources of problems. Repairmen in some other companies only maintain services to the exterior of buildings.

By contacting companies directly, an investigator could obtain information on joint services provided. Market analogies are available for most if not all of these services so that monetary valuations can also be made.

Customer Relations

Other customer-company transactions occur in addition to the provision of electrical services. Two additional transactions which could be investigated are consumer information and billing practices.

Some consumer information is provided by companies during initial contact and in ongoning relations.[15] The question is: What level and quality of information are provided? The LBWL, for example, mails a welcoming letter to each new customer with an attached description of services. Some companies, especially cooperatives, provide annual reports on the year's operations for their customers.

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[15] Whitesell, Municipal Electric Utilities.

Billing practices also vary among companies. Relevant considerations are:

1. Is a security deposit required for tenants and/or property owners? If so, are deposits refunded after a period of time, with or without interest?
2. At what point is service discontinued for nonpayment? Are customers afforded hearings, and are payment arrangements possible?
3. Are reconnection fees assessed?
4. What direct pay facilities are provided? (The LBWL had, as of January 1977, twenty-four pay stations established in commercial businesses scattered throughout the Lansing-East Lansing-Holt service area).
5. Again, what information is provided to customers about billing practices and procedures?

While company records could be used to measure customer relations, consumer surveys are also possible. Of special interest are consumer perceptions of company performance in communities served by more than one provider, cities such as were investigated by Primeaux. In Michigan, nine communities are so served.

Employee-Company Transactions

Company performance also includes relations with employees. Relevant considerations are: rates of pay and fringe benefits and labor-management policies. Average length of employee service offers a first-cut measure of employee satisfaction. Employee surveys are also possible.

Taxes and Other Transfers

Various transfers in the form of taxes, subsidies, payments and uncompensated services are provided by and for electric companies. As public corporations, municipals do not pay taxes. They do generally, however, render other transfers in lieu of taxes. Cooperatives pay no income taxes because of their nonprofit nature.

Subsidies flow to cooperatives through low interest rate loan programs, which have been significantly curtailed in recent years, and through management services rendered by REA. Implicit subsidies flow to municipals by their use of tax exempt bonds in raising capital. Besides their protected monopoly status, IOUs receive implicit subsidies in the form of grants of the products of publicly funded research and development of new technologies, e.g., nuclear reactor technology.

The various transfers to and from different gross institutional types --IOUs, RECs,and municipals -- are examined in detail in literature directed toward the public versus private utility debate.[16] Much less is known, however, about the various transfers to and from subtypes of municipals, the most numerous of the three types.

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[16] A thorough summary and analysis of the literature has been made by DeAlessi, "Economic Analysis," Public Choice.

A number of transfer transactions are used by municipals in lieu of taxes. Different products and services may be granted, such as traffic and street light installation and maintenance, public building uncompensated electricity, or uncompensated water pumping services. A portion of net revenues are also often returned to the local municipality.[17] For example, Table A-1 reveals payments by the LBWL to the city of Lansing for the period FY 1967 through FY 1976.

Table A-1 Ten Year History of Electrical Net Revenues and Return of City Equity by the Lansing Board of Water and Light

Fiscal Year	Net Revenue (Excluding Sales for Resale)	Return of City Equity
1976	$48,989,207	$1,552,525
1975	37,743,795	1,385,800
1974	30,433,339	1,336,200
1973	28,124,405	1,247,048
1972	26,302,172	1,192,468
1971	23,358,895	1,134,726
1970	22,112,212	1,042,730
1969	20,960,240	940,384
1968	19,620,315	976,676
1967	19,401,125	1,023,365

In Chapter VI of this dissertation, some suggestions are made for institutional analyses of municipal electric utilities. One researchable question is: What difference does it make

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[17] Cooperatives may also refund surpluses to their customers in the form of "capital credits."

for the variety and level of municipal transfers when the electric utilities are organized in different ways? An expanded topic, which could employ Whitesell's findings, would be to ask: What difference does how a municipal is organized make for its general financial policy? What are the size of investment or contingency funds? Is the municipal run as a self-sustaining, a self-sustaining and self-expanding, or a revenue producing enterprise?

Conservation Measures and Other Innovations

A number of electric company policies and programs exist which may, in general, be labeled conservation measures. Whether such policies and programs have been initiated and promoted constitutes a potential performance criterion. Conservation measures include:

1. rate structures which discourage waste;
2. emission and effluent controls;
3. use of waste products for fuel;
4. efforts to build a sense of community so as to reduce wasteful uses of electricity;[18]
5. self-imposed legal limitations on power use;[19]
6. selective switching devices to limit peak time uses;

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[18] Municipal utilities in Seattle and Los Angeles are credited with having innovative programs to promote a sense of community among users and providers of electricity. Seattle's "Kill-a-watt" program, initiated in 1973, reduced consumption by seven percent. Los Angeles has reduced consumption by about nineteen percent since 1973. Morgan *et al.*, Taking Charge, pp. 22-24.

[19] Burbank California, for example, passed a local ordinance restricting decorative lighting and other uses. *Ibid.*, p. 24.

7. development of flow resource powered generation;[20]
8. the practice of placing cables underground.

The practice of burying cables would depend, again, on customer density and terrain. Physical situations have promoted or retarded other innovations as well. REA and REC personnel, for example, are credited with technical innovations for low density distribution systems. Large IOUs are in the process of developing direct current transmission systems to move large amounts of power inexpensively between distant points. Because electric companies differ in the noninstitutional constraints and opportunities faced, these noninstitutional variables present a challenge to the investigator interested in the institution-performance link. The challenge is to design a study so as to reduce or eliminate confounding noninstitutional variables affecting company performance.

Spinoff Organizations and Programs

Electric companies may also promote the development of new organizations or programs not directly involving the supply of electricity. Such promotions may be most common in rural areas which lack elements of infrastructure.

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[20] *Ibid.*, pp. 25-30. This section contains information on innovations by municipals and cooperatives.

Morgan *et al.* have documented some ways by which electric companies -- mostly rural cooperatives -- have developed new spin-offs.[21] Among the new organizations and programs are:

1. credit unions;
2. group major medical insurance;
3. hospitals, clinics, health maintenance organizations, ambulance services;
4. cable television.

Conclusion

A wide variety of performance criteria are available for institutional research on electric companies. Works by Roberts, Whitesell, and Primeaux are useful because they suggest dependent performance variables and explanatory institutional and behavioral variables. These works are also useful for considerations of methodologies, hypotheses, and pitfalls.

Some caution about data sources are appropriate. FPC data on municipal companies are very incomplete; yet, the alternative of contacting municipals and obtaining data may be costly or frustrating. Municipal managers always responded to requests for assistance in conducting research for this dissertation but often only when a mailed request was followed by a telephone call or personal visit.

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[21] *Ibid.*, pp. 31-32.

Another obstacle to a disaggregated approach to studying the electric power industry is the difficulty in discerning those subtypes of utilities, rules, and institutional differences which may affect performance. The process involved in such institutional analysis will not be an easy task, but will instead necessarily involve detailed knowledge of the relationships of participant actors in the electric supply subsector.

Finally, the investigator will need skill in sorting out institutional, behavioral, and other factors which all may simultaneously influence performance. This sorting out process is essential if the researcher desires to provide information about what variables would be instrumental in the self-design of the future performance of electric companies.

APPENDIX B

THE MICHIGAN ENERGY EMPLOYMENT ACT OF 1976 (PUBLIC ACT 448)

The purpose of these introductory comments is to describe the highlights of P.A. 448, of 1976. Essentially, the act makes joint endeavors by municipal electric utilities with others clearly legal and prescribes the processes and organizations required for such endeavors. Key provisions are as follows:

1. Joint ventures, joint agencies, and other joint endeavors by municipal electric utilities with others are legal. (Article 1, Sec. 10)
2. Joint venture projects require feasibility studies. (Article 2, Sec. 21)
3. Joint venture agreements require contracts with certain inclusions. (Article 2, Sec. 23)
4. Each municipal utility shall own an individual interest in all joint ventures in proportion to resources contributed and shall be entitled to a share of the capacity or product equal to the percentage of its undivided interest. (Article 2, Sec. 22) (Note that the value of resources contributed may arbitrarily be defined by the participants.)
5. Capacity or output from joint ventures may be exchanged. (Article 2, Sec. 24 (1))
6. Joint agencies, involving two or more municipalities, may be formed to create a combined authority for those municipal utilities engaged in a joint venture. (Article 3, Sec. 31)
7. Each municipal member of a joint agency shall have one member on the board of commissioners of a joint agency. (Article 3, Sec. 32) A majority of commissioners constitute a quorum, and a majority of those voting is required to take action. (Article

3, Sec. 35). (Note that votes are not apportioned according to resources contributed.)

8. Joint agencies have broad rights of authority over joint ventures. (Article 3, Sec. 37) Included among these rights are the issuance of bonds (Article 3, Sec. 42) the right to sell or exchange excess capacity or output (Article 3, Sec. 44) and the right to take private property (Article 3, Sec. 45)

9. Joint agencies also have legal limitations. (Article 3, Sec. 38 and Sec. 40) Included among the limitations are the inability to levy taxes (Article 3, Sec. 41) the inability to sell or exchange excess capacity or output to a municipality without an electric utility unless and except under certain conditions (Article 3, Sec. 44) and the inability to exercise the power of eminent domain over existing electrical generation and transmission facilities.

APPENDIX C

METHODS TO DETERMINE THE RELATIVE PRESENCE OF RISK, UNAWARENESS, AND UNCERTAINTY AND TO CATEGORIZE RESPONDENTS' ANSWERS

Introduction

The case studies on limiting factors required the development of two procedures which this appendix explains. The procedures are: the determination of the relative presence of risk perception, unawareness, and uncertainty in responses by electric company managers and the categorization of respondents' answers along ordinal positive-negative scales.[1] The procedures will be explained by way of an illustration, using, as an example, the managers' responses to the question Has concern about the potential loss of individual company control over future choices inhibited your company's willingness to coordinate?

The illustration will begin with brief synopses of the initial and follow-up answers provided by each respondent. Initial answers were categorized by the investigator along

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[1] Discussions of risk, unawareness, and uncertainty as they apply to potential collective action and descriptions of the assumed behavioral implications of each are contained in the main text. See especially Chapter II, pp. 55-57.

In essence, the definitions of these three behavioral phenomena are as follows:

Unawareness -- a lack of knowledge by an actor about the potential negative consequences of a collective action.

Uncertainty -- the perception by an actor of potential negative consequences of a collective action without a measure of the probability that negative consequences will occur.

Risk -- the perception by an actor of potential negative consequences in a collective action <u>with</u> a measure of the probability that negative consequences will occur.

an ordinal scale according to a judgment that the answer was strongly positive (P), positive (PS), neither positive nor negative (0), negative (N), or strongly negative (NS). For the illustration, however, the investigator's judgment will be placed on a separate, following page. The separation of managers' initial answers and the investigator's judgment will allow each reader the opportunity to make his own judgment independently about which category the answers best fit.

Similarly, for the managers' follow-up answers, the investigator's judgment will be shown on a separate, following page. Follow-up answers were judged according to the degree to which they exhibited the presence of risk perception, unawareness of potential negative consequences, or uncertainty about potential negative consequences. By separating managers' follow-up answers and the investigator's classification the reader again has the opportunity to make a separate independent classification.

Synopses of Managers' Answers

Initial Question

The initial question was: Has concern about the potential loss of individual company control over future choices inhibited your company's willingness to coordinate?

Example Follow-Up Question

The follow-up question was: Why do you feel as you do?

Answers

The Michigan Group of Five Municipals

Manager of Company W: In general, I'd say there is a concern among municipals on this issue, but that's not true for my organization. This group of five municipals contemplating coordination is a special case. We have the most active mutual aid group in the state. Also, we're all small, and that fact lends itself well to the proposed joint agency which will be governed by a one company-one vote rule.

(Reader's Judgments: See page 389 to make your own independent judgments about the Company W Manager's answers and the answers for other managers which follow.)

Manager of Company D: We're not much concerned here. We've had a rather good relationship with Consumers Power and have made wholesale purchases from them, so we know from experience what it means to be somewhat dependent upon other companies. Our relationship with the other four municipals in the proposed group is also good. The group started by regular meetings on mutual aid, and the coordination idea evolved over time.

Manager of Company T: Our municipal isn't very concerned about the idea of a joint agency with the four other municipals. We would be concerned about the idea of a joint venture with a large investor-owned company like Consumers Power. Among municipals of similar size, values and objectives are fairly well aligned. We'd have less control of costs in a joint venture with an IOU, and we'd be justifiably suspicious that they would willingly take advantage of us.

<u>Manager of Company G:</u> I hadn't really thought much specifically about the loss of company control before, but now that you ask, maybe we have hesitated some on that specific issue. And maybe we should hesitate more. The members of our small group are all neighbors. But managers in the other municipals and proposed state legislation on joint agencies all support the idea of joint agencies governed by boards with one company-one vote rule. The feasibility study for our group, however, proposed that our municipal make a relatively large investment contribution. Would it be fair to govern the agency according to a one company-one vote rule when contributions to the agency are unequal?

<u>Manager of Company N:</u> Frankly, we don't think this Michigan Group is going to be established. The "economics" don't seem right to me. I haven't given the issue of loss of company control much thought.

Michigan Municipals and Cooperatives Power Pool Members and Holland

<u>Present Manager of Company I:</u> Neither this municipal nor I feel very concerned about the potential loss of control with coordination. The municipal has many years of experience in MCP, and I have experience both from here and from my previous work elsewhere. There are some threats to autonomy contained in coordination, of course. But proposed legislation on joint agencies divides control by using representatives from each member. Votes would be on a majority rule

basis, and I feel certain that if we felt strongly about an issue, we could persuade a majority of a joint agency's governing board.

Retired Manager of Company I: My many years of experience tell me that the threat to autonomy by coordination among municipals is not high. We didn't hesitate on the basis of this threat when I was company manager. Municipals have similar problems and objectives. Municipals have had difficulties with cooperatives in the past, but that is ending because we share both problems and objectives. Mind you, mine is not the unanimous view. Many municipal managers and their boards prefer the safety of independence. Managers have difficulty seeing the need for coordination and knowing how to organize it because they're trained as operators, not as planners. I don't think we share problems and objectives in the same manner with investor-owned companies as we do among municipals. There is a tendency for investor-owned companies to view joint ventures with municipals as a concealed way to obtain capital at the public's expense.

Present Manager at Company U: Whenever you enter into a legal contract with someone, you need to think about how that contract will constrain your future action. But thinking about constraints in contracts to coordinate systems has not inhibited our desire to coordinate. We try to get a fair and flexible contract rather than hesitate over the idea of coordination. What I've just said about our cooperative is not always true for municipals, however. We have now and have had for many years a close relationship with a neighboring municipal. That municipal, and especially politicians involved there, are very slow to accept the idea of joint ventures over which they will not have complete control.

Retired Manager at Company U: We were not concerned about the loss of autonomy in coordination to the extent that it inhibited our efforts to coordinate. That's not the case for many municipals, however, because in the political atmosphere in which municipals operate, decision makers must think about protecting their public image for the short run rather than thinking about long run planning to minimize bulk power costs. Municipals are especially hesitant because the legality of joint investments is unclear by Michigan law.

Present Manager at Company V: Yes, concern about our freedom of action in a situation of coordination has definitely inhibited coordination by this municipal. I'm concerned about my own autonomy and the municipal's. We really don't know what to expect from some of the more complex pooling arrangements which have been proposed. In my opinion, we should be cautious.

Retired Manager at Company V: Yes, my former company has taken a "go slow attitude" on coordination because of the fear of a loss of autonomy. I say that even though Company V has progressed into coordination beyond most other small systems. It took the shock of recent price rises for fuel and wholesale power to force many small system managers into rethinking the bases of their fears about losing autonomy by coordination. But municipal decision makers, for example, are suspicious of making any investments into facilities which they cannot physically observe and directly control. Investments into installations built beyond municipal boundaries are suspect because this type of investment is not within decision makers' experiences, and they fear a loss of control.

Manager at Company Y: We haven't been inhibited at all by a concern for control. Our experience doesn't warrant it. Fuel costs are seventy percent of my oerating budget, and I willingly accept having to deal with others in order to reduce those costs. I've consistently tried to coordinate this company with others, even when we've had to assume the major burden of initial costs.

Manager at Company L: We're not much concerned about the loss of control here. We're more concerned about cost advantages. I draw the analogy between coordinating our water system and coordinating our power system. We've worked closely with a neighboring city on coordinating water systems for some time now, and I don't see that electricity would be much different. We've maintained the essential independence in water; why not in power?

Manager at Company M: Yes, there's much hesitancy in our municipal over the issue of autonomy and even more, I'm sure, among other municipals. Personally, I'm in favor of moving quickly toward the coordination of Company M into a statewide power pool. My preferences are based upon previous experiences in another region, however, and municipals here have done less coordination than have municipals in that region.

Cloverland-Edison Sault

Manager at Company X: Yes, we've had some difficulty here convincing our board that threats to autonomy were more apparent than real and that benefits of coordination outweigh risks involved. Our generally good experiences with Company J have made us aware of both dangers and opportunities.

Manager at Company J: We haven't hesitated to coordinate because of a fear of losing independence. The relationship of this company to Company X has proved mutually beneficial. I do observe the fear of a loss of autonomy in the behavior of some cooperatives and especially municipals, however. A constraining world perception shared by many in the power business is what I'd term a "territorial orientation." In this business we tend to think in terms of our own geographical service area and its separate absolute well being. I've made an effort to think about how our company relates to others outside our territory, because those relationships indirectly, but significantly, affect our well-being. Territorial orientation is an approach taken quite often, I've observed, in municipal utilities.

Reader's Judgments

Ordinal Positive - Negative Scale

For each manager's initial answer to the question - Was his company concerned about a loss of control? - check one of the categories: strongly positive (PS); positive (P); neither positive nor negative (O); negative (N); or strongly negative (NS).

	PS	P	O	N	NS
Michigan Group					
1. Company W					
2. Company D					
3. Company T					
4. Company G					
5. Company N					
Municipals - Cooperatives Pool					
1. Company I (Present)					
2. Company I (Retired)					
3. Company U (Present)					
4. Company U (Retired)					
5. Company V (Present)					
6. Company V (Retired)					
7. Company Y					
8. Company L					
9. Company M					
Cloverland-Edison Sault					
1. Company X					
2. Company J					

Categorization by Presence of Risk, Unawareness, and Uncertainty

After the initial answers from the managers, follow-up questions were asked. If the initial answer was positive (concern existed and had inhibited coordination), the objective of the follow-up questions was to determine if the concern was based relatively more upon a knowledge of high probabilities of negative consequences (high risk) or relatively more upon perceptions of negative consequences without much knowledge of probabilities (uncertainty). If the initial answer was negative (concern did not exist), the objective of the follow-up questions was to determine if the lack of concern was based relatively more upon a knowledge of low probabilities of negative consequences (low risk) or relatively more upon a lack of perceptions of potential negative consequences (unawareness).

For each manager's follow-up answers, classify according to the relative presence of high risk perception (HR), uncertainty (UC), low risk perception (LR), or unawareness (UA).

	HR	UC	LR	UA
Michigan Group				
1. Company W				
2. Company D				
3. Company T				
4. Company G				
5. Company N				
Municipals - Cooperatives Pool				
1. Company I (Present)				
2. Company I (Retired)				
3. Company U (Present)				
4. Company U (Retired)				
5. Company V (Present)				
6. Company V (Retired)				
7. Company Y				
8. Company L				
9. Company M				
Cloverland-Edison Sault				
1. Company X				
2. Company J				

Investigator's Judgments

Ordinal Positive - Negative Scale

	PS	P	O	N	NS
Michigan Group					
1. Company W				X	
2. Company D				X	
3. Company T				X	
4. Company G		X			
5. Company N			X		
Municipals - Cooperatives Pool					
1. Company I (Present)				X	
2. Company I (Retired)				X	
3. Company U (Present)					X
4. Company U (Retired)				X	
5. Company V (Present)	X				
6. Company V (Retired)	X				
7. Company Y					X
8. Company L				X	
9. Company M	X				
Cloverland-Edison Sault					
1. Company X	X				
2. Company J				X	

Categorization by Presence of Risk, Unawareness, and Uncertainty

	HR	UC	LR	UA
Michigan Group				
1. Company W			X	
2. Company D			X	
3. Company T			X	
4. Company G	X	X		
5. Company N				X
Municipals-Cooperatives Pool				
1. Company I (Present)			X	
2. Company I (Retired)			X	
3. Company U (Present)			X	
4. Company U (Retired)			X	
5. Company V (Present)		X		
6. Company V (Retired)		X		
7. Company Y			X	
8. Company L			X	
9. Company M		X		
Cloverland-Edison Sault				
1. Company X	X	X		
2. Company J			X	

Explanations

Michigan Group

The managers at Companies W, D, and T answered in ways that reveal an awareness of potential negative consequences in how coordination could affect their companies' autonomy. But they also perceived a low risk because of previous mutual support, homogeneity of size, and homogeneity of type. Previous mutual experiences improve perceptions of probabilities of negative consequences. Mutual experiences and the homogeneity factors suggest that such probabilities are low.

Follow-up answers by the manager of Company G exhibit a mixture of high risk perception and uncertainty. Because Company G would make a relatively large initial investment, according to the consultant's report, the manager is concerned and somewhat uncertain about possible negative consequences. The proposed voting rule for a joint agency board suggests to the manager that the probability that Company G will have a negative experience is increased.

The follow-up answer by the manager of Company N reveals unawareness based upon the expectation that coordination will not occur.

Municipals and Cooperatives Pool and Holland

The present and former managers at Company V both answered in ways that reveal a hesitancy by the municipal to coordinate because of uncertainty over autonomy. These individuals differed by the degree to which they shared the uncertainty with other decision makers involved in the company. The present manager answered in a way which reveals more shared uncertainty with those other decision makers.

The answer of Company Y's manager reveals that some consideration has been given by the company to the risks involved in coordination but that a judgment had also been made that risks were low relative to potential savings.

Company L's manager answered in a way that exhibits a low risk assessment. The analogy he drew between his company's relationship to a neighboring city in providing water and coordinated electric systems seems the basis for some of his low risk assessment. The degree to which the analogy holds is unknown. The company shares his risk assessment and has proceeded with coordination.

The follow-up answer provided by the manager of Company M reveals some uncertainty in the company's board about the issue of autonomy. This uncertainty was not shared by the manager.

Cloverland-Edison Sault

The follow-up answer by the manager of Company X reveals some uncertainty among his board members about autonomy. The manager himself showed some perception of high risk. A combination of uncertainty and high risk perception by the company is evident in the answer.

Low risk perception by Company J is evident in the manager's follow-up answer.

APPENDIX D

MMEA INTERNAL LETTER OF JANUARY 1977

MICHIGAN MUNICIPAL ELECTRIC ASSOCIATION
818 COWLEY AVENUE
EAST LANSING, MICHIGAN 48823
PHONE 517 351-6169

JOINT VENTURE/JOINT AGENCY

On January 19, 1977, the Georgia Municipal Electric Authority went to the market for the first time with a huge bond issue of $300 million. The bonds, rated single-A by Moody's and single-A plus by Standard and Poor's, went for rates that will result in the Authority paying an average yearly cost of 6.09% for its financing. Planned projects will cost about $1.6 billion, with bond financings for the program expected to run into the mid-1980s.

What this means to Michigan is this: If Michigan's municipal electric utilities expect to use the provisions of PA 448, PA of 1976, then each participant would do well to learn anew the meaning of two words, money and trust.

Despite the staggering costs of the Georgia project, it's estimated that the 46 cities and one county who'll benefit from the move will get an estimated average savings yearly of about 14.4% over the users projected costs for power.

Before Michigan's municipal electric utilities can hope to enjoy such savings, there is a long way to go. Equally important, it should be recognized that there is no single way to go. Each one of the viable joint ventures/joint agencies that exist in the United States has had problems and solutions that are peculiar the that particular undertaking. The purpose of this paper is to outline some of the steps that have been taken by other agencies, some of the alternatives, some of the possibilities, and raise some questions for consideration. Keep in mind that the Power Supply Committee will have definite recommendations to make at the General Membership Meeting February 10. Those recommendations will advance a definite plan of action. It is up to the membership to decide whether or not it will adopt them in whole or in part. The key issue is that there is no single approach, that there are a number of ways that effective joint agency action can be implemented, but the final decision rests on a consensus of enough size to make a project feasible.

That's where the element of money comes in. Any participant in a joint agency/ joint venture will soon find that the dollar figures are far beyond that to which he is accustomed. Getting over the hurdle of large numbers is the first requirement. The other actions that must be taken come in no set order, and many of the elements that must finally be pulled together will be initiated at the same time.

It's axiomatic that the first thing to do is to get organized. Simple? Not really. The first decision is whether to set up a separate, non-profit organization, or use an existing organization. Both approaches have their plusses and minuses.

Regardless of how the organization is set up, it must define the mission of the program, and the participants must trust one another. The trust is important because the mission may have to be changed in mid-stream, and that puts a lot of strain on the relationship. There must be an honest conviction on the part of all who are considering a joint project that each participant will trust the others. If there is fear that one member might try to gobble up the others, that one member might try to use the others, that one member might do anything that would put the others at a disadvantage, then that project is in trouble.

There are a number of ways PA 448 can be implemented. There can be a blanket organization covering the whole state, a blanket agency with provisions for participation on a piecemeal basis, a series of regional agencies, or other variations.

The mission of the agency or agencies can vary. The objective may be complete power supply replacing the present supplier or suppliers, a partial system, or variations on any number of possibilities. As the interested parties move in that direction, they must at the same time consider the problem of retaining competent legal counsel, bond counsel, financial advisors, and consulting engineers.

Simple enough? Hardly. Legal counsel probably should be divided into two areas, general and special. How much weight should be given to bonding counsel? What happens if someone is not happy with counsel? Can the agency switch counsel? Should there be a legal committee? All of these questions and more will come up on this subject alone.

There is one absolute. That's the power supply contract, which is the key document in any joint project. Some agencies have waited until the project got down the line before getting to the power supply contract. The most successful projects have put together the power supply contract early, for this is the document that separates the wheat from the chaff. It's what decides who's going to get in, and who isn't.

Obviously, this important step can't be taken in a vacuum, and that's where the engineers come in. Should the consulting engineers be just that, or should the same firm be allowed to actually build the project? Must the firm be "nationally known"? Is an integrated power supply study needed? Who will assume the responsibility of gathering and evaluating information that's already available? Who will decide whether the best answer is to buy into existing plants or build new ones? Who will be responsible for the basic engineering study, and how can each participant be certain that the consulting engineer considers all options and makes no assumptions while at the same time not being too "promotional"?

The feasibility study is very important. It's required by the law, and more than engineering, it requires financial, economic, and demographic advice.

There are other decisions that must be made. What sort of reserve requirements are needed? Who will get the surplus, if any? How will the surplus be allocated or marketed? Who will be responsible for pulling together the history of the participants, the pricing out of alternatives? In this area, it should be kept in mind that much economic and engineering data must be assembled.

As all of this is going on, a decision must be made about start-up costs. Who will pay what? Will the monies paid to get the project off the ground be refundable, capitalized, or considered an operating expense? What sort of financial tab will late comers be expected to pay?

The setting up costs will probably be apportioned in a manner that will get the office organized. There'll be legal fees involved in putting the organization together, developing rules and regulations for the office, its retirement plan, leave policies, job descriptions, setting up books, arranging for interim financing.

Along with this, assuming that at this point the engagement looks like it will end up with a marriage, action must be taken to staff the agency. Again, decisions. Should the first General Manager be an admittedly temporary person, or should an effort be made to get a permanent manager right off the bat? The same decision must be made in regard to general counsel.

Sometime during this frantic activity, it will occur to a least one of the participants that joint venture/ joint agency also means a certain loss of autonomy. Again, here is the element of trust. Again, if the organization is properly and adequately staffed, a good part of the problem will be solved before it gets critical.

Perhaps one of the best ways to build trust is to emphasize communications. In Massachusetts, the first person hired after the General Manager was the Public Relations Director. It's that person's job to make certain that the entire spectrum of those involved in the project know what's going on and why. Since the project will largely involve publicly owned electric utilities, the job of keeping everyone informed is not inconsequential. Without citizen support, without an effort to explain, to convince, to educate, the project may founder on the fear of the unknown that is always a part of any activity that is new and different.

The general managers of the municipal utilities can be of great help in this area, and other areas as well. The joint project General Manager and Public Relations person must make an extra effort to involve them. Just as important, state officials must be kept informed about what's going on. The political problems of any joint project are important problems, and straight information is necessary to keep rumors and

and opposition to the project to a minimum.

Meantime, other decisions must be made. What should the nature of the obligations be? Should there be take and pay or take or pay contracts? At what rates? Are there effective variations? How will long term financing be handled?

As if all of these duties and decisions were not enough, there is the problem of an environmental impact statement, negotiation of wheeling rights, meeting the requirements of an affirmative action program, developing and expanding an integrated apprenticeship training program, obtaining permits, insurance, and a host of other chores, some simple, some complicated.

Each step of the way, it's possible for a joint project to go sour. The basic question, then, is whether a joint project is worth it. Obviously, there's nothing easy about going ahead. It's work, it's complicated, there probably will be setbacks.

The point is that if some action is not taken along the lines of joint action, it's not likely that municipal operations will survive in Michigan for a protracted period of time. There are some guidelines to follow, but no easy formula, no pat answer. In some cases, the joint project will have to break new ground, do something that no other joint agency has ever done, and that will test the nerves of each member of the Board of Directors. The Board itself, responsible to each governing body who appointed them, must have trust in its choices. The General Manager must have the full support of the Board, and in turn, the Board must have the full support of the General Manager.

Michigan has one of the most comprehensive and flexible joint venture/joint agency laws in the United States. The possibilities are almost endless, ranging from building a plant to procuring fuel to working out almost any arrangement that will benefit the citizen-owners of the municipal electric utility.

There is the danger of getting so busy doing everything that we wind up doing nothing. With hard work and good will, that problem, too, can be solved.

APPENDIX E

TABLES OF DETAILED COST COMPARISONS FOR MCP MEMBERS

TABLE E-1 DETAILS OF COST COMPARISONS FOR GRAND HAVEN (FY 1969 - FY 1976)

	Amounts (MWH)	Costs (or Revenue) ($)
Total Energy Requirements	938,585	--
Case I (Actual Pool Membership)	--	--
Steam Production	958,343	10,348,573
Diesel Production	120,981	2,053,396
Purchases from Pool	10,498	100,107
(Sales to Pool)	(151,237)	(1,707,505)
Net Costs: Production and Transactions	--	10,794,571
Capacity Charges (or Receipts)	--	(128,663)
Dispatch Costs	--	6,380
New Generation Costs:	--	--
(Diesel #1) Interest	--	123,600
Depreciation	--	33,333
Total Costs	--	10,829,221
Case II (Hypothetical Isolation: Adjusted Shares Method)	--	--
Steam Production	807,106	9,151,160
Diesel Production	131,479	2,177,368
Net Costs: Production	--	11,328,528
New Generation Costs:		
(Diesel #1) Interest	--	163,319
Depreciation	--	5,700
Total Costs	--	11,497,547
Savings (Total Costs of Case II - Total Costs of Case I)	--	668,326

TABLE E-2 DETAILS OF COST COMPARISONS FOR NORTHERN MICHIGAN REC (1968-1975)

	Amounts (MWH)	Costs (or Revenue) ($)
Total Energy Requirements	2,492,921	--
Case I (Actual Pool Membership)		
Steam Production	1,858,685	22,930,625
Diesel and Gas Turbine Production	188,804	6,472,788
Hydro Production	67,969	722,441
Purchases from Pool (Incl. Interch. In)	156,154	2,888,061
(Sales to Pool) (Incl. Interch. Out)	(91,446)	(1,494,284)
Purchases from DEC	115,960	2,346,683
Purchases from CPC	196,793	4,711,153
Net Costs: Production and Transactions	--	38,577,467
Capacity Charges (or Receipts)	--	471,646
Dispatch Costs	--	55,007
Interconnection Costs	--	779,255
New Generation Costs	--	--
(Gas Turbine #1) Interest	--	642,628
Depreciation	--	253,332
Total Costs		40,779,335
Case II (Hypothetical Isolation: Adjusted Shares Method)		
Steam Production	1,767,239	22,055,919
Diesel and Gas Turbine Production	344,961	10,862,389
Hydro Production	67,969	722,441
Purchases from DEC	115,960	2,346,683
Purchases from CPC	196,793	4,711,153
Net Costs: Production and Transactions	--	40,698,585
New Generation Costs	--	--
(Gas Turbines #1 - #4) Interest	--	2,694,703
Depreciation	--	1,092,056
Total Costs		44,485,344
Savings (Total Costs of Case II - Total Costs of Case I)		3,706,009

TABLE E-3 DETAILS OF COST COMPARISONS FOR TRAVERSE CITY (FY 1969 - FY 1976)

	Amount (MWH)	Cost (or Revenue) ($)
Total Energy Requirements	820,941	--
Case I (Actual Pool Membership)		
Hydro Production	19,724	34,576
Units #1, #2, #3	197,874	3,156,544
Unit #4	701,830	8,782,961
Purchases from Pool (Incl. Interch. In)	33,645	663,464
(Sales to Pool) (Incl. Interch. Out)	(132,132)	(1,754,436)
Net Costs: Production and Transactions	--	10,883,109
Capacity Charges (or Receipts)	--	(113,991)
Dispatch Costs	--	5,037
Interconnection Costs	--	292,323
New Generation Costs	--	0
Total Costs		11,066,478
Case II (Hypothetical Isolation: Adjusted Shares Method)		
Hydro Production	19,724	34,576
Units #1, #2, #3	199,107	3,168,595
Unit # 4	569,698	7,419,967
Gas Turbine	32,412	1,251,290
Net Costs: Production	--	11,874,431
New Generation Costs:		
(Gas Turbine) Interest	--	755,445
Depreciation	--	300,000
Total Costs		12,929,876
Savings (Total Costs Case II - Total Costs Case I)		1,863,398

TABLE E-4 DETAILS OF COST COMPARISONS FOR WOLVERINE REC (1968-1975)

	Amount (MWH)	Costs (or Revenues) ($)
Total Energy Requirements	2,307,139	--
Case I (Actual Pool Membership)		
STAG Unit	964,685	6,094,901
Gas Turbines	94,409	2,668,378
Other Internal Combustion	969,178	18,827,047
Purchases from Pool (Incl. Interch. In)	267,901	2,629,545
(Sales to Pool) (Incl. Interch. Out)	(103,488)	(2,008,955)
Purchases from DEC	108,121	2,015,473
Purchases from CPC	42,563	1,343,365
Purchases from other non-pool	117,659	1,485,106
(Sales to other non-pool, non-REA)	(153,889)	(1,677,887)
Net Costs: Production and Transactions	--	31,376,973
Capacity Charges (or Receipts)	--	(280,991)
Dispatch Costs (Net)	--	198,276
Interconnection Costs	--	631,431
New Generation Costs		
(Gas Turbine #1) Interest	--	404,671
Depreciation	--	141,234
Total Costs		32,471,594
Case II (Hypothetical Isolation: Adjusted Shares Method)		
STAG Unit	861,197	5,376,977
Gas Turbines	362,310	8,366,701
Other Internal Combustion	969,178	18,827,047
Purchases from DEC	108,121	2,015,473
Purchases from CPC	42,563	1,343,365
Purchases from other non-pool	117,659	1,485,106
(Sales to other non-pool, non-REA)	(153,889)	(1,677,887)
Net Costs: Production and Transactions	--	35,736,782
New Generation Costs		
(Gas Turbines #1, #2) Interest	—	1,429,918
Depreciation	—	555,619
Total Costs		37,722,319
Savings (Total Costs of Case II - Total Costs of Case I)		5,250,725

TABLE E-5 DETAILS OF COST COMPARISONS FOR ZEELAND (FY 1975)

	Amount (MWH)	Cost (or Revenue) ($)
Total Energy Requirements	51,772	
Case I (Actual Pool Membership)		
Diesel Production	71,141	1,394,735
Purchases from Pool	1,063	33,798
(Sales to Pool)	(20,432)	(560,012)
Net Costs: Production and Transactions	--	868,521
Capacity Charges (or Receipts)	--	0
Dispatch Costs	--	235
Interconnection Costs	--	0
New Generation Costs	--	0
Total Costs		868,756
Case II (Hypothetical Isolation: Adjusted Shares Method)		
Diesel Production	51,772	1,072,435
Net Costs: Production	--	1,072,435
Total Costs		1,072,435
Savings (Total Costs Case II - Total Costs Case I)		203,679

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