THE ELECTRICAL POWER INDUSTRY OF MANITOBA:

AN ECONOMIC ANALYSIS

A Thesis

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by

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THESIS ABSTRACT

A study of the electrical power industry presents certain difficulties when undertaken from the point of view of conventional supply and demand analysis. The existence of high overhead costs, the tendency towards monopoly, and the special "administered" nature of electricity prices suggest that usual price analysis may be inappropriate. At the same time, a cursory examination of demand, the conditions of utility operation and the history of the industry in Manitoba indicate that the subject might best be analysed in terms of policy formulation. Industry policy and the manner in which policy objectives have been determined have therefore been made the focal point of investigation.

Various characteristics and problems of the industry are related to issues and conditions associated with the early stages of hydroelectric development in the Province. Two generating and distributing utilities became established in Winnipeg, while a Provincial agency was given the commercially unattractive responsibility for extending service to the rural areas. This was the situation which existed until after the Second World War when a threatened power shortage induced the Manitoba Government to assume responsibility for the overall direction and development of the industry. In addition, the Depression of the 1930's and fear of postwar unemployment led to the major program of farm electrification which, while still continuing, is largely completed. However, the planned reorganization of the industry and transfer of City Hydro generating facilities to the Province, which was necessary for the proper discharge of the Government's responsibilities, was halted by political controversy in Winnipeg, and the

integration of the industry has proceeded on an ad hoc basis since that time.

The prolonged controversy associated with the original establishment of a municipal utility and the continuing competitive status of the City Hydro and the Winnipeg Electric Company over a period of years provided a unique illustration of the working out of the question of public versus private power development, and of the effects of competition in the field of electric power. At the same time, the laissez faire philosophy of the times had its influence in diluting potentially useful efforts towards rural electrification prior to 1930, leaving a legacy of uncompleted tasks and only modest successes until the Government acquired a broader view of its responsibilities after the War. This, together with the postwar problem of adequate developed capacity, indicated that competition or regulated free enterprise does not provide an adequate solution to all the problems of electrical power supply, and that in the final analysis government participation and direction is essential at one stage or another.

Today, most questions of organization, regulation or social purpose have been decided. Pertinent questions have more to do with specific development objectives and various technical questions associated with new means of supply. This includes the matter of choice between thermal and hydro facilities, which with each new project is dependent upon anticipated rates of growth, borrowing costs, essential risks, and so on. Also important is the question of local markets and changes in trends of consumption and the overall pattern of demand. Natural gas has become a strong competitor in certain uses, and may also result indirectly in a slowing

down in the rate of growth of demand for electricity, with significant effects upon the type of new generating capacity to be added in future and long-term average costs of electricity.

Public policy in the future should be related to the more efficient use of resources and to improvements in general welfare. This may be accomplished by the adoption of marginal-cost pricing (with all its implications). Whether or not this is done, the Provincial Government should strive to complete the rationalization and integration of the industry, and correlate additions to generating capacity to the growth of the economy of the region.

PREFACE

No comprehensive economic study of the electrical power industry in Manitoba has been undertaken in recent years, and certainly little enough analysis has been attempted for the purposes of pure research. Studies by such consultants as Dr. T. H. Hogg, Dr. E. P. Schmidt, and Mr. H. Carl Goldenberg have dealt with the industry from special points of view, such as engineering, rural electrification, and public accounting, in keeping with the objects of their separate inquiries. Other studies more limited in scope have been completed by industry personnel and other outside consultants for various purposes, and while many of these do not lack in depth or erudition they have tended to be rather summary in nature.

In view of this, the suggestion was made by Professor Clarence L. Barber of the University of Manitoba that an analysis of the industry from an economic standpoint would make a suitable topic for a master's thesis. The wisdom of this suggestion became evident in the fact a number of people associated with the electrical power industry through much of its history in Manitoba still lived in Winnipeg and represented a virtually untapped source of much undocumented material on the subject. Furthermore, the settlement of much of the controversy surrounding electric power during the late 1940's and early 1950's seemed to provide a suitable opportunity (in the aftermath of the political heat which was engendered) to discuss the issues with some of the principal figures involved with them at that time.

Many people have given generous assistance in the preparation of this thesis. Much is owed to Mr. J. W. Sanger, former General Manager of

the City of Winnipeg Hydro Electric System, and Mr. E. V. Caton, former Vice-President and Chief Engineer of the Winnipeg Electric Company, who gave many hours of their time and their interest, as well as insight, in providing a lively account of the early growth of electrical power, the competitive struggle between their two respective utilities, and the emergence of the policies which came to shape the development of the industry. Mr. Douglas L. Campbell, M.L.A., former Premier and Minister of Public Utilities of Manitoba, outlined some of the political problems associated with electrical power and gave freely of his experiences and judgement from years of contact with the industry while a member of the Cabinet.

Mr. W. D. Fallis, General Manager of Manitoba Hydro, opened many doors which otherwise may have been closed to this investigation, and gave of his time and interest. Mr. R. T. Harland, Assistant General Manager of City Hydro, provided certain essential information required from the municipal utility and Mr. G. E. Toole, Business Manager, was invaluable in locating and breaking down available historical information about City Hydro operations. Mr. A. R. Elliott, Vice-President and General Manager of the Greater Winnipeg Gas Company, provided information from the natural gas industry and gave useful suggestions as to supplementary sources of material.

Mr. J. B. Kinnear, City Clerk, and Mr. T. Mitchell, Deputy City Clerk of the City of Winnipeg, assisted in the search of City Records and the locating of By-Laws respecting the City Hydro. Mr. R. L. McDonald,

Chairman of the Municipal and Public Utility Board, provided certain records and gave valuable comments with respect to the relation between the Board and the electric utilities over the years. Mr. R. D. Guy, Q.C., of Pitblado, Hoskin & Company, loaned his personal bound collection of legislation, regulations and agreements affecting the Winnipeg Electric Company (the only one in existence), assisting the search of early records of the industry.

Mr. K. Kristjanson, Director of the Economics Department of Manitoba Hydro, read parts of the original draft and supplied volumnious material requested from his department. In the same organization, Mr. George Reid, Director of Finance, and Mr. J. F. Funnell, Secretary and Legal Officer, gave of their time and specialized knowledge. Mr. John Siemens and Mr. M. E. Render spent many hours over a number of months in informal discussion of various aspects of the thesis, and Messrs. H. E. Lyon, V. E. Nelson and D. S. G. Ross assisted on various occasions.

Miss Helen Paine, Research Economist with the Department of Industry and Commerce of Manitoba, helped to secure various supplementary materials and by her "good offices" assisted in the initial gathering of data for the study.

My thanks go also to Miss Edna H. Greer of the University of Manitoba Library for her untiring patience and help spanning over ten years of my association with the University, and for the many occasions when seemingly insurmountable difficulties were dissolved through her intervention. Miss Clementine Gombaz of the Provincial Library of Manitoba supplied

numerous materials difficult to secure elsewhere and displayed a personal interest in the work. Mrs. G. C. McRobbie of the Manitoba Hydro Library also helped locate special works on file with the organization.

Mr. E. Russenholt, author of the volume The Power of A City and a former employee of the City Hydro, loaned materials and ignited this student's early enthusiasm for the study.

My gratitude to Professor Clarence L. Barber, my teacher as well as faculty adviser, goes beyond the limits of this thesis, encompassing undergraduate years as well as subsequent study, but I am indebted to him for valuable criticism and ideas.

My wife, Eleanor Gardiner, shared in this work.

Alan G. Gardiner
Winnipeg, Manitoba
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CHAPTER I

INTRODUCTION

Electrical power represents one of the vital elements in modern industrial society. In one form or another, it lights the factories, turns the wheels, and controls most industrial machinery and processes. In the fields of electronics and electro-chemistry, it makes possible the continuous flow of new products to which the consumer public has become accustomed. And in the modern home, the conveniences associated with electrical appliances and a ready supply of electricity reduce household drudgery and permit a degree of comfort unknown to previous generations. In these various respects, electrical power is one aspect of the study of energy uses and requirements which today are receiving more concerted attention than at any time in the past.

In Canada, the electrical power industry is organized largely on a provincial basis, with each system having a more or less separate existence of its own and only a limited amount of interchange taking place between systems. In several instances, the industry is set up as a provincial monopoly under a crown corporation or a public agency operating under the authority of the provincial government. In Manitoba, a municipal agency, City Hydro, participates in generation and distribution with a provincial utility, Manitoba Hydro, and is the distributing agency within the City of Winnipeg. The provincial organization, on the other hand, is the distributing agency for the rest of the Province (including the suburban municipalities of Greater Winnipeg) and is responsible for all future additions to generating capacity in Manitoba.

Several approaches are possible with respect to a study of the industry. An historical or institutional treatment might be used to trace the development of the electrical utilities and the conditions which shaped growth in uses of power as well as the provision of supply. The industry might also be studied in terms of conventional supply and demand analysis in an effort to determine how far conditions (and past growth) reflect the usual assumptions of such analysis. Or the material may be made the basis of an exercise in economic statistics. Whatever the approach taken, the essential task is to determine the relationship between the demand and the supply sides of the market and how responses of both producers and consumers are affected by changing conditions. In this, one of the principal focal points is price and the manner in which price determination has influenced the development of the industry.

Price, however, plays only a small part in this analysis. This may suggest a certain unorthodoxy in the approach, but more important it reflects certain economic peculiarities of the industry itself, such as the dominance of overhead costs, the tendency towards monopoly, and the fact that various social, political, and other economic factors manage to take a measure of precedence over market forces in determining the prices which will obtain. The result is that price may be inappropriate as a point of departure, and some of the usual assumptions of supply and demand analysis may have to be altered for such analysis to remain fruitful.

This may be explained briefly in the following way.[1] First,

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[1]John H. Dales, Hydroelectricity & Industrial Development, Quebec 1898-1940 (Cambridge: Harvard University Press, 1957), Introduction.

prices arrived at under these conditions and ordinary prices are basically different things with different economic meanings. The "price" of traditional economic theory is both a summary of information and factors which constitute the market and a regulator of economic interaction within the market itself. Changes in prices reflect changes in the adaptation of the industry to the environment, and provide clues as to the manner in which the industry is being affected by the world, and the world by it. Now very few industries conform to the conditions of a perfectly adjusting market, and as these conditions are violated prices become less efficient servo-mechanisms and take on an "administered" character. In the extreme, they may become the servants rather than the masters of industry, though they may continue some of the old functions, such as the rationing of scarce goods. In any given instance, of course, it may be difficult to determine how far this tendency may have altered the original economic significance of price. But to the degree that management may be able to influence both consumer preferences (through advertising) and output (through monopoly control of production) the industry will be able (if income considerations are disregarded) to operate at price and output levels of its choice, and prices will tend to become increasingly administered and controlled.

Because of the considerable interdependence which exists between the supply and demand sides of the market, the ordinary restraints of competition which serve to keep most industries under control may be considerably weaker in this one. In any event, a freely fluctuating price mechanism is unable to perform that regulatory function which is one of its chief roles

in other industries. Indivisibilities of investment ("the necessity in most cases of damming a whole river or not damming it at all, for example")[2] and the relatively large amounts of capital required for hydro projects make it impossible to maintain a continuous balance between power supply and power demand. In practice, the effort may be made to stabilize both sides of the market as far as possible. Where surplus power exists, management will endeavour, through research and promotion, to create demand; or, if a shortage is threatened, may be more inclined to raise prices to discourage demand than to increase capacity, unless prompted to do otherwise by regulatory influences or existing market commitments. Price, then, becomes an administrative tool, and something quite different from ordinary price. Thus, it is management policy which is the nerve center of the industry and therefore the most suitable reference point for analysis.

This study is essentially a survey approach to the material, and may be divided into roughly three phases. The first is a discussion of some theoretical considerations and an attempt to provide a framework for analysis, as well as a cross-section of relevant statistics. Chapter II is a general discussion and description of demand, including a somewhat extended review of statistical material on the subject, while Chapter III deals with the economics of supply and develops the analytical format for the rest of the work. Chapter IV outlines the physical features, organization and his-

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[2] Ibid., p. 10.

torical background of the industry in Manitoba, and provides the basis for the next phase. Chapter V surveys the long-term development of objectives and policies in the industry and represents the main elements in the second phase of the essay. Chapter VI continues this analysis to some degree, but in a different vein. The chapter is mainly a discussion of some basic questions which will influence the growth and character of the industry in future, such as the role of further hydro development, the competition from natural gas, and the proper function of the industry in relation to social objectives and the most efficient use of resources. This constitutes the third phase, dealing with management policy on a contemporary basis and adding a speculative note to the discussion. Concluding, Chapter VII serves as a brief recapitulation of some of the main findings.

CHAPTER II

THE NATURE OF THE DEMAND FOR ELECTRICITY

Electricity is one of the most important forms in which energy is consumed. It is essential in a host of applications and supplies many basic wants such as light, power and refrigeration. It also provides one of the foundations of local and regional division of labour. While a highly specialized form of energy requiring special equipment to harness it, electrical power also permits specialization in its use by consumers, providing the necessary energy for a wide range of purposes and processes. And in the realm of industrial motive power, electronics and domestic light and power, electricity itself provides the basis of much of existing technology, so that adequate supplies of power are essential for the normal functioning of every-day life.

The demand for electricity is primarily a demand for energy for activation and control, rather than fuel or heat. In this realm, electricity is the most efficient as well as the most flexible form energy can take. For example, assessing various means whereby energy may be harnessed, the maximum efficiency of an electrically-powered motor in relation to energy input is estimated at 85-90%, compared with 30%, 38% and 16% for gasoline, diesel and steam engines respectively.[1] Again, electricity is clean, trouble-free, constant in quality and controllable, and from the customer's point of view requires a minimum of collateral equipment for transportation

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[1]J. R. Dunning and H. C. Paxton, Matter Energy and Radiation (New York: McGraw-Hill Book Company, 1941), p. 421.

or transmission. A direct cable connection with the power source provides the necessary energy supply for immediate and controlled use. In addition, it may readily (if not always economically) be converted into other forms of energy, and has proven the most suitable form of energy for lighting, industrial controls, communications, refrigeration, and a number of metallurgical and chemical processes. A wide range of equipment and applications have therefore been developed, greatly expanding the demand for electrical power. Most industrial machinery and domestic appliances are now electrically-driven, and demand for this equipment and the related services and end-products constitutes a parallel demand for electric power which grows with expanding technology and expanding consumption and output.

The demand for electricity is thus both direct and derived, or dependent upon wants which express themselves both directly and indirectly.[2] Some consumers, for example, require electricity for the immediate satisfaction of wants, as in residential use. Others, on the other hand, require it only in the event of suitable prospects of marketing some product or service produced by means of it. The exact boundaries between these two classifications cannot always be clearly defined, as in the case of municipal lighting, but the distinction has important ramifications for the overall shape and character of the community's demand for electrical power.

The significance of this distinction between direct and derived

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[2]G. W. Thompson and W. R. Smith, Public Utility Economics (New York: McGraw-Hill Book Company, 1941), pp. 77 et seq. Martin G. Glasser, Public Utilities in American Capitalism (New York: The Macmillan Company, 1957), pp. 405 et seq.

demand appears, first of all, in their respective elasticities.[3] For certain uses, such as lighting, electricity reigns supreme, with alternative energy forms such as gas (in the case of lighting) either unavailable, uneconomic or impractical (by comparison). Demand is therefore highly inelastic with respect to alternative forms of energy. In a variety of other uses, such as water heating and activating certain chemical processes, electricity competes with other forms of energy such as natural gas. Here, demand will tend to be much more elastic as regards alternatives, and choice of energy form may be influenced by relative prices, technical considerations, or even social or political pressures. Furthermore, within each area of use, the size and elasticity of demand will determine the quantities actually used under certain circumstances. Some expansion of the subject is therefore necessary in order to indicate certain aspects of market behaviour.

Thus far, demand for electricity has been dealt with only from the point of view of demand for a specific energy form. It is more practical,

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[3]Elasticity of demand refers to the change in quantities purchased resulting from a given change in price. This is also known as price-elasticity of demand. Demand is generally elastic if a change in price results in a more than proportional change in the quantity taken, and inelastic if it results in a less than proportional change in the amount. Income-elasticity of demand refers to the relationship between changes in buyer incomes and their expenditures on a commodity. Buyers have an income-elasticity of demand when, at a given price, changes in amounts purchased are more than proportional to changes in income; they have an income-inelasticity if the changes are less than proportional to changes in income. Unitary elasticity exists where changes in the amount are just proportional to the changes in price or income.

however, to deal with it as electric utility service. In this setting, demand is related not only to the intrinsic technical or social usefulness of the medium but also to the value and performance of the industry. A means of measurement is thus provided whereby the role and importance of electrical power in the community may be assessed.[4] Broadly speaking, it provides the economic and physical dimensions of electrical power and the most suitable frame of reference in which to continue the analysis.

It is in this light that the terms direct and derived demand become most meaningful. Derived demand (industrial, commercial and some institutional, such as that of hospitals) will tend to be both elastic and inelastic. For example, it will be elastic as far as substitute sources of power are available. If a manufacturer can install his own generating facility and supply his own needs at (say) 5 mills per kilowatt hour, his own demand will be limited by that substitute cost. If available from a utility for less than 5 mills, his demand would tend to be inelastic, at least in the short run. This, of course, is not the elasticity for his demand for electrical energy; but in view of the fact that few companies are able to supply their own power at a cost lower than utility rates or are able to secure it from another utility, the two may be taken as virtually synonymous.

As to the actual amount of utility service taken, once the pattern of industry requirements has become established, demand may become

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[4]The limiting case is the privately-owned generating system for the single mine or manufacturing plant; but the more typical source is the central utility supply.

very inelastic with respect to increases in rates. Power costs tend to be a relatively small proportion of total costs in most industries and consumption is normally determined by the rate and scale of output, rather than utility costs. Where power costs are in fact a major portion of the overall, small changes in electrical rates will be important; in these instances, demand will tend to be somewhat more elastic, with greater quantitative responses to marginal changes in price. Even if power costs do not loom large, however, demand may also become more elastic with respect to downward movements in rates, particularly in the long run. More power may be used if available at lower prices, especially off-peak generation for water heating and steam raising, and new applications found such as special exterior and display lighting.

In the realm of direct demand, i.e., domestic or residential demand, there are various components which may have different elasticities.

> "For lighting service the residential . . . buyers do not turn quickly to such alternatives as candles or kerosene lamps; consumers believe that these alternatives are distinctly inferior substitutes for electricity. Nor do these small buyers build their own electric plants, unless the electricity prices for lighting service are considerably higher than the prevailing prices. But the domestic lighting use of electricity, for which demand seems to be inelastic, is only a part of total domestic use. More alternative services are available for electric cooking, refrigeration, and water heating than for electric lighting. (In these) gas is a near substitute for electricity; and iceboxes can be substituted for electric refrigerators. Yet, even when all the domestic uses are considered, the demand elasticity for residential consumers cannot be very high at any price. Use of vacuum sweepers, electric stoves, refrigerators, and some other appliances is affected more by the prices and the efficiencies of the appliances than the incomes of the buyers. Before a consumer buys an expensive appliance, he probably thinks more about its quality and price and his own income than about electricity prices. And after the domestic buyers are

accustomed to electric appliances, their demands for those electricity uses often become inelastic."[5]

It is difficult, therefore, to indicate with certainty the precise shape of the curve for the overall demand for domestic or residential requirements. One pair of investigators has suggested that it seems to approach unitary elasticity.[6] Assembling a time chart of sample residential demand over a period of years, 1926 to 1940, it was determined that the price- and quantity- relationship approximated a curve of unitary elasticity ($P \times Q$ = constant). Now, while this is not the same as a schedule of quantities that will be taken at different prices at a given moment in time (the fundamental assumption of demand-analysis), it is the next best source of information. Attempting to explain the causal relationship between price change and quantity response which did in fact occur, it would appear that the main factors in increased electrical consumption were good will, institutional advertising ("live better--electrically"), and more active promotion (including price-merchandising) of electric appliances. Very little long-run reduction in rate schedules took place during this time, and total and per capita incomes fell during the Depression and did not recover former levels until the end of the period. It must be assumed, however, that rates must be sufficiently attractive (i.e.,

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[5]Emery Troxel, Economics of Public Utilities (New York: Rinehart & Company, Inc., 1947), pp. 582-83.

[6]Thompson and Smith, op. cit., p. 79. This general view is also shared by George J. Stigler in The Theory of Price (New York: The Macmillan Company, 1952), p. 47.

"promotional") for such programs to succeed, so it may be postulated that rate reductions and sales programs must go more or less together. But these are the very considerations which influence consumption at any given time; consequently, in the absence of any data to the contrary, it may be assumed that the demand for electricity is generally elastic, at least with respect to decreases in long-run price levels.

Once individual consumption patterns and habits have become established, demand may tend to become quite inelastic with respect to increases in rates, however. The modern home-owner in Canada or the United States expects to have power at the time he sets up housekeeping (his habits having been long established), and is not likely to reduce his consumption in the event of moderate price increases except where marginal use is involved. For instance, the original purchase of an electric range may have been induced by the twin stimuli of rate reduction and lowered merchandise prices; but once it has been integrated in the household, the pattern of use may become (broadly speaking) fairly independent of changes in electric service rates.[7] Changes to alternate forms of energy, such as natural gas, will more likely be the result of other factors.

It is reasonable to conclude, then, that elasticity operates more

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[7] A change to natural gas, say, might come about for the purpose of securing faster heating, but the monthly payments in purchasing or renting a gas range might offset any difference in rates for a long period of time. Hence, except where the rate differential is high rates are not likely to be a major consideration in making a change, unless equipment is being installed for the first time, as in new homes.

in the realm of prospective consumption and somewhat less on existing use. Continued rate increases might tend to curtail consumption, however, and a number of factors would tend to develop greater use, so that demand elasticity could be expected to remain fairly high. Downward movement of electricity rates might induce greater use of appliances and a general increase in power consumption (increasing price-elasticity of demand); intensive marketing and glamourizing of home appliances by electrical manufacturers may be expected to continue, increasing connected loads; finally, rising levels of income and purchasing power may bring a widening assortment of appliances within reach of more families than ever before. In this latter respect, many low- and middle- income families tend to buy labour-saving devices and appliances as income permits, so that resulting demand may be considered somewhat elastic with respect to increases in purchasing power (high income-elasticity of demand), although it is difficult to gauge this factor with any precision.

A further reference might be made with respect to demand elasticity through time.[8] Normally, the elasticity of demand for a commodity will increase with the length of time a price change is in effect. This is particularly true in the case of the demand for electricity, which characteristically takes several years to make a full response to a change in price.[9] There are several reasons for this. In the first place, the

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[8]Stigler, op. cit., pp. 45-47.

[9]Troxel, op. cit., p. 758. This view is supported by industry officials in Manitoba.

consumer may not be able to make immediate and complete readjustments of his consumption pattern. This may involve new equipment or appliances which may also be expensive, and their addition may require advance planning. Thus, a reduction in the price of electricity will have its full effect only after these appliances are purchased. Alternatively, existing equipment, especially durables, may have to be worn out before a change will be made to electricity. Another factor may be market imperfections. Price reductions may not be known to all customers all at once, and buyers may delay shifting their consumption patterns until the price change seems permanent. Finally, existing habits and inertia may delay responses of some consumers until the various choices open to the user have been reappraised, and the responses of other consumers become apparent.

This increase in elasticity with time is shown in Figure 2.1. Given a rate reduction from A to B, the immediate reaction on the amount demanded may be relatively small if the short-run demand curve D_1 is inelastic. In longer periods the quantity increases as the demand shifts successively to D_2 and D_3, and finally to D_n if the new price continues indefinitely. D_n is thus the long-run demand curve. One important lesson from this tendency is that rate reductions for utility service should be undertaken with care, particularly if, for the increased production necessitated by the shift in demand, the utility will be operating under conditions of increasing cost. Otherwise, the utility may be in the position of having to raise rates again at a later date.[10]

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[10]See the discussions with respect to price determination and costs in Chapters III and VI (Figure 3.1 and Figure 6.2).

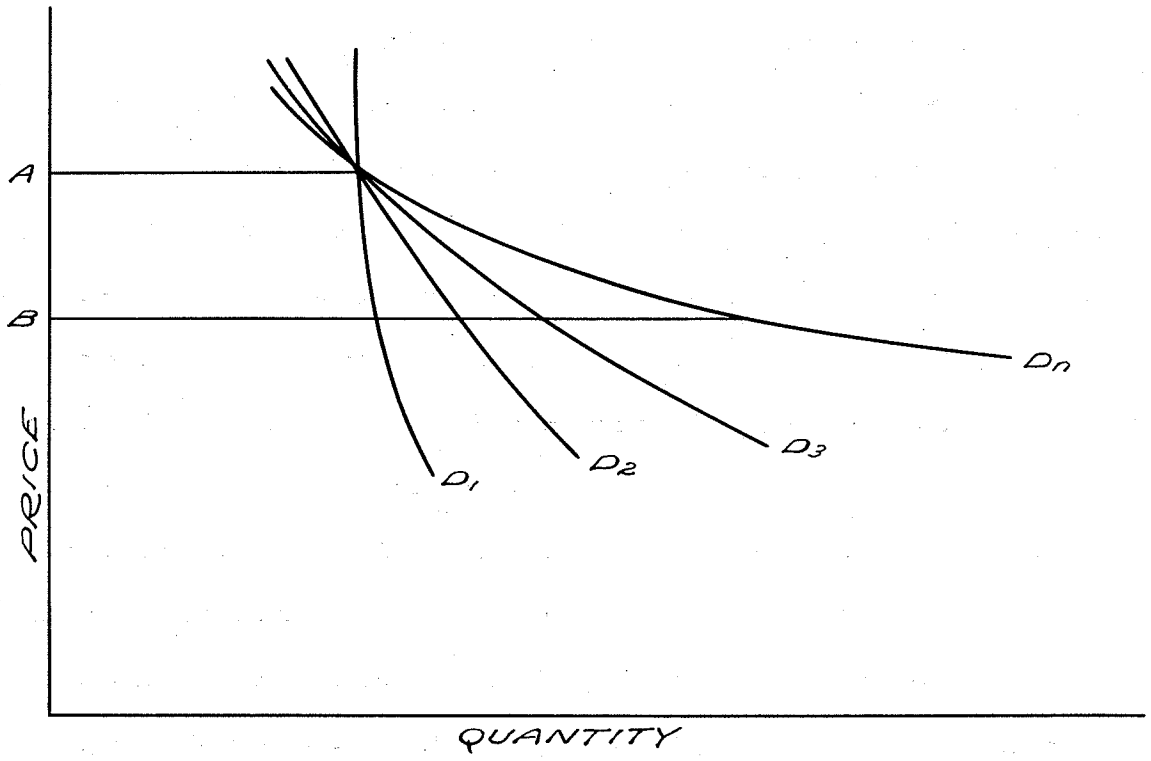

FIGURE 2.1

to the particular way of life of the community, and largely unaffected by normal fluctuations in the volume of retail purchases. Industrial demand is more directly related to production levels and hence markets for industrial output. In the case of power-intensive industries, the question of markets will be of overriding importance for the maintenance of demand for power in these sectors; and for the scale and makeup of total demand, they may be crucial. In summary, then, overall demand tends to be generally stable, once established, reflecting the more or less stable demands of public power and lighting for residential, commercial and municipal purposes; and dynamic, responding to developing technology in the production and employment of power, and fluctuating with changes in the level of industrial output and markets for certain manufactured and processed goods.

The demand for electricity may also be examined from the point of view of consumption statistics indicating recent patterns and trends within various classifications of users. The first grouping is usually residential or domestic service, and may include both urban and rural distribution. Customers are numerous, take service in small quantities, and show fairly regular individual demand peaks which occur at somewhat differing times in any given 24-hour, weekly or monthly period (high diversity). At the same time, consistent patterns of highs and lows are discernible for total consumption figures, reflecting, for example, coincidence of use of power for lighting purposes during evening hours of darkness and mealtime use of electric ranges and appliances for cooking purposes. Fairly

well-defined periods of reduced demand occur when most power is shut down, as in the early hours of the morning, or reduced, as in certain afternoon periods when fewer appliances are in use. Fluctuations are also seasonal, reflecting longer hours of artificial lighting in the winter compared with the summer, more frequent operation of furnace blowers during the coldest weather, and so on. Average consumption represents only a small percentage of maximum or peak demand during any given period (low load factor), however. Demand thus tends to be heaviest at certain hours of the day and during certain seasons of the year.

Total residential demand has grown rapidly during recent years, a reflection of the trend towards more or less complete electrification of the modern home. In 1935, less than 15% of all Canadian households had electric stoves, clothes washers and refrigerators; by 1947, this figure had risen to 27%, and in the late 1950's estimates indicated approximately 65%.[11] This increase, together with more intensive use of power for heating water, driving oil furnace blowers and operating sundry household appliances, resulted in a doubling of total domestic consumption within the post-war years.

These trends have also been apparent in Manitoba, where residential demand for electricity has grown more rapidly than any other sector. Total domestic consumption has expanded from 416.5 million kwh in 1945 to 1,542.9 million kwh in 1961, or approximately one-third of all power used

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[11]John Davis, Canadian Energy Prospects (Ottawa: Queen's Printer, 1957), p. 212.

in the province, as shown in Table 2.1. This has been partly the result of the backlog of demand accumulated during the war years and the depression; but even more important have been steadily rising income levels and continuing low electrical rates (together with the absence of any really competitive form of energy) which have brought complete electrification within the reach of most families. Here, an important factor has been the expanded provincial program of rural and farm electrification initiated during the 1930's, resulting, within one five-year period between 1950 and 1955, in a three-fold increase in rural consumption.[12] Urban requirements have also risen steadily, however, and today the average Winnipeg household consumes nearly 7,000 kwh annually, compared with a Canadian average of about 5,000 kwh per annum.[13]

A second classification is commercial lighting and other related services, or small commercial and industrial customers. These users are typically the mercantile community, business buildings, department stores, and service establishments such as printers, laundries and machine shops; there might also be a number of small factories and food-processing plants. These are much less numerous than residential customers, consume more than double the electricity per customer, and show greater density, usually locating within urban areas and concentrating (by and large) in certain districts. Unlike residential customers, these consumers use the service in the provision of goods and services. Service loads and peaks for individual

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[12]Manitoba Power Commission Annual Report (March 31,1959), See Table, p. 20.

[13]City Hydro.

TABLE 2.1

Distribution of Electrical Energy, Manitoba

by Type of Customer
(millions of kwh)

Year	Domestic	Commercial	Industrial[1]	Street Lighting	Losses	Total
1935	289.3	139.3	715.0	18.6	180.0	1,342.2
1940	330.3	84.7	1,110.7	20.0	201.1	1,746.9
1943	374.2	98.1	1,486.7	22.7	241.0	2,222.8
1945	416.5	114.3	1,468.0	21.3	262.5	2,282.7
1946	457.5	127.0	1,500.6	22.0	280.7	2,387.9
1947	501.7	149.9	1,528.3	23.9	262.9	2,466.9
1948	553.4	154.0	1,050.5	26.2	278.6	2,062.7
1949	616.3	170.1	1,547.7	26.5	264.8	2,625.4
1950	689.3	185.8	1,727.1	26.8	294.7	2,923.7
1951	759.5	198.2	1,745.5	28.0	316.8	3,048.0
1952	825.5	216.8	1,829.2	28.5	300.9	3,200.9
1953	898.9	230.2	1,787.4	29.1	316.4	3,262.0
1954	1,003.0	250.4	1,897.5	29.6	345.7	3,526.2
1955	1,079.2	264.4	1,793.8	29.9	460.8	3,628.1
1956	1,172.4	275.7	1,898.4	32.0	401.3	3,779.9
1957	1,247.6	428.5	1,598.0	33.9	387.5	3,695.5
1958	1,337.9	456.6	1,495.0	35.9	394.8	3,720.2
1959	1,388.3	488.7	1,771.9	39.8	493.6	4,182.3
1960	1,454.6	527.9	1,785.4	43.4	572.0	4,383.5
1961[2]	1,542.9	441.7	1,678.2	48.3	336.3	4,193.9

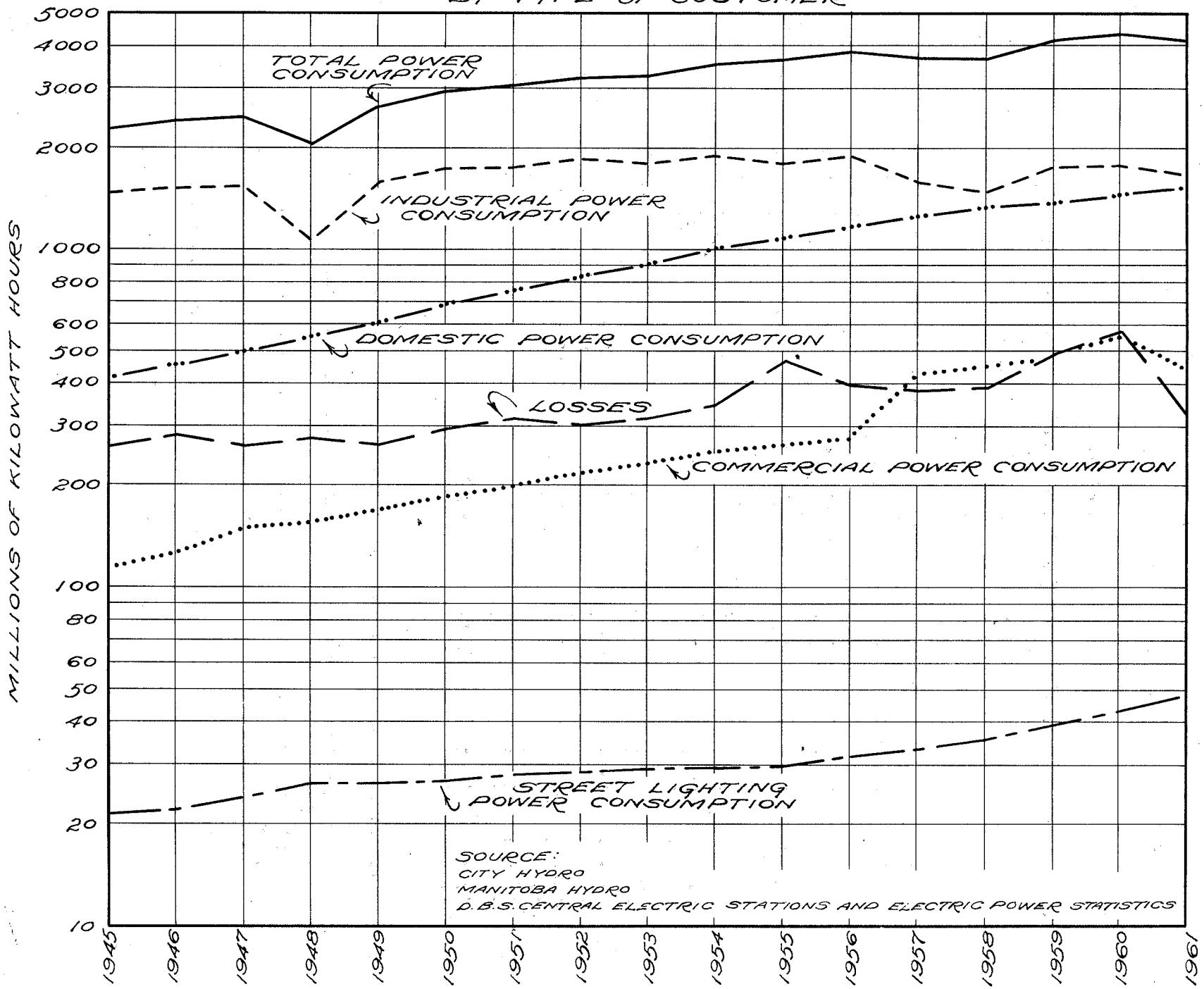
Note: [1]Includes small and large power, municipal power and free services.

[2]Compilation from separate data of Manitoba Hydro and City Hydro includes estimate of actual division of use between commercial and industrial classifications, assessing end use of electricity for lighting, power, water heating, and other special classes of use.

Source: Dominion Bureau of Statistics Central Electric Stations and Electric Power Statistics
Manitoba Hydro
City Hydro

CHART 2.1

DISTRIBUTION OF ELECTRICAL ENERGY, MANITOBA
BY TYPE OF CUSTOMER



store or business building, for example, makes heavy demands for interior lighting, air conditioning, water heating and elevator operation. The more typical large user, however, is the primary industry such as iron and steel, pulp and paper, non-ferrous smelting and refining, and large-scale food processing, all of which are power-intensive and whose requirements are more directly related to production levels. These will provide the main impetus to the most important power projects, and often commit in advance large blocks of available power. The stability of industrial demand, however, will depend on the number and range of industries (of some size) serving markets for secondary as well as primary goods. To the extent that there is a representative selection of industries and primary-resource industries do not dominate the scene, industrial demand, as a class, will tend to remain relatively stable, perhaps to an even greater degree than economic conditions generally. To the extent that the demand for power is influenced by power-intensive industries subject to the vagaries of primary commodity markets, an element of potential instability will remain.

A further reference should be made in connection with the separation of markets. The large concern engaged in the processing of resources usually wants assured power at guaranteed rates for a given period of years. Contract power may be arranged with a utility developing the power source or the company may develop captive power at its own site. In either case the power supply or the amount required by the firm is separated from the rest of the market and may not enter the reckoning with respect to either assessing overall demand or attempting to meet it on a community basis. It may be

virtually removed from the main discussion. Similarly, municipal and street lighting, once established, represents essentially fixed requirements which are varied only in the case of extensions or dimming to conserve power in the event of failure. Consequently, lighting and utilities may also be calculated separately.

Industrial consumption of electric power represents by far the largest class of demand in Canada, or approximately 60% of the total power used in 1960.[15] Resource-processing industries have been the most important, with pulp and paper and mining and smelting each accounting for about one-fifth of total requirements. Pulp and paper has long been a heavy user of electricity, a large portion being used for steam raising purposes, and low cost power has been an important attraction to this industry. As fuels have come to assume the role of supplying heat and the tertiary power so employed has been diverted elsewhere, electricity is used more for machinery operation and control and power consumed by the industry has tended to move more or less in step with output since 1950.[16] While power requirements have not increased as rapidly as those of other industries since the war, and the percentage of total use has dropped several points in recent years,[17] demand is stable and growing.

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[15]Dominion Bureau of Statistics, Electric Power Statistics 1960, Table 5, p. 20.

[16]Davis, op. cit., p. 208.

[17]i.e., from approximately 21% in 1953 to an estimated 18-19% in the period 1959-61. D.B.S. Central Electric Stations; and Davis, op. cit., table, p. 209.

Non-ferrous smelting and refining is rapidly becoming the largest consumer of electrical power. Electro-processing is one of the principal methods in the recovery and purification of non-ferrous metals, and while chemical leaching processes have become more important electrical consumption in this area has increased more rapidly than in any other except household use, or, since 1945, at an annual rate of about 8%.[18] Metal output, being weighted increasingly with aluminum, has risen at a more modest rate, but established demands for light metals (for example) such as aluminum, magnesium and titanium suggest a present and continuing growth of demand for electricity of about 6% in this industry. Mining, on the other hand, has not increased in importance with respect to power use, trailing well behind output which has been rising at the rate of nearly 10% per annum. With the decline of underground coal and gold mining and the increase of open-pit operations, the use of diesel equipment and electrification of controls, this trend may be reversed, with a new and emerging category of demand of some importance in various parts of the country.[19] Similarly, iron and steel, a relatively small but expanding industry in Canada, may be increasingly important to some communities. Power consumption, already high per unit of output,

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[18]Davis, op. cit., pp. 210-11.

[19]See earlier note with regard to separation of markets. Mining requirements may or may not affect overall market situation (at least in the short run), depending on the nature of specific power contracts which may be arranged. Mining commitments of this kind may be useful for head building, but may embarrass supplier later on when demand from other sectors begins to exert pressure on total supply - particularly if special contracts involve very low rates.

has been climbing even more quickly than steel production itself, and with the growing use of electric furnace capacity, turbo-open hearths and electric induction heating, new or unforseen requirements may emerge.

Secondary manufacturing has also become an important user of power, although of much smaller order of magnitude--about 9% of total consumption.[20] With increasing conversion to electricity for motive power and control, power use has risen at almost double the rate of manufacturing output or at an average annual rate of about 7% since the war. Accounting for the balance of industrial use are chemicals and abrasives, including certain building materials, constituting 6-7% of total demand. A fairly steady ratio has existed between power consumption and chemical output since 1945, and with the importance of electro-chemical processes for certain fertilizers, phosphorus, and so on, increasing production has resulted in steadily increasing power demand.[21]

Finally, reference must also be made to exports and losses, representing, approximately, 5% and 10% of total "consumption".[22] Exports of power have had a long and complex legal and political history, and power shortages in Canada, the falling off of import demand in the Pacific Northwest and limits imposed in the past by Canadian legislation have all tended to minimize the flow of electricity from Canada to the United States, especially in recent

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[20] Davis, op. cit., p. 215.

[21] Ibid., p. 212.

[22] Ibid., pp. 213-14.

years. Thus, exports tend to lag well behind total electrical output. A figure for line losses and other unaccounted power use must also be taken into consideration in order to arrive at a total figure for consumption matching generation (plus imports, if any). This fluctuates somewhat but will tend to rise (rather than fall) as power is transmitted greater distances from remote generating stations to market areas and distribution systems become more complex and more power is distributed to larger numbers of small urban and rural customers.

In Manitoba also, industrial consumption of electricity represents the largest category of demand, once in excess of two-thirds of total consumption (1943) but declining in recent years to its present level of approximately 40%. Actual consumption has moved from 1,468.0 million kwh in 1945 to a maximum of only 1,898.4 in 1956, and has since declined to 1,678.2 in 1961. This is to be compared with a more than doubling of both primary industry and manufacturing output during the same period[23] which, although substantial, is still considerably less than the growth in other parts of the country.

As shown in Table 2.2, the industrial market for power in Manitoba is dominated by the requirements of eight industries, the main outlines of which may be determined by the consumption of thirty-seven major firms and establishments. Consumption by these firms represents about one-third of all industrial use. This latter is heavily weighted by the requirements of the International Nickel Company at Thompson, which also constitutes

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[23]Department of Industry & Commerce, Province of Manitoba.

TABLE 2.2

Electrical Power Consumption
of Significant Industrial Consumers:
Manitoba 1958-1962
(Firm power only) (kilowatt hours)

Industry	No.of Establishments Included	1958	1959	1960	1961	1962
Steel[1]	7	47,562,084	74,371,432	55,154,054	77,731,880	71,839,320
Oil	4	60,382,054	64,373,174	67,020,611	72,722,480	71,233,354
Meat Packing	4	32,727,001	35,255,528	35,071,215	35,395,208	34,043,342
Military	3	50,288,425	49,428,063	48,188,557	49,278,766	50,481,193
Wood Products	1	187,074,401	203,628,437	208,375,021	191,235,329	195,276,323
Transportation	7	65,152,786	67,531,739	65,311,048	66,453,198	65,718,637
Mining	1	12,356,195	12,116,864	13,336,586	13,894,384	14,169,746
Food Products	10	34,882,088	36,062,295	37,424,264	37,861,381	37,271,595
TOTAL	37	490,425,034	542,767,532	529,881,356	544,572,626	540,043,510

Note: [1]Griffin Steel began production in 1959.

Source: Manitoba Hydro
City Hydro

result of greater refinery output, but also due somewhat to the needs of the Trans-Canada pipeline. Meat packing and food products, while important users of power (together they account for the same quantity of electricity as the iron and steel industry), have had fairly static requirements during the past five years. These industries are "export" in character as the local market is not large enough to absorb output. This is particularly true of meatpacking, and only if adequate and assured supplies of high quality livestock can be made available to the industry will output expand at a faster rate. However, the vegetable processing industry has shown notable growth in recent years which has partially offset declines in other branches of the food industry.

The transportation industry and military requirements are the remaining important consumption areas. Military needs are associated with R.C.A.F. and R.C.A. establishments and are imponderables with respect to year to year requirements, although loads have been fairly constant in recent years. The transportation industry is dominated by the C.N.R. and C.P.R. yards and main stations. Increasing power demands have been associated with increasing automation in these facilities and the growing power requirements of maintenance facilities in the aero industries.

The balance of industrial consumption is distributed mainly among a large number of secondary manufacturing concerns representing a wide range of miscellaneous activities. Although some of these industries are quite small, in some cases consisting of a single minor plant, there are firms from every major industry in Canada with the exception of tobacco and

automobiles.[26] Table 2.3 indicates the variety, the very large number of firms, and the distribution of employment among these industries. Now while there are no consumption statistics indicating the requirements of these various industries, it is established that over 99% of all suburban power users use less than 100,000 kwh, and over 90% consume less than 10,000 kwh annually.[27] As most small industry locates in urban communities, this would seem to suggest (particularly in view of the fact that there are many very small concerns) that consumption is well distributed, although nowhere near the average figure of 375,000 kwh per firm,[28] and a number of fairly large users must remain within this group. Further, demand within this group must be presumed to be fairly stable, though declining in recent years, as a comparison of Tables 2.1 and 2.2 would seem to indicate.

An attempt may now be made to summarize the main elements of demand during recent years. Residential and farm consumption has climbed steadily without let-up since 1945. Farm electrification has brought about a tremendous increase in rural services and consumption, and urban requirements have more than doubled. Habits would appear to be fairly stable at the current high income levels, and existing demand has probably become increasingly inelastic both in regard to changes in price and reductions in

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[26] C.O.M.E.F., op. cit., p. VI-1-3.

[27] Manitoba Hydro figures only. Winnipeg excluded--but these approximate figures apply generally.

[28] Total power consumption of the industry grouping concerned (582/m/kwh) divided by the estimated remaining number of manufacturing firms (1,550) equals 375,000 kwh.

TABLE 2.3

Number of Establishments and Employment
By Industrial Group (Manitoba)[1]

Industrial Group	Establishments	Employment
Iron, Steel, Machinery & Transportation Equipment		11,472
Primary Metal Products	12	
Machinery	30	
Metal Fabricating	122	
Transportation Equipment	34	
Food & Beverages	392	9,446
Clothing & Textiles		6,325
Clothing	140	
Textiles	35	
Knitting Mills	5	
Printing, Publishing & Allied Services	192	3,830
Wood Products	239	3,000
Non-Metallic Minterals & Mineral Products	53	1,918
Electrical Goods	18	1,749
Paper & Allied Products	23	1,035
Chemicals & Chemical Products	35	800
Miscellaneous Manufactures	262	5,460
TOTAL	1,592	45,035

Note: [1]Estimated current figures, taken from separate compilations for 1960 and 1961.

Source: Department of Industry & Commerce.

income, and with respect to increased disposable income, at least in regard to certain uses. However, much of the postwar surge of demand seems satiated, and gas is attracting customers for water heating and cooking, particularly where there are new installations. In the rural areas, increased consumption is more directly related to increasing earning capacity and reducing labour requirements (per unit of output) than to household conveniences. Incentives have arisen through the active promotion of the Manitoba Power Commission and the Manitoba Hydro, and as a result of rising operating costs and reduced earnings on a number of cash crops.

Commercial demand for electricity has grown with the number and variety of retail, wholesale and service establishments. Important elements have been the increase in the actual number of service establishments throughout the Province, the erection of a number of large business and government buildings and the development of modern supermarkets and shopping centers in the Winnipeg area and a number of smaller centers. For a long time, electric lighting and occasional water heating were the sole sources of commercial requirements. Today, however, the wide range of new applications for commercial and industrial use and the advent of commercial refrigeration, air-conditioning and thermostatically-controlled space heating have served to develop base loads and steadily increasing demands. In some measure also, these trends have been associated with the increasing importance of metropolitan Winnipeg as a commercial, industrial and financial center.

Industrial demand today is heavily weighted by the needs of primary

industry, and is subject to the vagaries of export markets for meat packing, nickel mining, and pulp and paper. It is also influenced by markets in Western Canada for clothing, food products, and a number of small manufacturers which, in turn, are affected by the prosperity of the farm community producing for distant grain and cattle markets. However, there have been no radical fluctuations of demand in these markets since the end of the war, and in the absence of any tabular study relating the electrical content of the output of these and other local industries with their actual production, it is not possible to estimate the extent to which overall demand might be negatively or positively influenced by changes in the product markets. Nonetheless, it would appear that total industrial demand for power has been fairly inelastic with respect to changes (both increases and decreases) in output during recent years, as shown by Chart 2.2. At the same time, demand has been elastic with respect to lower prices for tertiary power (i.e., off-peak or surplus power) and flat-rate water heating, witness the purchases of the pulp and paper industry and the commercial and residential sales of the utilities which totalled approximately 10% of total power consumption in 1961.[29] This is energy which would not have been purchased at regular rates, but at the special rates for the purpose is competitive with natural gas. Finally, it may be presumed that rates must be generally competitive with prices of other forms of energy and with rates elsewhere, in view of the extent of power consumption in lieu of available

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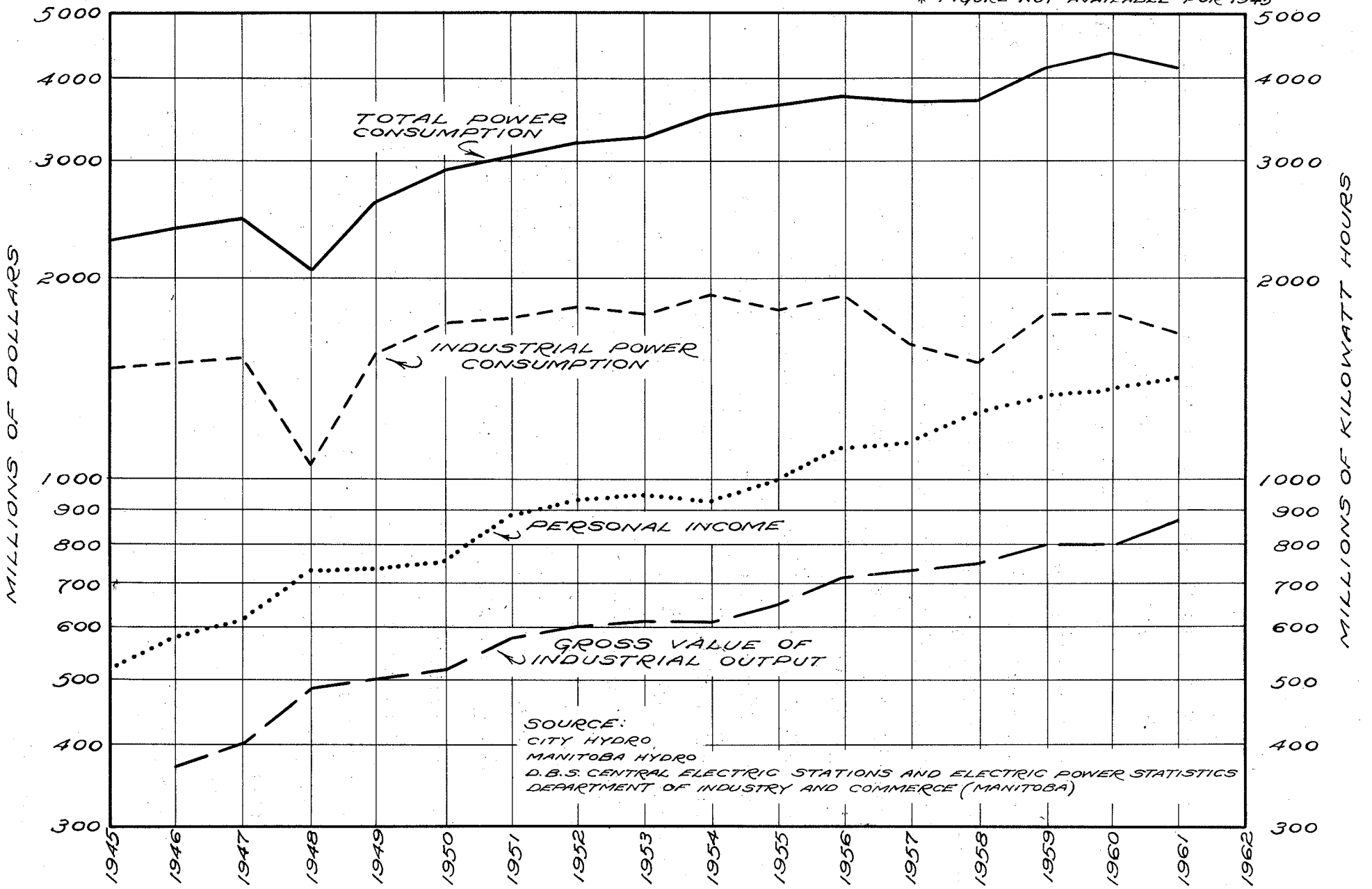
[29]Figure calculated from separate data secured from City Hydro and Manitoba Hydro.

CHART 2.2
INDUSTRIAL OUTPUT (GROSS VALUE)*, PERSONAL INCOME AND ELECTRICAL POWER CONSUMPTION (INDUSTRIAL AND OVERALL) IN MANITOBA, 1945 - 1961

* FIGURE NOT AVAILABLE FOR 1945



the basic forces of regional economic growth and stagnation and with the vagaries of the more short-term business cycle.

While it is not possible on the basis of information thus presented to provide a definitive relationship between electrical requirements and economic activity, it is possible to suggest that a correlation may in fact exist. This, of course, is a statistical creation arrived at mathematically by a simple projection of past trends. Assuming a relationship exists between the growth of demand and the expansion of the economy, growth of demand has been compared with the growth of Gross National Product, and using multiple correlation analysis a correlation coefficient of 0.99 has been obtained, which may be summarized as follows:

> "(a) year in and year out there is a steady increase in the demand for electricity which appears to be due, not so much to the growth in other sectors of the economy, but to the new and more intensive uses for electricity as such. This results in an annual increase in demand for power in the order of 6%.
> (b) for every 1% volume change in G.N.P. there is a 0.36% change (in the same direction, up or down) in electricity consumption."[30]

Similarly, a good correlation has been found between electricity consumption and the employed labour force, which, in turn, has been used to provide a basis for demand forecasts. These indicate similar rates of increase, ranging from 6.5% to 7.5%. However, all of these are ex post facto imputations with respect to national statistics only, and are intended only to suggest relationships which may or may not occur at the provincial level where constituent elements may differ and loom larger when the composition varies.

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[30]Davis, op. cit., pp. 203-4.

In Manitoba requirements have been found to expand at an average annual rate of about 6.5% since 1945 (if 1948 is not taken into account), and 4.7% since 1935.[31] In future, these are expected to increase at the rate of about 5-5½%,[32] at least during the next 10 to 15 years. This, however, represents a compromise figure based on a variety of considerations, and no specific correlations have been explored in this project.

Canadian experience is not unique, and in fact appears to be fairly typical of estimates of other Western industrial states, such as Britain, France and the United States.[33] Annual rates of growth of demand do not seem to differ markedly between those only now beginning to use power intensively and those who already do. Consequently, long-run consumption statistics and data with respect to the special experience of certain industries with respect to the use of power may be compared with Canadian developments--with possible applications at the provincial levels.

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[31] See Table 2.1 and Chart 2.1.

[32] Manitoba Hydro.

[33] Davis, loc. cit.

CHAPTER III

THE ECONOMICS OF SUPPLY

Electricity has been defined as a peculiar condition of the molecules of a body developed by friction, chemical action, heat or magnetism.[1] Conceived as a stream of electrons, it represents energy or a manifestation of energy in one of its purest forms which may be utilized and controlled to perform work. In this context, it assumes economic characteristics:- it is useful, is desired to meet human wants, and is relatively scarce. It is not found in any natural state of value to man, and must be manufactured and processed to meet specifications of voltage and amperage for further use. As a product, it may be used for the immediate satisfaction of wants or as a factor of production. However, it is neither material nor storable, and cannot be employed except in conjunction with specialized apparatus, and hence is more closely akin to a service.

Electrical power has certain other characteristics that are relevant from an economic standpoint.[2] Uniform quality and controllability mean that voltage and amperage may be varied over a virtually unlimited range with absolute control maintained at all times. This permits great flexibility in adaptation and use for a wide range of requirements in home and industry. Lack of storability means, however, that production facilities must be organized to provide the service at time of need. Peak

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[1] Oxford Concise Dictionary, (Revised 1946).

[2] Thompson and Smith, op. cit., p. 76 et seq.

requirements must be taken into account and production schedules adjusted accordingly. Due attention must also be given to holidays, daily and seasonal weather conditions, and any other special circumstances which may influence demand (or supply) in order that service will be ready and available as required. Finally, highly sophisticated and expensive engineering equipment is required for the production and distribution of electrical power in quantity. Adequate (and assured) demand is therefore necessary in order to call forth the major capital outlays required, and only well-financed organizations and institutions will be in a position to arrange and undertake the necessary investment.

Electricity for commercial purposes may be produced thermally through the utilization of heat, or hydraulically by means of falling water. The most typical thermal means are steam turbines and diesel engines. The steam turbine may be fired by coal, natural gas, petroleum fuels, or even an atomic pile, and has largely superceded the original reciprocating-type engine. Diesel engines, operated singly or in banks, provide a flexible alternative for a wide range of power requirements and operating conditions, though at higher unit costs. The specific choice of thermal equipment will depend on the amount and pattern of service requirements, available fuels, and the capital and operating costs of various types in the specific situation.

Where sufficiently large markets and the necessary natural resources permit, electric power may also be secured through hydro-electric installations. The hydro plant consists of generators harnessed to water

flow on the site of natural or artificial falls of a lake or river. Power potential is determined by actual water flow, the drop or "head" which may be natural or artificially created by a dam, and pondage or storage of water which assists in damping out irregularities in seasonal flows. The facilities are necessarily massive structures in order to accomodate turbines, generators and control centers and to resist pressures of ice and masses of water. But the efficiencies which modern turbines develop (80-90%)[3] combined with the enormous power potential which many natural sites yield means that (despite the frequently very large initial capital costs entailed) great blocks of power can be made available which, by any other means, would be impractical or highly uneconomic.

As the hydroelectric plant must be located on the physical site of the water flow to be utilized, the development of a hydro facility or system is dependent upon suitable natural sites which can be developed economically. This will be determined by proximity to the potential market, the actual physical accessibility of the power site, and the capital costs of facilities on location and along the designated route to the market area. This "economic distance" (or "economic access") to the market is dependent upon the terrain and the presence (or absence) of natural barriers as well as the physical distance over which equipment must be hauled and transmission lines and towers strung out (and subsequently maintained) to connect with the market.

In addition to capital costs, however, technology also presents

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[3]Glaeser, op. cit., pp. 159, 168.

certain limitations. Under present engineering practice in the field, 300 miles represents the approximate maximum distance over which high voltage alternating current may be economically transmitted. Line loss and rising costs of stepping-up equipment, insulators, and so on as voltage is increased to permit transmission over ever longer distances makes costs prohibitive even where no natural barriers are encountered. Direct current power has been successfully transmitted 600 to 800 miles in Sweden, and even 1000 miles has been achieved experimentally.[4] But these techniques are not yet technically perfect nor universally adaptable commercially. In order to incorporate a DC link in an AC distribution system, costly equipment conversion would be required; consequently, such conversion would most likely be undertaken only in the event of long distance transmission facilities becoming necessary, and then as part of an overall modernizing program, not just as a single project.

These various considerations place limitations upon the exploitation of some hydroelectric sites--plants must be located within 300 miles of markets, while steam and diesel generating equipment may be located within the actual market area, provided adequate fuel supplies and water for cooling purposes are available. Any given utility system may employ a combination of generating methods, however, and the actual choice as to the power source or priority of sources for a complex of base-load and peaking power will be determined by a wide range of factors such as the size and anticipated rate of market growth, costs (per unit of output) of various

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[4]John Davis and David W. Ross, unpublished manuscript.

types of generating machinery, availability and costs of various fuels, availability of investment capital, and so on.

Whatever technical means may be employed, there are several features common to the large-scale or utility supply of electric power. The first of these is a high ratio of capital investment to gross operating income.[5] Most retail and manufacturing concerns secure in the course of a year's business a gross revenue at least equal to the amount of invested capital. The American steel industry, for example, has long secured an annual revenue equal to twice its investment. Similar ratios exist in the auto and pulp and paper industries, while in meat packing and retailing the ratio has been as high as three to one. In the realm of public utilities, however, a reverse relation exists, and investment may exceed income several times over. This is particularly true in the realm of hydro power, with ratios of investment to income ranging from six to one to as high as nine to one, as in the case of Manitoba Hydro.[6] In other words, a typical company may turn over its capital once in six to nine years, and secure gross revenues of only 16.7¢, or as low as 11.1¢ on the investment dollar.

This ratio will vary with the type and power configuration of each utility, but the same general conditions exist in most cases. Service demands, the technology of the industry and the economy of large installa-

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[5]Thompson and Smith, op. cit., p. 82 et. seq.

[6]Manitoba Hydro Electric Board Annual Report (for the year ended March 31, 1962). Statement of Consolidated Income and Expenditure, and Consolidated Balance Sheet.

tions cause plant construction in advance of current needs. The installation of expensive engineering equipment in large or multiple units makes it possible to economize on unit costs of production for the system as a whole. The modern practice of meeting rising demands as they arise also means that production units will be built larger than present needs dictate. In any event, "present needs" will usually constitute the greatest probable peak load for the system, although this peak may be of short duration. As a result, there is almost always spare capacity (the equivalent of the output of the largest generating unit) for emergency purposes during peak periods, and as high as 50% available capacity during off-peak hours of regular use, such as daylight hours. In this situation, actual power purchases may rarely exceed 50% of total available power, and with the level of rates traditionally kept low (i.e., close to actual or estimated costs) for promotional or community purposes, total revenues typically remain low (in the sense discussed above) in relation to overall investment. A stable (and growing) market for power and a stable income is therefore necessary over a period of years if the utility is to expect any reasonable financial success or stability whatsoever.

In addition to having a relatively high ratio of investment to income, public utilities, again contrary to most businesses, have unusually large total capital requirements, particularly where hydro developments are involved. Taken together, these two considerations raise important problems of financing which have troubled the industry throughout much of its history.[7]

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[7]Thompson and Smith, op. cit., p. 105.

The reasons are twofold. First, in view of the pattern of revenue described above, the costs of financing new capital investment may prove an excessive burden to the concern if subsequent power consumption does not grow in proportion, at least over some stipulated period. But there is no way of knowing with certainty whether forecast increases in demand will materialize when and in the amount anticipated. Consequently, in view of the need for planning relatively large rather than small incremental units of generating capacity at a time, an evident hazard exists in the consideration of expanded facilities (particularly in remote areas where surplus cannot be readily sold off) which can only be minimized by effective market survey techniques. The alternative is securing firm commitments for specific blocks of power in order to make the transition less hazardous--a device which is not always possible or desirable. Secondly, the investment in electric utility plant and associated distribution systems and equipment represents a high degree of specialization of capital which cannot be converted to other purposes or moved (readily) to another location. Consequently, in the event of failure, the investment represents a high degree of loss which is difficult to prevent and may be stabilized only by financial reorganization of the utility and subsequent growth of demand to absorb the oversupply.

The problems of finance therefore resolve in two phases.[8] At the outset, there is the problem of sufficient capital for initial construction of plant and distribution system, essentially the task of marketing securities

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[8] Ibid., pp. 111-112.

on favourable terms. There is the further problem, however, of providing a steady flow of funds into the industry in order that necessary rate of growth may be maintained, particularly during the early development of the industry. This problem is one of maintaining a good credit standing, and it is here that the special problem of utility financing arises. The need for a continuous flow of new capital combined with relatively modest revenue flows would suggest that stocks should be more important than bonds in the financial structure of utilities, and that debt might even be restricted to special purposes and limited in amounts. A review of available evidence, however, shows the general emphasis to have been on bonds, and in the case of government projects and crown corporations present practice is to finance entirely through the medium of guaranteed bonds and debentures.

A second feature of large-scale power supply is the dominance of overhead costs, or high ratio of what are essentially fixed costs to total costs. These frequently account for a large share of total costs, and in a variety of electric utilities may represent 60% or more.[9] This is particularly true of hydroelectric facilities where costs are mainly interest on plant and equipment (dams, power houses, transmission lines, distributions systems), rent (premises, power sites, water rental), depreciation, maintenance and administration.[10] Variable costs are usually negligible in

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[9] Ibid., p. 87.

[10] Manitoba Hydro shows (M.H.E.B., op. cit., p. 15) "operating and administrative expenses" as a combined figure, uniting certain variable and overhead costs.

production and transmission, and are only a small proportion in the realm of distribution. The resulting ratio of overhead to total costs is thus very high--frequently over 90%.[11]

> "This high ratio, incidentally, reflects one of the main economic differences between the hydroelectric industry and the thermal electric industry, where the corresponding ratio is considerably lower owing to a smaller investment in fixed plant and higher variable costs, chiefly the costs of fueling and firing."[12]

This feature becomes very important in the light of the conditions under which the utility is operated. To begin with, the presence of large overhead costs make the plant or system subject to the law of decreasing cost; that is, average unit costs decline as output increases.[13] High overhead costs mean that average may fall over a wide range of output, and in the case of hydroelectricity may fall right up to the point of maximum output of the system. This is important in the operation to the extent that a sustained demand makes fuller utilization (with its concomitant reduction in unit costs) more profitable[14] and may induce management to extend output and maximize sales at every opportunity.

In addition to operating under decreasing cost, the power concern also operates under conditions of joint costs, or, (stated another way) is

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[11]Thompson and Smith, op. cit., See Chart 11, p. 87.

[12]J. H. Dales, op. cit., p. 8.

[13]For further reference see Thompson and Smith, op. cit., p. 88 et. seq., and Glaeser, op. cit., p. 408.

[14]i.e., when Price minus AC per unit times volume of sales approaches maximum profitability (MC = MR).

subject to a condition of common costs arising out of joint use. The typical plant serves industrial, commercial and residential customers, and common costs of supply must be shared on some basis among the various classes of users. This circumstance is not unique, but where the utility markets power under a variety of conditions and at differing price scales the problem of allocation of these costs becomes very important, first as a matter of equity, and secondly as underlying guides to price determination. However, as there is no invariable principle upon which suitable division may be made and all methods of allocation are to some extent arbitrary, there are no unchallengeable guide lines for the determination of prices. As a result, not only do costs become increasingly disregarded, but in addition determination of actual price schedules becomes dependent upon a variety of considerations other than cost.

Finally, the electric utility is directly connected to the ultimate consumer and is in a position to control use, including the possibility of resale. The service connection may be broken or suspended (in itself costly and inconvenient), but there is not usually an alternative feasible source of supply immediately at hand, and the original supplier represents the prime if not sole source of supply.

These two sets of considerations respecting costs and financing result in an almost irresistible tendency towards monopoly, either local or regional. The amount and specialization of capital requirements, the complexity of the operations, and the long period of time normally required in bringing a plant into operation (particularly major hydro installations)

and building markets sufficient to absorb supply at maximum output prohibits all but the largest, most substantial and best organized firms from entering the field, thereby limiting competition at the outset.[15] But where more than one concern does in fact become active within a given region, the resulting competitive situation is likely to be quite unstable. Where decreasing costs exist, any increase in sales would reduce unit costs since rates charged for new business would ordinarily make some contribution towards overhead costs, and the incremental costs attributable to increased traffic would be relatively small. Thus, the existence of unused capacity sets up an irresistible inducement to get additional traffic, and at rates which aim to cover marginal costs--and as much more as competition will permit. But the presence of joint costs makes it impossible to say what portion of total costs other than incremental or direct costs are attached to any one unit or class of service. Therefore, the inevitable consequence will be price inducements by one firm to the customers of another, opening the door to discrimination and rate wars. Out of this struggle for traffic there comes, eventually, some sort of understanding, combination or merger. In any event, competition, which at best was an imperfect and unstable order, is likely to be eliminated.

An accompaniment of this tendency towards monopoly is a system of administered prices encompassing rate-setting and discrimination among classes of users. Unstable market conditions mean price instability, in

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[15]Glaeser, op. cit., p. 414 et seq.

which case price is unable to perform that regulatory role of matching supply and demand which is one of its main functions in most industries.[16] This leads to great pressure for price stabilization of some sort, whether cooperative price-setting or monopoly price-fixing, in order to organize the market about some definite focal points.

The market for electricity is not uniform, however, but segmented, with residential, commercial and industrial customers varying considerably with respect to the amounts of power they require and the character of their demand schedules. Residential customers take relatively small amounts of energy, although costs of service may be just as high as those for industrial customers. At the same time, domestic demand tends to be inelastic, so that fairly high rates may be charged (compared with industrial rates) without affecting consumption. The monthly outlay required for the purpose by an average household ($4.93 in the City of Winnipeg, 1962)[17] may be relatively small in comparison with other typical expenditures of the family, yet sufficiently high to enable the utility to cover the costs of service.

Industrial customers, in turn, typically require much larger quantities of service. Electricity rates may or may not be an important consideration with regard to total costs, depending upon whether

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[16] Dales, op. cit., p. 10 et. seq.

[17] Calculated from Table 6.3.

the particular industry or process is power-intensive. Nonetheless, unit costs of supplying service will be considerably lower than in the case of residential service and the utility will be able to supply power at much lower average rates. And, assuming that rates will be a factor in determining where industrial firms will locate, or whether (having located) they will purchase service or supply their own, the competitiveness of rates (compared with other sources of supply and with rates elsewhere) will be important in determining how much power may be sold for industrial purposes.

Finally, for uses such as commercial light and power, demand may be almost perfectly inelastic. The highest average rates (as a class) may be charged without noticeably affecting consumption. The requirements of shops and office buildings will be determined by what is required in order to operate and to remain competitive, and hence will be largely unaffected by modest changes in sales volume. Again, costs of electrical service will be relatively minor in relation to total expenses.

Uniform prices applied uniformly to all classes of demand are thus unsatisfactory for the purpose of meeting the problems of supply and demand peculiar to each class of need, and inefficient and ineffective in securing optimum revenue for the supplier. The alternative, therefore, is a price structure which discriminates among classes of users, taking into consideration quantity of power required by each customer, pattern of use, and direct costs of supplying service, thereby catering to the specific needs of each group and so maximizing and maintaining utilization and sales. This, in turn, is the procedure followed by most utilities today.

In this setting, price becomes a tool of management, and the two sides of the market for electricity are related through entrepreneurial policy, especially in the long run. In the short run, there may be gluts and shortages, but over the longer period management is more likely to be able to equate supply and demand, securing adequate distribution of available supply through advertising, appliance merchandising, promotional use of rates, retail credit policy, and expanding available supply when growth of demand seems to justify new capacity. Entrepreneurial policy, then, not price, becomes the key to the economic decisions made within the industry and the necessary focal point of investigation. What have been the objectives of the industry; how have they been determined, and by whom? How have the special characteristics of power (transportability, non-storability, high overhead costs, and so on) affected its development? How have rates been used, and what markets cultivated? These and other questions form the basis of inquiry in the present study, and indicate the general approach taken.

In studying entrepreneurial policy, however, it is first necessary to examine the milieu and circumstances in which the concern carries on business. In the typical monopoly situation,[18] as shown in Figure 3.1, it is assumed that the firm will endeavour to maximize earnings and will follow policies calculated to serve that end. But the monopolist can only

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[18]The following discussion draws upon . . . Glaeser, op. cit., pp. 408-414; Troxel, op. cit., pp. 549-555; and Stigler, op. cit., pp. 210, 212 et. seq.

maximize net revenues in relation to his existing demand curve, which is the industry demand curve, and will therefore choose a level of output which with the corresponding price on the community demand curve will secure his optimum return.

Now a monopoly has no conventional supply curve--that is, a schedule of quantities offered or forthcoming at various prices. It will, however, have a schedule of quantities that will be supplied at various marginal revenues, provided the firm is selling to competitive buyers. This schedule is portrayed graphically by the marginal cost curve, which, in turn, reflects technical considerations determining possible factor combinations, the ratio of fixed to total costs, and the scale of total costs. The marginal revenue curve, in turn, is derived from the demand schedule, and reflects incremental revenue of the last unit of production at each level of output. It will also tend to reflect the character of community demand, but will be less elastic. The monopolist will therefore carry on business at the output where marginal cost equals marginal revenue. At this output revenues will be maximized; at higher levels net addition to cost reduces profits, while at lower levels net addition to revenue exceeds cost and increments of output will therefore increase earnings. This total product will be sold at price P on the demand curve. The rate of earnings will be determined by the difference (at that point) between price and average costs, and net earnings will be equal to the shaded area NR.

A similar analysis may be applied to the case of the monopolist charging different prices to different classes of users. In Figure

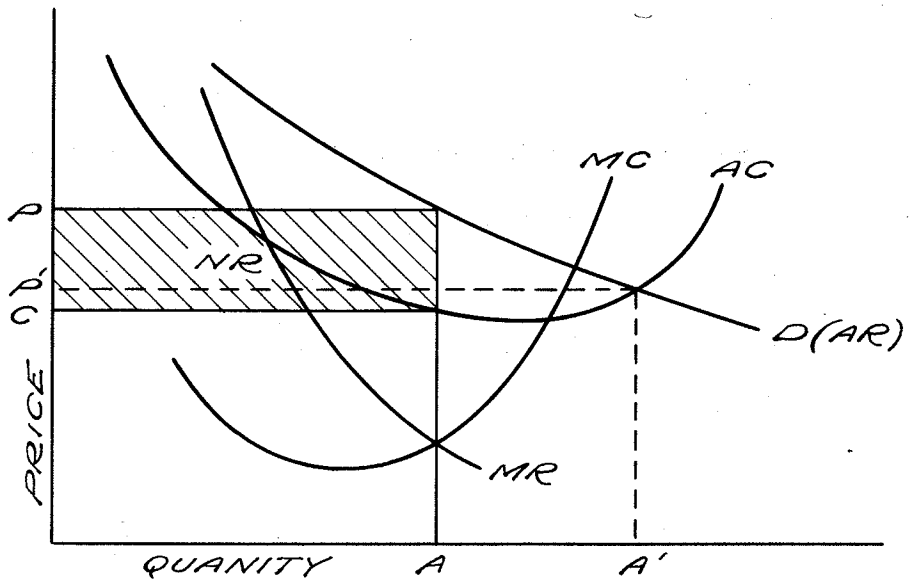

FIGURE 3.1

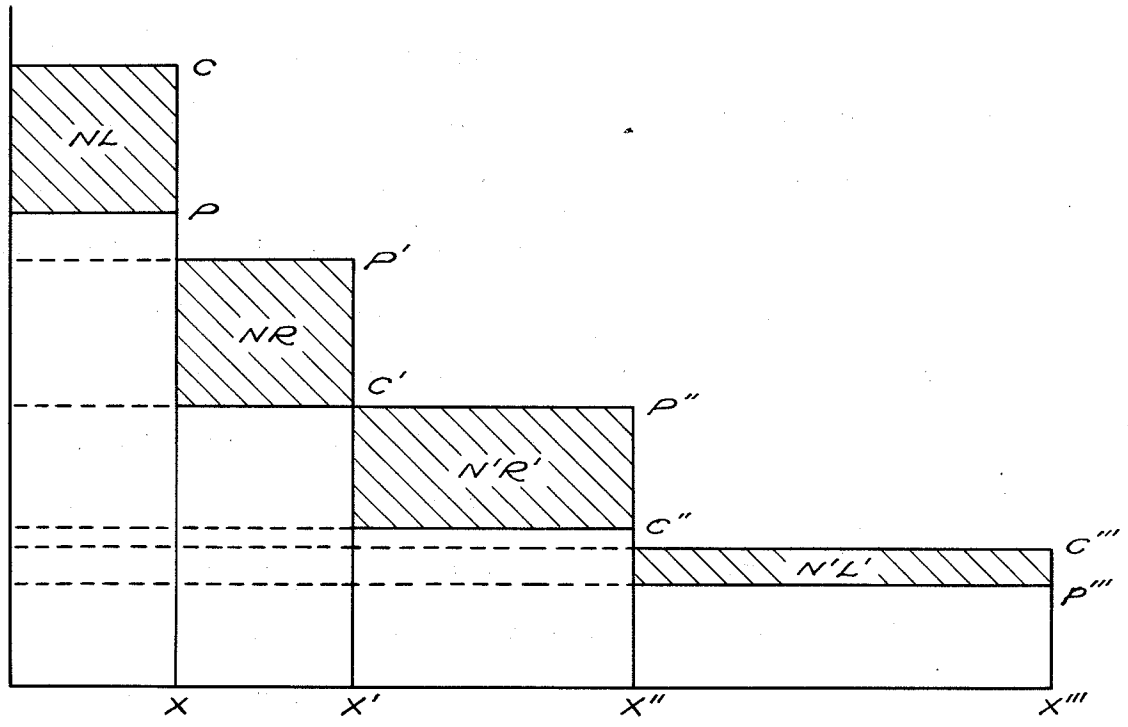

FIGURE 3.2

monopoly product is no exception to the rule that effective prices must reflect the relative intensity of demand. They should also, from a public relations standpoint, have the appearance of "reasonableness" in terms of actual or apparent costs of production.

The ability of the customer to develop his own source of supply (as in manufacturing or refining), to locate elsewhere for cheaper power, to utilize substitute services where possible in order to reduce power needs or secure other benefits, (such as gas, perhaps, for cooking and water heating), and even to purchase other goods and services in lieu of electric service and appliances, will place various other kinds of upper limits upon prices which may be charged the various classes of consumers. It will also restrain the monopolist from antagonizing the community and induce him to court the good will of the public, and perhaps be satisfied with less than a full monopoly return.

A more fundamental limitation on monopoly behaviour, however, social and political as well as economic, has to do with the special status and responsibilities accorded certain industries and occupations. The medieval concepts of status and common calling[20] drew attention to certain occupations which could be described as a public employment as distinguished from a private employment, and invoked certain duties and responsibilities as well as privileges in connection with these occupations or "callings." The doctrine of just price recognized the common advantage to buyer and seller which should attend an economic transaction and drew special attention

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[20] Ibid., pp. 196 et. seq.

to the economic coercion which might in fact exist in some circumstances. On this account, scholastics advocated a "just price" or one which was just sufficient to cover the expenses of production and provide for the economic support of the seller. These two elements came together in the subsequent (and much later) development of the English common law concept of "business affected with a common interest", which recognized the existence of a virtual monopoly in certain situations and involved the theory that the individual customer was in a position of dependence and required protection. From these various antecedents has come the modern concept of the public utility which, while imprecise, describes in some measure the special relationships attending certain economic functions which society may therefore deem necessary to regulate or control in some manner.

The development of this concept has been a matter of both social evolution and statutory change over a long period of time, and the industries and occupations placed in a special category have varied with the economic, political and cultural influences of different eras.[21] In recent years, the basis on which the decision has usually been made has been the imperfect operation of economic forces, having the effect of giving the industry concerned an excessive amount of power over those forced to do business with it.[22] Today, this is applied to those industries closely

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[21]A. S. Dewing, The Financial Policy of Corporations (4th ed.), (New York: Ronald Press Company, 1941), p. 224 et. seq.

[22]Thompson and Smith, op. cit., p. 56 et.seq.

related to urbanization, such as electric power, water and transit, which are essential to significant fractions of the population and for which competition has been ineffective and unsuitable as a means of proper control.

Industries coming under this heading may carry on business as private concerns operating under franchise and the supervision of a public regulatory body, or as a government agency or crown corporation under the authority of public legislation. The specific character and scope of regulation will be determined by the particular experience and background of the subject in the community concerned. Certain duties and responsibilities have become more or less universally required of this type of industry, however.[23] The first is to serve all who apply for service. Persons engaged in private business are at liberty to refuse to serve any or all, and private interest and the ability of the customer to secure other service are presumed adequate corrective of any failure to supply service and supply it adequately. But in the absence of these correctives, a special accountability requires the utility to serve all without discrimination. Secondly, the industry will be required to serve up to the limit of its capacity, and to be prepared for all foreseeable future increases in demand. It may not let customers wants go unsatisfied, and must be ready to give instantaneous service (properly understood) when required. Nor may it attach unreasonable conditions to contracts which may in effect negate its

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[23]Glaeser, op. cit., p. 218 et. seq.; Thompson and Smith, op. cit., p. 70 et. seq.

its duty to "serve all comers." At the same time it is incumbent upon the utility to provide safe as well as reasonable and adequate service. The potentially hazardous nature of many utility services (such as electrical power), the involvement with public property and thoroughfares, and the dependence of the public on proper care being taken make it necessary that the industry observe more than ordinary care in the provision of service. For this reason many regulations are developed to control voltage, servicing, maintenance and construction and performance is supervised by public authority.

In addition to the foregoing, the industry must charge no more than a reasonable price for its service.[24] What constitutes "reasonableness" will be differently determined in various circumstances and has been the subject of considerable political controversy on occasion. Specific price policy will be a matter of the particular objectives and yardsticks employed, and actual rates will at least to some degree be arbitrary. In the absence of any formal guidelines, the effort is usually made to approximate some sort of competitive norm which will cover all operating expenses plus a return on investment or some allocation for reserves.

The utility also has certain customary rights and privileges which in addition to an exclusive franchise may include the right to charge reasonable rates, the right to build on public thoroughfares, to render

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[24]This does not prohibit or limit customer classification for the purpose of rate-making, but such price classes and subsequent class rates must be manifestly reasonable.

service under reasonable rules and regulations, and to withdraw service under prescribed conditions after giving suitable notice.[25] Among these, special attention should be drawn to the matter of reasonable rates. Increasing demands for service require periodic new investment in expanded facilities, for which purpose large quantities of new funds must be secured from the capital market. Since the prime recommendation is a satisfactory financial record, sufficient earnings must be permitted to ensure solvency and attract new money. Rates should therefore be at least sufficient (assuming reasonable efficiency of management) to allow some fair return on investment. Should this not be intended, however, some guarantee of security of invested capital must be arranged, such as municipal or state underwriting of utility bonds and debentures, or some other incentives provided, otherwise some other means of capital raising must be secured.

It is one thing to define goals of regulation, however, and another to attain them, securing adequate supplies of electricity and providing them at suitable prices and standards of service satisfactory to all concerned. Nonetheless, it may be gathered from the foregoing that at least one basic standard is generally accepted: electric rates must be sufficient to assure total revenues at least equal to total costs. Returning to Figure 3.1, it is apparent that this will occur when demand (which also represents average revenue) is equal to average costs, at which point corresponding price and

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[25]"Abandonments" are a special chapter in the subject of utility regulation, and are often associated with technological change which may force a discontinuation of service. Apparently uneconomic services may be retained, however, for social or political reasons.

output are P' and A'. Here, the monopoly profit of NR has been reduced to the vanishing point.[26]

Again applying the analysis to the case of differential class pricing in Figure 3.2, a meeting of average revenue and average costs may be accomplished in several ways. Prices may be reduced pro rata on all units of the output X'' (for example) until AR on all output supplied just equals AC. But this represents an artificial lowering of the demand curve without benefit to other than the existing customers of the concern. Alternatively, supply may be extended in the direction of X''' without any change in the existing class-price schedule until the same result is achieved (TR = TC). This, however, means that the last class of customers will be supplied at a cost greater than their actual demand price (which indicates the actual value of the service to them), and that their power needs will actually be subsidized by the other classes of consumers. Again, these two methods may be combined, resulting in lower rates to existing customers and extension of service to new customers with a lower demand price. Here, a practical working rule or guideline in rate-making used by many utilities (to govern supply of service in marginal or fringe areas) is to extend service to customers prepared to pay direct costs of supply plus some set amount towards overhead or "demand" costs. Finally, similar results may be achieved through improvements in the quality of service, with or without changes in prices or output. This constitutes an increase in

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[26]This, however, is not the most economic point from a social standpoint, but that question will be taken up and discussed in Chapter VI.

costs (the cost schedule), and at the same time, may or may not have the effect of rendering the utility service more desirable--thereby influencing the demand prices of some classes of customers.

In summary, then, it would seem that the most appropriate objectives of public participation would be to secure through private or public investment under monopoly conditions an amount and quality of service consistent with the pattern of resource utilization accepted for the total economy.[27] Prices established for the power should be conducive to this end and otherwise consistent with the accepted pattern of prices in general. In most instances, the attempt will probably be to provide "about enough" service of a "satisfactory" kind at prices that are "about right." The fact that the utilization of resources under these controlled conditions almost assuredly will be more efficient (economically defined) than would obtain under unregulated development is today almost incidental to the manifest benefits of assured power supply in adequate amounts and stable, satisfactory prices. Natural monopolies such as power and water seem to result from the law of economics rather than the law of the land, and most questions of organization and regulation have long been decided. Modern concerns have more to do with development objectives and technical questions of new means of supply. Nonetheless, any analysis and appraisal of industry performance must also involve an evaluation of regulatory objectives and performance as well, at which point certain additional questions must be added: How has

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[27] B. W. Lewis, "Public Policy and the Growth of the Power Industry," Journal of Economic History (Supplement VII, 1947), pp. 48-49.

public policy influenced the growth of the industry? Has it been a neutral factor, or might it have contributed more to the performance of the industry? These various questions do not lend themselves to exact assessment, but useful answers are to be had even if they be value judgements on matters that cannot be precisely measured or categorically interpreted.

potential--the Winnipeg, the Nelson and the Churchill which, in combination with the Saskatchewan, collect the run-off from an area several times that of the Province of Manitoba. The most important and immediate power sites are those of the Winnipeg River in the southeast section of the Province, supplying most of the existing needs of Winnipeg and the southern market area. The largest and most numerous sites lie in the northern regions, however, above 56° of latitude. The Nelson River alone offers almost three times the present generating capacity of Manitoba, while the potential of the Churchill is about equal to total present consumption. In addition, the Winnipeg, Nelson and Saskatchewan Rivers have a common connection and storage facility in Lake Winnipeg, which, when additional northern sites are developed, will make it possible to regulate their flows and power output on an integrated basis.

While most of the natural power resources are located in the North, the principal markets for power are to be found in the southern plains area of the Province. Approximately 84% of the population and most of the industry are located southwest of a line running from The Pas to the southeast corner of Manitoba.[2] Traditionally an agricultural region, most of the arable land is devoted to grain (notably wheat) and livestock (mainly cattle), and much of the population is to be found in the rural areas and the many small towns serving the farm community. The industrial heart of the Province and the main population center is Winnipeg, which, together with the

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[2]Department of Industry and Commerce, ibid., p. 23.

surrounding suburban municipalities, forms a metropolitan community representing 53-55% of the total population, an estimated 63-65% of the work force, and about 80% of the population engaged in manufacturing.[3]

The location of Winnipeg at the crossroads of the Canadian transportation system, intersected by lines from St. Paul and Chicago, has enabled it to develop as the major transportation center of the West, taking the eastern flow of grain and livestock and the western movement and distribution of manufactured goods produced locally and in Eastern Canada and the United States.[4] This collection and distribution function has resulted in some heavy industry, serving the needs of transportation (railways, trucking and airlines); slaughtering and meatpacking (the largest industry by value of output);[5] and a variety of secondary industries (men's clothing, chemicals, food processing, farm machinery) serving local, prairie and (to some extent) national markets. Finance, insurance and related services have also developed, together with a wide range of service industries supporting basic economic functions as well as the domestic needs of a growing population.

This concentration of business and industry has had great attractive influence on the population and industry of the rest of the Province.

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[3]Derived from D.B.S., Census of Canada 1951.

[4]C.O.M.E.F., op. cit., Part III, Chapter 1.

[5]Department of Industry and Commerce, op. cit., p. 78.

This has been due in part to the basic role of the City in relation to the farm economy, and in part to the centripetal influence which already-large concentrations of population and industry have on surrounding populations. In any event, it has enabled Greater Winnipeg to expand and to attract population and industry at the expense of other areas, and no other center has been able to grow to a large size because of the dominance of this community.[6] Brandon, a small but well-equipped rural center serves the prosperous farming area of southwestern Manitoba; but with about 25,000 inhabitants is only one-twentieth the size of the metropolitan center; other communities have also this typical, limited regional influence. Consequently, Winnipeg and district, or an area within a radius of approximately 10 miles, represents the prime market for industrial and domestic power, and accounts for just over one-half of all power consumed in the Province, exclusive of certain primary industries in northerly areas.[7]

Historically, hydro power development has come about mainly in response to the express needs of the City of Winnipeg.[8] The first Winnipeg River plant at Pinawa, one of a series of subsequent developments within 80 to 90 miles of the City, was constructed by the Winnipeg Electric Company as early as 1906. Before that, power had been supplied by several thermal

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[6] Ibid., p. 26.

[7] Sources: Manitoba Hydro and City Hydro. Estimate calculated from collected statistics, and checked with staff member of Manitoba Hydro.

[8] Sources: City Hydro, Manitoba Hydro, Department of Industry and Commerce.

generating units located in Winnipeg, and development of the River was expected to provide an ample supply of cheap electricity for the City's needs. The initial operation of the Point du Bois plant in 1911 (brought to maximum output in 1926) marked the beginning of the municipally owned City of Winnipeg Hydro Electric System, supplying electricity at the promised low rate of 3 1/3¢ per Kwh. This was supplemented in 1924 by a Steam Standby Plant (Amy Street), operated in conjunction with the Central Steam Heating System, to supply essential services under emergency conditions. In 1923, the Winnipeg Electric Company began operation of the Great Falls plant, and in 1931 a subsidiary firm began supplying power from the Seven Sisters site, these stations being completed in 1928 and 1950 respectively. In 1931, City Hydro began operating the Slave Falls plant, which was not fully developed until 1948.

In 1928, the Winnipeg Electric Company contracted to generate up to 30,000 horsepower of the electrical needs of the Manitoba Power Commission --a provincial Crown Corporation established in 1919 which at that time supplied some of the rural areas under arrangement with the City Hydro. Power was not available until 1931, but under the agreement the government was given an option of taking over the Seven Sisters site upon termination of the contract.[9] In the meantime, most of the smaller communities throughout Manitoba were still providing their own needs through locally-owned steam or diesel plants on location.

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[9]R. T. Jeffrey, Report on the Development of Electric Power in the Province of Manitoba (Winnipeg: King's Printer, 1930), Vol. I, pp. 3-4.

The establishment of a government enterprise for the supply and distribution of electricity in rural Manitoba and the urban centers outside the metropolitan area of Winnipeg is related to the economic and political circumstances indicated earlier.[10] The resources of the Winnipeg River for some years provided power at low cost to the Winnipeg area where a very large proportion of the population is concentrated. For many years, however, the larger part of the population was located in the rural areas and smaller urban centers, which are separated from each other by relatively long distances. The demand for electricity in these localities is mainly that of domestic and farm requirements and the needs of small commercial establishments; until recent years the demand for industrial power has been very small. These geographic and economic factors presented obstacles to the extension of low cost electrical service on a province-wide basis, and in order to facilitate this extension and thereby raise living standards in rural sections of the Province the government established the Manitoba Power Commission to distribute power outside the Winnipeg area. While primarily an electrical utility, it also operated a steam heating plant and a gas utility for the community of Brandon.

Hydroelectric development was slowed down temporarily by the depression, and no new capacity was added from 1931 to 1937. In Winnipeg, commercial revenue dropped sharply, but because of the large domestic load

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[10] H. Carl Goldenberg, Report of the Government Commercial Enterprises Survey (1940), Chapter VI.

the City Hydro's financial position was not seriously affected.[11] The Winnipeg Electric Company, with a larger proportion of commercial and industrial accounts, was more seriously affected.[12] In the rural areas, extension of farm lines came to a virtual standstill, and by the end of the decade fewer than 1% of Manitoba farms could boast utility service. The geographic factor of distance between farms made the cost of extension almost prohibitive to the average farmer (an average of only 1 1/3 potential contracts per mile). The number of towns taking service increased from 65 to 140, however, and energy consumed showed a like increase from approximately 16.9 million Kwh during the same period.[13]

In 1942, cognizant of the weaknesses of the farm economy and the difficulty of extending utility service in rural areas, and fearing a post-war recurrence of the depression (such as followed the First World War), the government initiated a study of rural electrification problems and possibilities, under the chairmanship of Dr. E. P. Schmidt.[14] In brief, the Commission found that the dependence of the region on foreign markets, and the existence of climatic difficulties which hampered both grain farming and efforts to diversify agriculture, required the farming community to continually adapt to external influences. This adaptation could be

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[11]City Hydro, Annual Reports (1931-1937).

[12]This was generally admitted, and is confirmed by former industry executives, J. W. Sanger of the City Hydro, and E. V. Caton of the Winnipeg Electric Company.

[13]H. Carl Goldenberg, op. cit., p. 72.

[14]Manitoba Electrification Enquiry Commission Report entitled A Farm Electrification Program (Winnipeg, King's Printer 1942). (Also known as the "Schmidt Report").

facilitated, it was felt, by the intensive use of electricity on the farm. In various parts of Europe and the United States, this process of rural electrification was far advanced, and had resulted in greater diversity of farm products, improved quality and output, and greatly increased output per manhour spent on the farm. At the same time, it had made the rural home more pleasant, and reduced much of the drudgery of washing, milking, and water pumping associated with farm life.

However, such programs were possible (as a rule) only with the active participation and assistance of government. Privately-owned electrical utilities generally were unable, by the very nature of their organization, to undertake the task on a large scale. Nevertheless, if electrical power could be brought to the farms at a price they could afford to pay, farmers responded to such a degree that the systems frequently became self-supporting, or virtually so, so that in most cases the programs would not represent a permanent financial burden on the state. Furthermore, such projects were ideally suited to helping employment because of the stimulation given to a wide range of industries, such as metals, lumbering, capital goods, and a variety of supporting trades and services. Consequently, while electricity on the farm might never be rated as one of the prime factors in the agricultural economy of the Province, it nevertheless might provide a stimulus to the regional economy and provide important economic and social benefits in general.

The Commission therefore recommended that the Province undertake a comprehensive program of rural and farm electrification as a means of

improving the productivity and stability of Manitoba agriculture, and of bringing about a "better economic balance" between the urban and rural areas. The postwar farm electrification program under the aegis of the Manitoba Power Commission (an intensification of efforts begun in the 1930's) was the result. At the same time, the postwar overseas demand for agricultural products and the backlog of consumer demand which affected all industries took hold, and within a short time generating facilities on the Winnipeg River had to be expanded.

In 1948, concerned about long term requirements, the Provincial Government retained a consultant, Dr. T. H. Hogg, to analyse the electrical power situation in Manitoba.[15] The consultant reported the danger of a power shortage within a few years ("a matter of some urgency"), but found little planning by either of the hydro utilities towards meeting power requirements of the region once the Slave Falls and Seven Sisters plants were fully loaded. In view of this absence of planning, and the stated intention of these utilities not to go ahead with any further developments without direct Provincial assistance, he recommended that the Manitoba Government itself undertake to meet the impending power shortage . As a result, a new agency, the Manitoba Hydro-Electric Board, was established in 1949 and given the responsibility of ensuring adequate supplies of power for the Province.

Development of the Pine Falls site was initiated by the Province in 1949, brought into production in 1951, and completed the following year.

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[15]Dr. T. H. Hogg, op. cit.

This station was operated as an integral part of the Winnipeg Electric Company system, although owned by the Manitoba Hydro-Electric Board. The last remaining undeveloped site on the Winnipeg River at McArthur Falls was then harnessed, and brought to maximum capacity in 1955. To keep pace with the rapidly growing demand for power in the southern part of the Province, the Board then turned to thermal generation, fueled mainly with lignite coal from South-eastern Saskatchewan.

The key to the Commission proposals, however, was a basic reorganization of the power industry (under the aegis of central authority) and the integration of existing hydro development as a foundation of low-cost power upon which the development of the more expensive northern power might be grafted. The first step in such a plan would be the purchase by the Province of the assets of the City Hydro and the Winnipeg Electric Company, to be followed by consolidation (including, by implication, the Manitoba Power Commission)[16] with the new central body. This became the basis of government policy, and in the early 1950's preliminary discussions and negotiations took place between the Province and representatives of the Company, the Hydro and the City of Winnipeg. As a result of these negotiations, and the heated political controversy which ensued, the celebrated"Plan "C" which to the citizens of Winnipeg represented loss of City Hydro and low cost power was submitted to the ratepayers in plebiscite form, and was defeated.

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[16] Ibid., pp. 35-36. Dr. Hogg quotes from Manitoba Electrical Enquiry Commission Report where Dr. Schmidt alludes to duplication of personnel and administration which could be eliminated by amalgamation of all the utilities (including the Manitoba Power Commission) into one organization.

Forced under the circumstances to adopt another approach, the Provincial Government purchased the electrical assets of the Winnipeg General Electric Company (1953) and after turning generating facilities over to the Manitoba Hydro-Electric Board sold the distribution facilities to the Manitoba Power Commission and the City of Winnipeg Hydro Electric System (1955). At this juncture, the power situation in Manitoba was as follows:

1. The Manitoba Hydro-Electric Board was the principal generation agency in the Province;
2. The Manitoba Power Commission was responsible for the distribution of electricity throughout the Province, including the suburban areas of Greater Winnipeg, but excluding the City of Winnipeg;
3. The City Hydro retained its own distribution system, plus the distribution facilities of the Winnipeg Electric Company within the City limits. It also retained its two hydro plants on the Winnipeg River (Slave Falls and Point du Bois) and its Amy Street thermal plant within the City of Winnipeg;
4. The Manitoba Hydro-Electric Board generation network and that of the City Hydro were firmly interconnected, with generation capacity operated as a single system.[17]

As the next step in a developing program of consolidation, the

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[17]A victory achieved in fact which was more meaningful and significant (from the point of view of provincial power) than that of the citizens of Winnipeg in preventing the sale of City Hydro.

distribution agency, the Manitoba Power Commission, was amalgamated with the generation agency, the Manitoba Hydro-Electric Board, now generally known as Manitoba Hydro (April 1st, 1961), so that today the supply of electrical energy within the Province is primarily the responsibility of this combined organization. There is still, however, substantial capacity and output from the Winnipeg River hydro plants and the Amy Street thermal unit of the City of Winnipeg Hydro Electric System.

To keep pace with increasing power demand, the Board completed the Brandon thermal plant in 1958, with a capacity of 120,000 kilowatts. Initial power was available in 1957 and fed into the transmission system between Winnipeg and Brandon. A second thermal unit with a net capacity of 124,000 kilowatts has since been built at East Selkirk (1960), and completes present plans for thermal generating capacity in Southern Manitoba prior to the initial operation of the Grand Rapids hydro station in 1964.[18] In addition, however, the Board has been able to exchange power through its interconnection with the North-western region of the Ontario Hydro Electric Power Commission since 1957, and the Boundary Dam thermal plant of the Saskatchewan Power Corporation (near Estevan) since 1960. This has resulted in a net importation of power each year with the exception of 1957, when there was a net export.[19]

In the northern part of the Province, the Kelsey hydroelectric

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[18] M.H.E.B. Eleventh Annual Report, p. 7.

[19] M.H.E.B. Annual Reports (Seventh to Eleventh).

plant serving the nickel mining and smelting industry and the town of Thompson was brought into initial operation in 1960 with a capacity of 160,000 kilowatts. Approximately two-thirds of the capacity of the station is under contract to the International Nickel Company, having been developed initially for that purpose, while the remainder is available for sale to new resource developments that might be undertaken in the region.[20] The one major hydro development on the Saskatchewan River at Grand Rapids represents the main existing project intended to meet the mushrooming requirements expected in the southern market area during the next 10 to 15 years, and the next most economic hydro site to develop for this purpose in the Province. Now under construction, the installation will make an additional 330,000 kilowatts available to the Interconnected Southern Utilities[21] when completed in 1965.

Table 4.1 summarizes the present installed generating capacity in the Province of Manitoba. Total capacity is 1,030,000 kilowatts, of which approximately 72% is hydraulic capacity. With respect to the Interconnected Southern Utilities, useful capacity is 809,000 kilowatts (if thermal generation of the City of Winnipeg which is used only for training and standby purposes is ignored), of which a similar proportion is also

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[20] M.H.E.B. Eighth Annual Report, p. 5.

[21] Reference used in the Seventh Annual Report of the M.H.E.B., (p. 5) to "refer to the systems of the (Board, the Commission and the City Hydro), all of which are interconnected and operate continuously in parallel." Now includes Manitoba Hydro and City Hydro.

TABLE 4.1

Manitoba Generating Capacity (1962)[1]

Developed Capacity	Kilowatts	Cumulative Totals
Winnipeg River		
City Hydro	140,000	
Manitoba Hydro	420,000	560,000
Nelson River		
Kelsey	160,000	720,000
Thermal		
City Hydro	45,000	
Manitoba Hydro	244,000	1,009,000
Other[2]	21,000	21,000
Total Developed		1,030,000

Summary	Hydro	Thermal	Total
City Hydro	140,000	45,000	185,000
Manitoba Hydro	420,000		
	160,000	244,000	824,000
Total	720,000	289,000	1,009,000
Add Other			21,000
Total Developed			1,030,000

Note: [1]Capacity of generating stations presently in operation is defined as normal generating capability at time of system peak load, expressed in kilowatts. The figures are net of station service requirements.

[2]Includes developments on Laurie River and diesel capacity at various locations.

Source: Manitoba Hydro.

TABLE 4.2

Total Generation of Electric Power and Population, Manitoba, 1907 to 1961, Selected Years[1]

Year	Electric Power Produced (million kwh)	Population (000)	Electric Power Per Capita (kwh)
1907	34	383	89
1919	219	577	380
1925	508	632	805
1931	963	700	1,375
1940	1,369	728	1,879
1945	1,861	727	2,560
1950	2,463	768	3,207
1954	3,021	828	3,649
1961	3,944	922	4,277

Note: [1]Do not represent equal periods.

Source: Government of Manitoba Prospects for Development in Manitoba (1955)

Manitoba Hydro-Electric Board Eleventh Annual Report

Dominion Bureau of Statistics Census of the Prairie Provinces 1946, Census of Canada 1951, Census of Canada 1961.

TABLE 4.3

GENERATING CAPACITY 1906-1962

Southern Manitoba

	Hydraulic	Thermal	Total
	(Kilowatts of Capacity)		
1906	8,000	3,750	11,750
1907	14,000	3,750	17,750
1908/10	14,000	4,500	18,500
1911	29,000	16,500	45,500
1912	37,000	16,500	53,500
1913	37,000	16,500	53,500
1914	47,000	16,500	63,500
1915/16	47,000	16,500	63,500
1917	52,000	12,000	64,000
1918/20	52,000	12,000	64,000
1921	67,000	12,000	79,000
1922	67,000	12,000	79,000
1923	103,000	12,000	115,000
1924	118,000	22,000	140,000
1925	118,000	22,000	140,000
1926	158,000	22,000	180,000
1927	180,000	22,000	210,000
1928	224,000	22,000	246,000
1929/30	224,000	22,000	246,000
1931	286,000	22,000	308,000
1932/36	286,000	22,000	308,000
1937	294,500	22,000	316,500
1938	303,000	22,000	325,000
1939/44	303,000	22,000	325,000
1945	303,500	10,000	313,500
1946	321,000	10,000	331,000
1947	322,000	10,000	332,000
1948	365,000	10,000	375,000
1949	394,000	10,000	404,000
1950	416,000	10,000	426,000
1951	411,000	10,000	421,000
1952	504,000	22,500	526,500
1953	504,000	22,500	526,500
1954	504,000	45,000	549,000
1955	530,000	45,000	575,000
1956	560,000	45,000	605,000
1957	560,000	75,000	635,000
1958	560,000	165,000	725,000
1959	560,000	165,000	725,000
1960	560,000	227,000	787,000
1961	560,000	289,000	849,000
1962	560,000	289,000	849,000

Source: Manitoba Hydro.

The power industry so established is governed by a variety of institutional, legislative and public directives and influences. City Hydro, for example, operates as a department of the City of Winnipeg under the original authority of By-Law No. 4138 which in 1906 authorized expenditure of $3,250,000 for a municipally-owned hydroelectric plant at Pinawa. A brochure prepared at that time and various statements and pronouncements over the years by City Fathers have established the policy and objectives of the City Hydro as providing adequate electricity for the citizens on a self-sustaining basis at the lowest cost to the consumer. The organization itself was created on the strength of By-Law No. 6827 in June, 1911, which provided for a department "to be known as the City Light and Power Department", a general manager to oversee operations, and powers enabling the Department to requisition services from the other City departments. Subsequent by-laws authorized additional specific expenditures from time to time, but no further authorization or directive exists indicating objectives or specifying formal purposes and intent.[24] Today, custom and the expectations of the public have the force of law in an organization which is traditional, very conservative, and of unquestioned integrity. As to channels of authority and communication, the General Manager reports to the Council through the chairman of the Utilities and Personnel Committee.

The Manitoba Hydro, on the other hand, operates more within bounds of certain specific guiding legislation, mainly The Manitoba Hydro Act of

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[24]Corroborated by the City Clerk.

March 30th, 1961. The purpose of the Act is "to provide for the continuance of a supply of power adequate for the needs of the province" and to promote efficiency and economy in its supply and use (Section 3). To this end, the Board is given broad powers to develop, distribute and control supply, "upon such terms and conditions as the board deems proper", and to "do all things proper or necessary for the due exercise of (these) powers" (Section 15). Most specifically, the Board is given "sole and exclusive jurisdiction" with regard to all matters to which the Act applies (Section 23).

As to limiting conditions or legislation, the Board is subject to The Water Power Act[25] with respect to determination and maintenance of water levels in certain areas (for example) or, more particularly, securing of licenses and leases for power sites, payment for water power rentals, and so on. In this area, the Board deals with the Department of Agriculture, although the chairman reports to the Minister of Public Utilities. The Board is also subject to The Water Rights Act which indicates rights and

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[25]When the Dominion Government turned over control of natural resources to the Province in 1930, the Province adopted, in the absence of any specific alternative, the federal legislation as a pattern for Provincial control. This has remained in effect, including the provisions respecting leasing of power sites and payment of water power rentals to the Province, although much of this is purely nominal today. It remains in effect partly as a result of inertia, and partly because of differences in viewpoint among (for example) the Department of Agriculture, the Department of Mines and Natural Resources, and the Manitoba Hydro, as to the most suitable objectives of water power management and the proper agency to supervise the task. Today, administration of the Act is under the Director of Water Control and Conservation of the Department of Agriculture and Conservation.

responsibilities with respect to public waterways and adjacent properties and provides for adjudication of disputes. The Public Utilities Act does not apply to the operations of the corporation, however, with the exception of the issue of regulations respecting construction standards (Section 4) and the right of appeal to the Public Utilities Board in connection with electricity rates set by the corporation (Section 40). In addition, the corporation may apply to the Public Utilities Board for a determination of the price that the organization should charge for electricity. Finally, Manitoba Hydro is directed to market power at prices "such as to return to it the full cost (italics mine) to the corporation of supplying the power" (Section 40) including operating and administrative expense, interest and debt service charges, and a sum that in the opinion of the Board should be provided for purposes of amortization, rate stabilization, or such other special purposes (Section 41).

In addition to amalgamating the Manitoba Power Commission (and permitting the amalgamation of the Winnipeg Electric Company as a legal entity) with the Manitoba Hydro-Electric Board, the Act also serves to consolidate previous legislation concerning the component organizations. The purposes of the Act and the special powers granted the corporation to develop and supervise supply derive from the Manitoba Hydro-Electric Development Act (and subsequent amendments) creating the Board in 1949. The merging of such responsibilities with those of distribution (in particular) incorporates the provisions of the Manitoba Power Commission

Act, 1931, whereby the Commission was authorized[26] "to develop and use any water power for the purposes of this Act (and) construct, maintain and operate works for the production of power by the use of coal, oil or any other means whatsoever" (Section 17).[27] It is worth noting, however, that this Act (contrary to the present legislation) specified that electricity rates would be fixed by and at all times subject to the approval and control of the Commission (Section 33). Provisions respecting The Water Power Act and The Water Rights Act are also adapted from previous legislation.

Apart from the very general provisions of the present Act permitting integrated control and management of the industry, practical integration of the Winnipeg River and the Southern Power System[28] have in fact been secured by means of a working arrangement between the City Hydro and the Manitoba Hydro. This is the Power Sales Agreement, first written in March 1955 and amended from time to time, whereby the necessary mechanics were established to operate a fully interconnected and parallel system. A Scheduling Committee, the key instrument which is responsible to the combined general managers, develops station load procedures and

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[26]More specifically, the "Lieutenant-Governor-in-Council, upon recommendation of the Commission may (italics mine) authorize the Commission . . .".

[27]This provision was repealed, however, in an amendment to the Act in 1955.

[28]A term sometimes used synonymously with "Interconnected Southern Utilities."

priorities on the River, may schedule output, and determines sharing of costs of operating with regard to power used jointly. This excludes so-called "dedicated" power committed in advance to specific purposes, and applies only to contribution to meeting of system peaks and total energy requirements.

This operating arrangement serves the market area as far north as Mafeking. Further north, power is supplied under a variety of arrangements. Thompson, which receives hydro power from Kelsey, together with The Pas and Grand Rapids, which are supplied from diesel plants on location, are all served by Manitoba Hydro. Churchill is served jointly by Manitoba Hydro, the Department of National Defence and the Harbour Board, while Cranberry Portage is supplied by the Department of National Defence (employing facilities of Manitoba Hydro), power in both cases coming from diesel generators. The Lynn Lake nickel-copper mine and townsite is supplied from the hydro station on the Laurie River (about 75,000 kilowatts) owned by Sherrit Gordon Mines Limited. These various services represent separate and distinct or "isolated" systems (as termed by the Manitoba Hydro) set up independently over each other. Another separate system serving the town of Flin Flon and the Snow Lake area is supplied from the generating station at Island Falls on the Churchill River in Saskatchewan owned by the Hudson Bay Mining and Smelting Company. As this power is not produced in the Province and is provided under private arrangement, it does not appear in any public records of supply or consumption for Manitoba.

CHAPTER V

THE DEVELOPMENT OF OBJECTIVES AND MANAGEMENT POLICY

The various elements of the electrical power industry in Manitoba were fired and annealed in a strange crucible of political controversy, mixed government objectives, and historic rivalries. Basic objectives were initially those of nineteenth century laissez faire philosophy of the private interests which entered the field, redirected if not entirely modified by a growing political reaction of the day, and subsequently shaped and ordered by economic rivalry and public controversy in the principal market of the Province. Trends common to the industry elsewhere were deflected into unaccustomed paths, and growth has been force-fed in the Winnipeg area by competition, and in the rural areas by a combination of economic policy and political practicality. In the process, a developed and integrated power complex has emerged, and while this has not come about easily, and has been attended by irregular and uneven rates of growth between urban and rural areas, the physical and technical achievement is of a high order and one which almost unnoticed has accompanied the evolution of public policy in the field of power development.

The path of development, particularly with regard to productive capacity, was associated with events and issues at the turn of the century and the coming into being of two competing electric utilities within the City of Winnipeg, one privately- and one publicly-owned. The prolonged controversy associated with the establishment of the system operated by the City and the continuing competitive status of the two

organizations over a period of four decades provides a unique illustration of the working out of the question of public versus private development and of the effects of competition in the field of electric power. Much of the subsequent growth and character of the industry was related to this basic condition.

Interest in electricity in Winnipeg began about 1880 with the establishment of a company to distribute gas and power,[1] and for the first thirty years efforts to develop utilities were carried out under the aegis of private industry. In 1892, new interests entered the scene; the Winnipeg Electric Railway Company was promoted by McKenzie and Mann of railway fame, and within two years (following a pattern in Toronto and other centers) this Company began merging existing companies into a virtual monopoly for the supply of gas, electricity and transit in Winnipeg. Operating under a collection of franchises and without reference to any supervisory public body, the Company carried on business almost without regard to public opinion.[2] In time, the suspicion became prevalent that rates were considerably higher than necessary, and with the failure of official negotiations with the Company to secure some modification of rates some civic leaders and an increasing number of private citizens began pressing for a City owned and operated electric utility.

Aware of the growing importance of electric power for street

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[1]Manitoba Electric and Gas Light Company.

[2]This is confirmed by a former senior executive of the Company, E. V. Caton.

lighting and other purposes, and dismayed by the continuing high cost of power and the apparent unwillingness of the Company to improve the situation, the City Council sought to have the Municipal Act amended in the Legislative Assembly (1899) in order that (if necessary) the City might build its own power facilities and sell electricity to the citizens of Winnipeg. This was refused on successive occasions before being approved in 1906, and precipitated an open clash between the opposing interests which boiled over into municipal politics and dominated the elections of 1905. In the interim, Company interests had begun the first hydro plant at Pinawa, and just before the submission of the referendum for Point du Bois announced a rate reduction from 20¢ to 10¢ per Kwh. This did not impress most ratepayers courted by a number of City Fathers with the promise of power for 3 1/3¢ per Kwh from Point du Bois, and, coming at this late date, failed to have any effect on the outcome.[3] In the prospectus to the citizens, public power advocates had stressed the importance of supplying electricity to users at cost, and it was expected that competition under these circumstances would bring about a general reduction in rates. Almost as an afterthought, it was suggested that low rates would also encourage the establishment of manufacturing industries in the Winnipeg area.

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[3]In the opinion of J. W. Sanger, retired General Manager and former Chief Engineer of City Hydro, this was the crucial error of judgement on the part of the Company. A modest rate reduction (eg. 1¢ per Kwh) --a gesture in this direction during earlier period--and City Hydro would never have come into being. As it was, the Hydro was brought about against tremendous economic and political odds.

It is worthy of note that to achieve the greatest economic and social benefits competition (albeit sponsored by public authority), not formal regulation, was made the watchword, and under the economic spur thus established[4] the industry was left to be essentially self-regulating. This rule of competition was the first principle adopted, and became the mainspring of a large part of the development of the industry. It was immediately apparent, however, that this was not a complete solution and opened the way to chaos.

The obvious anarchy of the situation became apparent when at the outset the City entered suit against Winnipeg Electric to prohibit the Company from continuing business within the City, and the Company countered by applying for an injunction restraining the Hydro from erecting poles in Winnipeg, duplicating the private network.[5] The Privy Council upheld the right of the Company to continue operating in the City, and the City managed to secure an Order-in-Council bringing both systems under the Public Utilities Act.[6] Subsequently the City applied to the newly-formed Public Utility Commission for an order directing the Company to join with the City in instituting a procedure for the joint use of common poles. After some negotiations such an order was issued and led to the joint pole agreement incorporated in City By-Law No. 7406 (July 23, 1912) "for the

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[4] i.e., competition, plus public supply at or near cost.

[5] These were the most important moves of each system in a general campaign of harassment of the competition.

[6] Order-in-Council No. 18944, May 28, 1912. This was in response to the formal request from the City of Winnipeg incorporated in By-Law No. 7288, May 20, 1912.

accomodation of the present or future wires of the respective parties . . . for electric light, heat and power purposes in the City of Winnipeg." Thus, a second principle was introduced, that of cooperation in the use of certain distributive facilities where it was clear that obvious benefits would accrue not only to both systems but also to the public at large.[7]

In the years following, this formal cooperation broadened into a degree of coordination and full, active cooperation at the operating levels. This included intersupply of power for special loads, interchange of equipment for emergency purposes, and assistance of work crews on the rival system, and developed to a point where management of both organizations could say there was "complete harmony" between the two systems at the operating level, regardless of what might exist at the marketing level.[8] This cooperation, for political reasons, was to a considerable extent virtually sub rosa for many years, however, and not fully acknowledged officially by the Board or by Council, although it could not have taken place without (at least) their tacit consent.

The initial phase of unrestrained competition was further tempered by the almost predictable emergence of an area of understanding between the two organizations with respect to marketing. After a period of years of

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[7]This was the beginning of the series of developments leading to the unique situation of having two utilities supplying electricity rather than one agency with a franchise for the entire municipality.

[8]This reference is made by both J. W. Sanger and E. V. Caton, and is confirmed by present management at City Hydro.

virtual rate war--price-cutting in the semi-secret negotiation of special contracts of which the general public was not fully aware--a "gentlemen's agreement" was reached (about 1925) whereby competition was limited to soliciting new customers only and old customers were allowed to change accounts only at the expiry of the contract period. This arrangement was not always rigidly adhered to and did not apply to the very large commercial and industrial power consumers, but it helped to avoid needless duplication and waste of equipment and installation expenses for industrial load connection (lines, regulators, and so on) which in the case of capricious change-over involved direct financial loss to one concern or the other. Thus was avoided what might be described as "destructive" competition and within a few years one observer was moved to suggest that a condition of "stabilized competition" prevailed.[9]

For practical purposes, however, a vigorous competition reigned supreme as the fundamental influence in the development of the industry. Apart from the early years when the working "rules of the game" were being fashioned and the strong personality of the Commissioner (1911-1912) Judge H. A. Robson intervened, the business of the industry was carried on virtually without reference to third-party supervision. When the Municipal and Public Utility Board was established in 1926 in place of the defunct Public

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[9]Royal Commission on the Municipal Finances and Administration of the City of Winnipeg Report (1939), p. 195. (Also known as the "Goldenberg Report").

Utility Commission,[10] broad regulatory powers were provided, but except for fixing the allowance for depreciation regulation has been largely nominal and for many years few matters if any were brought before the Board.[11] In sum, supervisory powers were established to prevent abuses and deal with obvious inequities on an ad hoc basis, but no definitive purposes were laid down or intended, except as might emerge from succeeding precedents.

The development of objectives and management policy was further influenced by other important factors. In the campaign for City-owned power, engineering cost studies indicating that electricity could be produced for 3 1/3¢ per Kwh became the basis of policy and 3 1/3¢ power caught the imagination of the ratepayers and public at large, resulting in the passing of the By-Law. It was soon discovered that this did not take into account costs of distribution, and when the first power was delivered in 1911 at the consulting engineers' recommended rate of 7 1/2¢ per Kwh, a storm of public protest caused City Council to reverse the decision and arbitrarily guarantee the promised rate.[12]

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[10]The Municipal and Public Utility Board Act Cap. 33 (16 George V) revoking Public Utility Act Cap. 166 Rev. Stat. 1913.

[11]Goldenberg Report, p. 195. This is confirmed to date by the present chairman of the Board, R. L. McDonald.

[12]See E. Russenholt, The Power of a City: A Story of City Hydro (Winnipeg: City Hydro, c. 1925), p. 330 et. seq. The schedule recommended in committee and approved by Council was as follows: domestic 3 1/3¢ less 10.0% discount, general lighting 7 1/2¢ less 1.7%; power 5¢ less 1.1%.

The establishment of the domestic rate at 3 1/3¢, politically motivated and without any technical or economic basis, had two very important results for the development of the industry. Once the saturation point had been reached for standard lighting (about 1919), it was necessary to develop sales for other uses and thereby increase total volume if the existing low rate for domestic lighting were to be maintained.[13] The City therefore entered the field of electric cooking and water heating and low promotional rates came into being--1¢ per Kwh for electric cooking combined with $3.00 per month flat rate water heating (with peak load cut-off)--with which City Hydro determined to drive out the more expensive manufactured gas supplied by the Winnipeg Electric Company. Again, these rates were not determined by any technical or accounting considerations, but (on this occasion) by purely marketing considerations: what (it was felt) the consumer was prepared to pay. For example, it was known what would have to be recovered to distribute the additional electricity for the purpose and what minimum charge would have to be adopted in order to secure custom away from the Company. Establishing sacrifice rates for cooking and securing a guaranteed revenue from water heating and equipment rentals, the Hydro was able to make serious inroads on Company preserves and in the process take away customers for standard lighting contracts as well.

In order to attract additional customers and assist in building load as quickly as possible, City Hydro also entered the electrical

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[13]Here was the "scissors" pressure of low revenue in relation to investment, and the inducements offered by the condition of decreasing costs, supra, Chapter III.

appliance business. This began in 1913 with a modest effort to sell electric hand irons, and subsequently expanded into a major promotional campaign in which the system undertook to provide electric ranges and water heaters (in competition with the Winnipeg Electric which quickly joined the fray) virtually at cost and under very favourable installment terms. The success of this program led to the creation of a separate department for the purpose (1920) and with the advent of the showrooms merchandise selection was enlarged to include a wide range of electrical equipment and appliances--vacuum cleaners, washing machines and ranges being the most popular items.[14]

There was considerable criticism of this phase of Hydro operations as being directly competitive with the mercantile community. But no small merchant was in a position to attempt the large-scale promotion undertaken by City Hydro, and indeed private retailers singularly "failed to accomplish anything after five years with a one cent cooking rate."[15] In fact, small business unquestionably benefited from the growing market for appliances and electrical goods, new wiring contracts, and so on. And as private merchants began to share in sales and to carry stock, the Hydro was one of the few outlets carrying only high quality merchandise and never afforded serious price competition to large retail houses. Finally,

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[14] Goldenberg Report, p. 251.

[15] Ibid., (quoted from an address given by J. W. Sanger). This general position is supported and confirmed by E. V. Caton, who was on the staff of the City Hydro before joining the Winnipeg Electric Company in 1922.

it must be recalled that the main object was to promote load-building, and it has been general practice among both privately- and publicly-owned electrical utilities in Great Britain and North America to sell appliances for this purpose.[16] In this objective, the promotional efforts of the City Hydro were successful.[17]

The ability of the Hydro to maintain the initial low domestic rate and later to extend service at even lower rates forced the Winnipeg Electric Company to meet the low rates and for the same reasons attempt to secure greater total volume and an increasing share of available custom. This gave rise to a rapidly growing rate of consumption, as shown in Table 5.1, and literally force-fed development of residential demand. Having similar force and effect was the intense competition for commercial and industrial power contracts needed for load-building purposes and (it was hoped) stable revenue. In this setting, the standard Schedule "C" rates for commercial power were often only a starting point for subsequent bargaining, and between 1920 and about 1932 up to 50% of all commercial power contracts were arrived at in this fashion.[18] The very large customers were sought after as much for prestige purposes as for addition to loading, and

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[16] Ibid., p. 269.

[17] H. Carl Goldenberg concluded that "City Hydro . . . benefited materially as a result of its effort to promote the use of electrical appliances, which, in turn . . . increased its load." (Goldenberg Report, p. 552). The question of appliance merchandising by the publicly-owned utilities is discussed further in Chapter VI.

[18] This general account and estimate is concurred in by both Mr. Sanger and Mr. Caton.

in the process of trying to keep the business away from one's competitor final contractual arrangements were often (in the words of a retired power executive) "purely a horsetrade."[19]

Another important factor during these early years was undoubtedly the character and personal objectives of the General Manager of City Hydro appointed in 1912, J. G. Glassco.[20] An electrical engineer, formerly project engineer for the City under the consulting firm of Smith, Kerry & Chace and Chief Engineer for the Hydro itself, the General Manager had been a part of the development almost from the beginning and caught up in the enthusiasm from his special vantage point in relation to the system. He had a personal desire to "electrify the City," and was also anxious to develop the domestic market--a new and uncharted sea which was particularly open to the City utility. When the Hydro first began to distribute power, it was met by an enormous wave of good will from the public at large and a large number of customers changed over to City Hydro as fast as the operating crews could extend service. In this setting, the business and political acumen of J. G. Glassco was an important influence which, together with a high grade management team, developed the system into an institution highly respected in the City of Winnipeg[21] and subsequently able to command 80% of domestic sales and approximately 65% of the total market.[22]

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[19]E. V. Caton.

[20]Recounted by Mr. Sanger, Chief Engineer during this period.

[21]This view is also supported by Mr. Caton.

[22]City Hydro. This estimate is supported by Mr. Caton.

TABLE 5.1

Firm Generation and Firm Peaks:

Manitoba 1907 to 1930

Selected Years

Calendar Year	Generation in Kilowatt Hours			Peak in Kilowatts		
	W.E.Co.[1]	City Hydro[2]	Total at Plants[3]	W.E.Co.	City Hydro[4]	Total at Plants[5]
1907	33,964,000		33,964,000	12,600		12,600
1910	72,666,500		72,666,500	21,050		21,050
1911	87,975,642		87,975,642	22,300		22,300
1912	93,974,378	28,645,720	122,620,098	20,700	10,500	31,200
1915	112,094,300	72,375,400	184,469,700	25,500	19,500	45,000
1920	144,542,500	110,616,029	255,158,529	33,900	29,600	63,500
1921	139,847,900	124,146,660	264,118,516	32,200	32,600	64,800
1925	252,882,600	218,672,626	471,968,197	61,000	51,900	112,900
1930	487,915,578	304,675,784	793,530,360	99,000	76,700	175,700

[1]Total plant generation less boiler load and temporary firm.

[2]Total plant generation less local services for the years 1914/1923; total plant generation less local services, and boiler load adjusted to plants at 8% for 1924/1930.

[3]Includes M.P.C. firm power generation between 1921 and 1930.

[4]Adjusted to the plants by 8% for 1921.

[5]The two peaks are not coincident.

Source: Manitoba Hydro.

The distribution of power in rural Manitoba was something no existing utility was willing or able to attempt, particularly in the early years of the industry. The inherent risks of electrical utility operation even under favourable market conditions would become highly magnified under the conditions which would be encountered[23]--greatly increased costs of distribution per customer, larger capital outlays in advance of the time when adequate loads might be forthcoming, and the problems of an embryo market economically more backward than the main urban community. At the same time, the obvious economic and social advantages accruing from the success of the industry in the Winnipeg area prompted rural leaders to press for some such development whereby the rest of the population in the farming areas could share in the benefits derived from the power resources of the Winnipeg River.

In these circumstances, the Electrical Power Transmission Act was passed (1919), which made it possible for any municipality desiring electricity for its own use or that of any of its inhabitants to apply to the Minister of Public Works, and after fulfilling the necessary legal requirements to enter into a contract for such supply. The Minister, through a Power Commissioner, was empowered to make provision for generation, or purchase, and transmission of the supply of power to the municipality which would be responsible for disposition or distribution. The price paid by the municipality was to be sufficient to cover fixed charges,

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[23]Supra, Chapter IV.

maintenance and replacement charges. As to the necessary capital funds, the Lieutenant-Governor-in-Council could authorize expenditure out of the consolidated revenue of the Province and also the borrowing of up to $350,000 for the purposes of the Act. In this respect, the arrangements were parallel to those of the City Hydro, and in fact all advances of capital monies to the system since its creation have been made by the Province.[24]

The system which was to emerge from these beginnings became a developing experiment in direct government intervention and participation in the economics of the industry. It was intended that the supply of power be self-supporting (in the manner defined above), but bad weather and depressed economic and financial conditions during the first few years, in addition to difficulties incidental to the launching of a new enterprise of this kind, conspired to hamper development of the system and growth of revenues.

> "Unforeseen difficulties increased construction costs beyond what was anticipated and out of proportion to the value of the capital assets of the utility. Operating results were adversely affected as there was a rateable increase in such charges as interest and depreciation. The situation was (further) aggravated by cyclone damage to the transmission lines in 1922 amounting to $150,000."[25]

Thus, while it was necessary that further extensions of the system be made (such as to the City of Brandon) in order to build up load which would

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[24]Manitoba Hydro-Electric Board Annual Reports.

[25]H. Carl Goldenberg, op. cit., pp. 254-55. (Appendix D).

produce adequate revenue, it was apparent that the system was over-burdened by excessive capitalization and bearing fixed charges which normally would be carried by the developed utility. Stated another way, pressure of the high level of investment in relation to available revenue aggravated the classic financial problem associated with the early stages of load-building, which did not develop as quickly as may have been expected.[26] In sum, the magnitude of the task and the nature of the risks had not been fully understood by the authorities, and it was necessary that much greater resources be employed in the construction and early development stages.

As a result, the government was forced to provide direct assistance and make provision for subsequent support of the system. This was accomplished in two ways. By way of the Electrical Power Commission Amendment Act of 1925, the Province relieved the system of a portion of its capital liability and assumed its accumulated deficit, thus reducing capitalization and fixed charges. In addition, the government also adopted a new policy to assist the Commission in extending its lines. By Order-in-Council (June 18, 1929), the original Electrical Power Transmission Act was amended to provide that all monies received by the Province as rentals for water power (i.e. from the City Hydro and the Winnipeg Electric Company) be credited to an Electrical Power Transmission Extension Account, and that out of these monies there be paid the interest and sinking fund charges on an amount not exceeding 50% of the capital cost of generating stations, substations and transmission lines (Chapter 19). This subsidy was to apply

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[26] Supra, Chapter III.

to all existing lines and to the construction of new lines, but not to distribution systems. Accordingly, each municipality was subsequently credited with its share of the payments received by the system from water power rentals. Thus, willy-nilly, two new principles were introduced into the industry: the special support of one part of the industry by a tax on another, and the employment of the industry in a specific policy to develop the rural areas under subsidy from the Greater Winnipeg population.

The next phase began with the creation of a corporate body and a revision of the basis of operations. The repeal of the Electrical Power Transmission Act and the passing of the Manitoba Power Commission Act (1931) provided for a permanent organization with a full-time chairman and general manager and broad powers to develop and supply electricity for the rural areas.[27] The Commission began by revising the contracts between the system and the municipalities, supplying and charging the individual communities only for such power required for street lighting, water pumping, or other municipal services, and undertaking to deal directly with all private individual customers.[28] Next, uniform rates were established throughout the system--the same Kwh charges were made to all municipalities, regardless of location or distance from the original source of supply,[29] and special

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[27] Supra, Chapter IV.

[28] This general account and what follows is taken from H. Carl Goldenberg, op. cit., p. 69 et.seq.

[29] i.e. with only minor adjustments. See M.P.C. Twelfth Annual Report (1931), p. 8.

promotional rates were provided for all retail customers.[30] The latter were introduced the previous year to the farms and now extended to the towns, and consisted of a flat rate for the first block of energy and lower rates for successive units consumed plus a service charge. This was intended to stimulate consumption by decreasing the average cost per unit as the total consumption increases. Finally, the Commission undertook to promote electric ranges and water heaters by providing 50% of the cost of wiring to customers installing new units.[31]

These activities represented what was now a concentrated program to develop the rural market. It is difficult to suggest, however, that efforts in this direction were simply a consequence of financial stringency (load-building was in fact urgent and critical with the pressure brought to bear on the system by the Depression), or a reflection of political purposes at the administrative level. There was also the interest and dedication of senior officials such as Herbert Cottingham and J. W. Sanger (also of the City Hydro) and rising management personnel such as W. D. Fallis who, over the next decade, were faced with exceptionally knotty problems,[32] but foresaw major possibilities as well as challenges in the electrification of the Province.[33] Unquestionably, personalities of the time had an important

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[30] M.P.C. Thirteenth Annual Report (1932), p. 5.

[31] Ibid.

[32] Supra, Chapter IV.

[33] This conclusion is arrived at from a survey of available records such as annual reports and newspaper accounts of the period and talks with senior executives and members of the Provincial Cabinet at the time.

bearing in the unremitting growth of load even during the worst years of the Depression and in the eventual vindication of the organization.

The final or mature phase of the rural organization--which became primarily a marketing industry--emerged with the intensive campaign of rural extension and electrification of the postwar period. Elements of this program in embryo form were being developed by the Commission before the War, and with the work of Dr. Schmidt broad new long-term objectives became clear relating rural power distribution and uses to the important variables of agricultural output, employment, and general economic growth.[34] With favourable economic conditions in which to bring this program to fruition, educational and promotional efforts were more than successful as a complete network of rural distribution became a reality (by about 1955), a large number of agricultural applications became widespread, and the scale of rural domestic use began to approach that of the metropolitan area.[35] Rural electrification was now an established fact. The purse and purposes of the Commission were no longer called into question. Most of the old battles had been won.

Several additional observations should also be made with respect to the rural program. While the Act of 1931 gave the system broad powers to develop supply, the Commission was able to purchase under contract with the Winnipeg Electric Company all its requirements for some years at

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[34] Supra, Chapter IV.

[35] Manitoba Hydro.

exceptionally low rates (1/2¢ per kwh in 1931), and it was never necessary or desirable to extend operations into this area, apart from a few standby plants and other collateral units. This points up the fact that rural marketing was very heavily subsidized. In addition to borrowing on the credit of the Province and meeting a large part of the capital charges out of public funds, the system was receiving power at a fraction of the delivered cost at the Scotland Street transmission station. Furthermore, this power was being sold at rates well below the already-low rates prevailing in the City of Winnipeg (1933), although management was wont to say (innocently enough) that these were "expected to be sufficient ultimately (italics mine) to meet all charges (sic)".[36] Moreover, the Commission was prepared to refund to customers (as a part of public assistance during the Depression) year-ending operating surpluses (euphemistically called "profits") "instead of withholding and accumulating (them) for the purpose of a general rate reduction."[37] (italics mine) Nonetheless, the economist and power developer having the courage of his convictions would be prepared to claim that in the rural program "results must always be measured not only in terms of finance but also in terms of social objectives."[38] And indeed, it was social objectives as well as economic which were enunciated in A Farm Electrification Program published in 1942 and subsequently adopted in

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[36] M.P.C. Thirteenth Annual Report, pp. 5-6.

[37] M.P.C. Seventeenth Annual Report (1936), p. 3.

[38] H. Carl Goldenberg, op. cit., p. 162.

full dress by the Manitoba Government.[39]

Finally, in excluding supervision of rural electrical rates from the jurisdiction of the Municipal and Public Utility Board,[40] the government reserved unto itself (through the Commission) full and unrestricted control over rates without appeal to an outside, quasi-judicial arbiter. While it is difficult to say that this power was ever abused, it represented an expression of absolutism which was definitely retrogressive as well as unpopular, and was not repeated in the legislation amalgamating the Commission with the Manitoba Hydro-Electric Board.

In 1947, it could not be said that government in Manitoba had an enunciated or determined policy with respect to electrical power development. In practice, the organization and development of the industry had been left to existing utilities and competitive enterprise, and the only exercise of provincial control was the requirement of some demonstration of need before the necessary permits and licenses for establishment of new generating capacity on the River would be issued.[41] The special policies in connection with the Manitoba Power Commission related only to the extension of distribution for other economic and social purposes such as

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[39]The question of subsidizing the industry or rural distribution is discussed further in Chapter VI. For a schedule of subsidies received by the Manitoba Power Commission, see Table 6.4.

[40]Supra, Chapter IV, pp. 83.

[41]This assessment is confirmed by D. L. Campbell, Premier of Manitoba during the immediate period under consideration.

rural development and employment, and the operating policies of the Commission did not extend into the realm of basic development projects. However, with the sudden postwar expansion of demand and the very evident strength of this trend which (it appeared) would continue for some years, senior power executives and officials in the industry and in the government became aware of a serious potential problem in the near future. At the same time, in keeping with widespread changes in attitudes towards economic problems and the role of government which had taken place during long years of depression and world war, a perceptible change was taking place in the atmosphere surrounding the government's approach to the matter--now a subject of crucial importance to the health of the economy. In fact, the door was about to be closed on the laissez faire philosophy of the power development policy of the Province.

The development of policy from this time came about in uniquely modern fashion. Senior industry and government employees working in collaboration with a leading authority in the field of electrical power analysed the problems and formulated outlines for government policy and action.[42] In this setting, Dr. Hogg lent his prestige as well as his judgement; but the core of the analysis was provided by such men as D. M. Stephens, J. W. Sanger and E. V. Caton, all of whom had participated in

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[42] This general assessment, and what follows, is also corroborated by Mr. Campbell.

other important studies of various aspects of the industry.[43] Indeed, the style of presentation and the sense of urgency in the findings and recommendations of the Report are more suggestive of the attention and concern of those directly interested in the Province than of the professional analysis of the consultant.[44] Aware of this, and having confidence in the local people as well as in Dr. Hogg, the Government was able (in fact, if not in immediately obvious policy) to adopt the Report in its entirety --analysis, interpretation, and recommendations.[45]

The truth of this became apparent in the gradual unfolding of government policy between 1948 and 1953. The main elements were

> "likely to encounter a series of problems which (had) their roots in the tradition, sentiments or loyalties which . . . in the past attached themselves to existing units of the industry. These somewhat intangible, but nonetheless vital factors (could) constitute major difficulties in arriving at either a completely voluntary or even a somewhat arbitrary disposition of the problem."[46]

Consequently, the movement of the government in this direction was undertaken cautiously and gradually with a careful courting of the City and of the public-at-large. It was important that adequate public discussion

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[43]Royal Commission on the Municipal Finances and Administration of the City of Winnipeg (1939); Government Commercial Enterprises Survey (1940); Manitoba Electrification Enquiry Commission (1942).

[44]The style of writing might also be compared with that of subsequent Annual Reports of the Manitoba Hydro-Electric Board and of contemporaneous reports of the Department of Mines and Natural Resources of Manitoba.

[45]In reply to the query "How far did the government adopt the Hogg Report?", Mr. Campbell said outright (in the course of a recent interview)-- "about 100%!"

[46]Dr. T. H. Hogg, op. cit., p. 37.

enable the City to make up its mind that this was really what was required and familiarize voters with the issues sufficiently to assure public support of the government's handling of the matter.

It is necessary at this point to refer to certain theses contained in the Commission's Report. First, the Province had been confronted over the years with circumstances which afforded the government little scope in water power matters. By the time the Province came into control of its natural resources most sites on the Winnipeg River were under long-term commitment and the last remaining undeveloped sites represented the least attractive locations. Furthermore, development of these at Pine Falls and McArthur Falls would be costly and not readily justified except on the basis of improved overall river regulation and control. Were the Province to release these to any of the existing utilities, it would probably find it necessary to stipulate for recapture at the same time as the other leased sites (1962)[47] in order to avoid a perpetuation of the existing anomalous situation on the River. This would seriously detract from the attractiveness of these sites as far as either the Winnipeg Electric or the City Hydro were concerned, but it would not seem wise for the government to extend existing leases or to enter into any new ones which would have the effect of alienating such sites from the Crown for any prolonged period.

Secondly, the absence of adequate surplus capacity (in either

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[47] Great Falls and Seven Sisters (Winnipeg Electric Company, and Slave Falls (City Hydro). Pointe du Bois was secured on what amounted to a perpetual lease, and the Pine Falls site had been reserved for use of the Manitoba Paper Company.

system) with which to meet increasing demand over the period needed to bring new sites into production,[48] together with the fact that neither power-producing utility had any assurance of an adequate supply of low cost energy beyond 1962, placed them in a "difficult or marginal position" with respect to the development of remote and more costly locations.[49] And, in addition, the only manner in which the two plants could be operated for continued maximum effectiveness in meeting any particular load pattern would be through the closest integration hydraulically and through actual interchange of energy between the systems.[50] Consequently, the industry in its present form could not be expected to meet the anticipated additional requirements.

In turn, any new agency which might assume the responsibility without adequate control over Winnipeg River power

> "would be required to contend with very unfavourable conditions both with regard to an adverse balance as between high cost and low cost energy and with regard to an adverse balance as between partially employed and fully employed capital. If such a new agency were a private corporation, it would find itself in an exceedingly weak competitive position with respect to the other utilities. If it were a provincially owned corporation, it would, in the absence of complete rationalization, have to rely upon taxation of the existing utilities to meet the costs involved in the development of adequate and more costly future power supplies."[51]

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[48] The two generating utilities had been able to meet the demand thus far only by reason of existing high flows on the River. (Dr. T. H. Hogg, op. cit., p. 41.)

[49] Ibid., p. 43.

[50] Ibid., p. 29.

[51] Ibid., p. 43. Note the underlying assumption that the industry (if not one specific agency) must or will be self-supporting.

Consequently, if the Province were to take over the task without first securing the necessary control, it would find itself in a very difficult financial position. In fact, it would not be feasible except on the basis of complete integration and regulation.

Thirdly, there was need for immediate action by the Province to meet an impending power shortage.[52] But the handling of the short-term problem would raise a whole host of questions with respect to the basic organization of the industry and the long-term supply of power (which the government would prefer to approach less hurriedly). As a result, the ultimate solution could not be left, and it was important that the right blueprint be adopted, and accepted politically, from the beginning.

The principal problem was thus the question of power supply for the period after the Manitoba reaches of the Winnipeg River were fully developed, which resolved into the problem of bringing about development of the more expensive, northern power sites, if demand for energy was to be met from hydraulic sources. Here, low cost power from the Winnipeg River would be important, "pulling" power into the market from sources which, if unrelated to existing supplies, would be marginal if not uneconomic.[53] Steam generating capacity would also prove useful for supplementing hydro generation when river flows were reduced, for load-building (with the object of transferring the load to new hydro units), and for standby purposes. However, the absence of low-cost fuel supplies within the region, the greater

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[52] Ibid., Part IV, Recommendations.

[53] Ibid., p. 30.

difficulty in securing steam generating apparatus in comparison with hydro-electric equipment, and the size of the prospective load in Manitoba (large enough to justify the development of new hydro sites) would dictate concentration on hydro power and necessitate the most careful management of available water power resources.[54]

The first efforts of the government in this direction began with discussions with senior City and Hydro officials during the Winter of 1948-1949, which continued well into the Spring. Following a number of preliminary announcements to allay fears of a take-over of the City Hydro, the government indicated that the key to any reorganization of the industry would be a suitable agreement freely worked out to the mutual satisfaction of both the City and the Province.[55] Speaking in the House (April 1949), the Premier reminded the Members of the urgency in connection with present supplies and the poor prospects of long term requirements being met by the existing industry. The Water Power Committee had reported that "the Province could accept the heavy responsibility only if it were placed in a sound financial and administrative position," and the government in turn, while desirous of bringing about a reorganization of the industry along the lines recommended by the Commission, would do so only "provided this could be done on a sound and prudent basis and (that) such a plan was acceptable to the communities mainly affected."

In keeping with the report, the Province wished a central agency

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[54] Ibid., pp. 31, 42.

[55] Winnipeg Free Press, April 9, 1949.

created with responsibility for all development and operation of power plants and a municipal agency established for distribution of electricity (and operation of transit) in the metropolitan area, in which case the City Hydro would be the nucleus of the new municipal utility. However, the City was reluctant to give up its two plants at this time and the government agreed that it might be possible to bring about the basic reorganization in two separate stages rather than in a single stage contemplated in the Report. The possibility was therefore being considered of transferring the Hydro plants to the proposed provincial agency at a date some time after the initial reorganization had been carried out. Premier Campbell noted that there was "some danger (at this time) in attempting to enunciate a clear policy in a field where there are so many hypothetical considerations."[56]

The government position received general acceptance (in principle), and with a public awareness of the exigencies action could be taken on the first elements of policy: the need for immediate development of Pine Falls, and the decision of the Province to assume responsibility for further development of generating capacity. Acting on the assumption that suitable arrangements would in fact be worked out (with the City) in due course, the House passed the necessary legislation (assented to April 22, 1949) providing for the Manitoba Hydro-Electric Board and the exploitation of the Pine Falls site. The Act itself, in detail, proved less than satisfactory and

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[56] Ibid.

required a number of important amendments (between 1951 and 1953) as public policy became further developed and defined, but the major step had been taken and passage of the legislation was the first positive expression of government policy ever made with respect to the organization or development of electrical power in Manitoba.

One year later, in February 1951, following a challenge from the Opposition to "produce a policy" indicative of long-term planning and "looking ahead to 1965," the Premier presented a comprehensive statement which to the present remains a definitive expression of government policy on power matters in the Province of Manitoba.[57] He indicated the need for early reorganization of the industry so as to place the new Board in substantial control of generation and transmission and to make it responsible for all future development. As a first step, the necessary steps should be taken to acquire the primary facilities of the Winnipeg Electric Company, and to facilitate acquisition by the City of the distribution system (and transit properties) of the Company. It was also desirable that arrangements be made for the pooling of all power produced from the plants to be acquired by the Board,[58] and to equalize the wholesale costs of power to the City utility and the Manitoba Power Commission from some basing point in the Greater Winnipeg area. The policy of crediting a portion of water rentals

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[57]Mr. Campbell also believes this to be the case, and several other interested parties have concurred. The account which follows is taken from the Winnipeg Free Press, February 7, 1951.

[58]Note the subtle implication: this means the City Hydro plants also.

to the Extension Account would be continued, however, in order to assist the Commission to maintain reasonable retail rates. It was also determined that the principle of "no diversion" of funds from the Board account to the provincial treasury (and vice versa) would apply, other than payments in lieu of taxes or for services rendered.[59] Finally, the Board would be given authority to expropriate public utility and other properties with due compensation, with appeal to the courts in accordance with new procedures prescribed by statute.

The growing political problem with regard to the City-owned properties led the Premier to announce also that it was "not feasible" to bring this full plan into effect at the present time and that a "modification" of Plan C had been developed and was now a "matter of government policy." At the same time, he reasserted the importance of a complete intermix of high and low cost power under the control of a single agency, indicating that this was the "bed-rock tenet" of government policy. The inevitable could not be put off indefinitely.

About this time, the question was raised as to why existing generating capacity could not simply be pooled and wholesaled to the existing organizations--in effect a three-unit pool (City Hydro, Winnipeg Electric, and the Manitoba Hydro-Electric Board) instead of the two-unit arrangement

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[59]Two main principles were enunciated with respect to power costs. First, costs would be borne by power consumers, and not by the taxpayers. Secondly, the consumer would "not be called upon to make special contributions (through profits) to provincial services generally." (Free Press, ibid.). (Note the dig at the City of Winnipeg with respect to the City Hydro.)

indicated by the government. The estimated $60 million otherwise required for the expropriation of the Company could then be applied on the development of new capacity, and corresponding savings in capital costs could be passed on in the form of reduced rates. This was the alternative Plan D discussed by the Commission as an "interim arrangement" if one were required.

The main defects of this arrangement were obvious.

> "Since the allocation of power among the several utilities would be in the discretion of the Province, it might have the effect of arbitrarily utilizing the assets of one corporation for the particular benefit of another and possibly competing corporation. (Further,) this particular course of action would offer little hope of bringing about an overall reduction in the cost of producing electrical energy and would by placing an additional agency in the hydroelectric field be likely to bring about an increase in overhead and hence in the cost of electrical generation and distribution."[60]

Speaking to this in April, the Premier stated also that the substantial reserves under the Plan would accrue to the private investor, while under the government scheme they would benefit the (power) consumer.[61]

The most compelling reasons for the adoption of the government program, however, were the very considerable long-term savings in corporation taxes (which a government enterprise is not required to pay) and the costs of capital borrowing. The immense capital sums required for future development could best be raised by the entire industry on the credit of an integrated system backed by the Province of Manitoba. Savings in interest rates of one to two percent on capital raised in this fashion could be

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[60] Dr. T. H. Hogg, ibid., pp. 39-40.

[61] Winnipeg Free Press, April 5, 1951.

secured, with important results for the wholesale cost of power.[62] At the same time, the high rate of federal tax payable by the privately-owned utility represented a direct charge on the consumer (and, incidentally, a drain from the Province) which could be escaped under the government reorganization.

During the following Winter the entire power question became increasingly controversial, and in February 1952 the City charter was amended in the House to permit a general referendum to determine the preferences of the public with respect to (as the Winnipeg Free Press would have it) "the future ownership and management of the industry."[63] However, the Premier warned (for the benefit of opponents and public-at-large) that the defeat of Plan C would not make Plan D "automatic"--in fact, the government had no intention of proceeding with the "impractical" Plan D which was, in any event, unacceptable to both the City Hydro and the Winnipeg Electric, and dependent wholly upon compulsion.[64]

The defeat of the City referendum led to an emergency Special Session of the Legislature in July in order to approve commencement of the McArthur Falls station and to authorize the necessary expenditures. Endeavouring to produce some alternative solution to the power problem, the

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[62] R. D. Turner, M.L.A., noted that "a difference of one percent in interest rates could make a difference of as much as 10-15% in the wholesale costs of power." (quoted in the Winnipeg Free Press, February 7, 1951.)

[63] Winnipeg Free Press, February 19, 1952.

[64] Winnipeg Free Press, March 11, 1952.

and similar tax exemptions and special allowances enjoyed by the Hydro (still the Company's competitor) were given to the Company also--in other words, equalization of treatment.[67] Some security of tenure was also stipulated, and the government assessed these conditions as a demand for a rate of return to the Company which would (in effect) be double the interest costs under public development and statutory safeguards which would ensure this rate of return and prevent undercutting.[68] The government therefore determined to proceed on its own, and necessary amendments were made to the Manitoba Hydro-Electric Development Act to permit the Province to continue with the McArthur Falls project and make such other additional arrangements as might be necessary for development purposes.

The defeat of the referendum had left no clear or reasonable alternatives, and it was therefore necessary to carry on as planned without the City Hydro. The government moved to purchase the Winnipeg Electric[69] in order to consolidate generation and transmission facilities of the Company with those of the Board, and to set off the surpluses of the Company immediately available from electrical operations against the operating costs of providing the new capacity for the Province. This made it possible to coordinate generation of the three largest plants on the River and provided the Board with a ready-made operating arm and transmission system. At the

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[67] E. V. Caton, by interview, May 31, 1963.

[68] Winnipeg Free Press, ibid. This interpretation, with various embellishments, remains the prevalent one within the industry.

[69] Supra, Chapter IV.

same time, it changed the overall financial position of the Board from one of serious and mounting annual deficits to one in which it was possible to liquidate previous deficits and strengthen the reserve position of the Board. Put another way, it was possible to add the new $25 million Pine Falls development without any alteration of the standard rate structure and to cover all costs involved as well as add to contingency and other reserves.[70]

It was still manifestly clear, however, to all responsible for power supply (elective as well as administrative) that complete integration was necessary for full exploitation of the River and additional hydro development. This was next achieved with the Power Sale Agreement arranged at the managerial level of the two utilities and without political involvement outside the chambers of government. This, together with the division of distribution between the urban and rural systems, represented the essential rationalization of the industry which had to take place if power needs were (in fact) to be met by the Province.

While the government might announce that Plan C had been "abandoned" and provision made for the needs of the Province without incorporating City Hydro[71] (an achievement accomplished by technical sleight-of-hand), the most important requirements underlying the original plan of

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[70] M.H.E.B. Second Annual Report (year ending March 31, 1953), p. 8. Further, whatever else might happen to rates after the McArthur development was completed, changes in the rate structure would be delayed, and less in amount than if the organizational changes had not been made.

[71] Winnipeg Free Press, January 14th, 1953.

reorganization had now been met, even though at a slightly higher cost to the City--having lost the lucrative suburban market. The next government which came into office in 1958 oversaw the completion of the process with the amalgamation of the Commission with the Board, but made no essential change or modifications of this established program. The electrical power industry had come of age in Manitoba.

up for a lack of mineral fuels and played an important part in economic development. At the same time, it has contributed to the relatively high standard of living enjoyed in the Province. Elsewhere on the Prairies and in much of the United States, consumers have had to rely more heavily on thermal sources such as coal, oil and natural gas, until recently a much more costly procedure.[2] System power costs have been climbing, however, as shown in Chart 6.1, and it is uncertain how far this special position of hydro will continue, at least as far as new development is concerned.

Manitoba must now turn to the development of other hydroelectric resources which are both large in scale and remote from the main market area. At the same time, thermal power costs are coming down, and the gap between the costs of hydro and certain types of thermal production has become very narrow. Highly efficient conventional fuel burning units can now be built right at the principal load centers at a capital cost per unit of capacity well below that of bringing hydro power in from the North. These units may range in cost from $150 to $250 per kilowatt, while northern hydro developments require investments in the $365 to $450 (or more) per kilowatt range,[3] and, being large, do not fit as readily into the more modest upward trend of consumption anticipated for the next 10 to 15 years.[4]

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[2]See table of comparative rates in Winnipeg and elsewhere, Appendix.

[3]Manitoba Hydro.

[4]Supra, Chapter II.

Thermal capacity, in other words, can be sized and timed in such a way as to minimize the amount of capital investment which will be unproductive at any given time.

In the long run, hydro power may have certain definite advantages. No consumption of depletable resources is involved, nor is there direct dependence on outside sources of supply, as long as precipitation remains normal and international (and interprovincial) water control agreements remain in effect.[5] Further, the major hydro development, once completed, is relatively inflation proof, and improvements in high-voltage transmission methods can help to offset the greater costs involved in the longer distances and difficult terrain over which the energy must be sent to the southern market. Multiple developments along a given river such as the Nelson or Churchill, utilizing the same stored water repeatedly, as on the Winnipeg River, can lead to declining unit costs. Finally, existing plants can be periodically redeveloped to counter obsolescence, or simply renewed and maintained for peaking purposes in conjunction with high load factor hydro and existing steam generation facilities.

Operating costs in each case are affected differently by economic conditions, however. In hydro projects, these may be largely dependent upon the trend of interest rates. After the Second World War, capital was available at about 3%, while today new hydro financing costs 5 1/4-5 3/4%,[6] and under long-term inflationary conditions there seems

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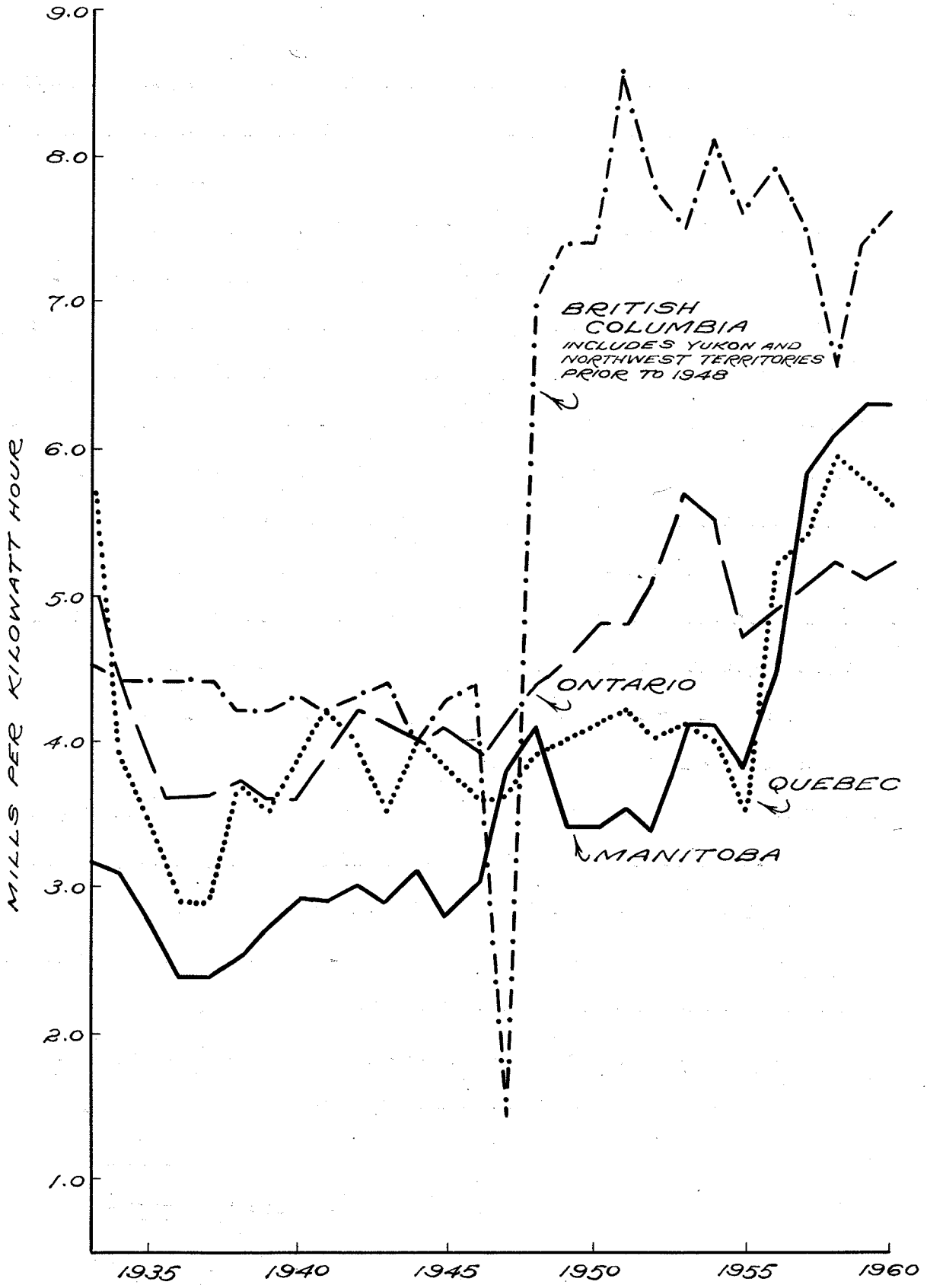
[5] Supra, Chapter IV.

[6] Manitoba Hydro.

CHART 6.1
SYSTEM POWER COST TRENDS
QUEBEC, ONTARIO, MANITOBA AND BRITISH COLUMBIA
CURRENT DOLLARS 1933-1960



SOURCE: D.B.S. ELECTRIC POWER STATISTICS AND CENTRAL ELECTRIC STATIONS

Future hydro projects, to be economic, presumably must be able to improve upon this laid down cost. Fortunately, several large sites exist which, it is estimated, if they were developed in the right sequence and with proper timing relative to available markets, could make large power available at perhaps 5-6 mills per Kwh, and it is largely for this reason that present planning is proceeding on the assumption that most of the Province's needs in the next decade can be adequately met from hydro sources.[11]

At this point, a few cost comparisons will help to clarify the position of the various fuels and electric power. Natural gas, in terms of Btu content, is the cheapest form of energy at its source. Next comes coal, the price of which may range from roughly equal to several times that of natural gas at the well head. Crude oil is even more expensive, but economies of transportation (by pipeline) enable it to displace coal within several hundred miles of the source. Competition with natural gas, however, would appear to be more effective beyond (say) a 1,000 mile range, where more flexible mobile transportation also comes into its own.

Table 6.1 summarizes the costs of transporting energy in various forms. Petroleum is the least expensive to move, and can be transported for about one-third the cost of natural gas. Natural gas can be transported for less than one-half the cost of moving coal by rail, while coal can be

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[11]These costs assume 5 1/2% rates of interest, and might be reduced to 4.5-5.5 mills on the basis of (say) 4 1/2% rates. Were this possible, it would remain to await market conditions or power export arrangements which would justify embarking on these projects.

transported more cheaply than electricity over long distances. On the other hand, for distances of 300 miles or less, electricity may have an advantage due to the elimination of handling costs and the uncertainties of long-term freight rates. Consequently, it could be preferable to generate power at the coal field in Saskatchewan[12] rather than import the fuel for conversion to thermal power at the market in Manitoba.

In addition to its role in the matter of hydro versus thermal power, the arrival of natural gas on the Manitoba scene (1958) is also having a direct influence on electrical power consumption. The hesitation in the rate of growth of power consumption has been due in part to fluctuations in industrial requirements,[13] and in part to a tapering of the growth of urban demand suggestive of an approaching saturation point and the end of the postwar surge in consumption, at least in Winnipeg.[14] But natural gas sales have undoubtedly cut into power consumption, taking over such functions as water heating in the home,[15] although this is as yet difficult to measure statistically.[16] Nonetheless, the marked reduction in residential consumption in the City of Winnipeg since the high of 1959 may be largely

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[12]Lignite.

[13]Table 2.1 and Chart 2.1.

[14]Table 6.2.

[15]C.O.M.E.F. op. cit., p. X-7-6.

[16]Neither City Hydro nor Manitoba Hydro have attempted to prepare estimates indicating displacement of electric ranges, water heaters, and so on, and the accompanying loss of power sales.

TABLE 6.1

Cost of Transporting Energy

Form of Energy	Transmission Method	Distance (Miles)	Cost Per 100 Miles (Cents)	Conversion Factor to B.T.U.'s	Cost Equivalent Cost/Ton/ 100 Miles (Cents)
Petroleum	30-in. dia. Pipeline	2,000	2.0 to 3.0 (per barrel: 35 imperial gallons)	6,000,000 (35 imperial gallons)	9.0 to 13.5
Natural Gas	34-in. dia. Pipeline	2,000	1.1 to 1.6 (per thousand cubic feet)	1,050,000 (per thousand cubic feet)	28.0 to 40.8
Electric Power	High Tension Line	400	0.04 to 0.05 (per Kwh)	3,412 (per Kwh)	316.5 to 395.5
Bituminous Coal	Railroad	1,500	70.0 to 80.0 (per ton)	27,000,000 (per ton)	70.0 to 80.0

Source: John Davis.

TABLE 6.2

City Hydro: Domestic and Commercial[1] Sales 1945-1962
(millions of Kwh)

Year	Domestic	Commercial	Total
1945	250.2	181.2	431.4
1946	270.0	187.6	457.6
1947	286.1	198.1	484.2
1948	303.9	206.4	510.3
1949	319.3	217.9	537.2
1950	339.7	223.5	563.2
1951	351.5	235.1	586.6
1952	363.1	240.7	603.8
1953	378.6	251.1	629.7
1954	401.5	263.7	665.2
1955[2]	464.7	402.0	866.7
1956	510.2	491.1	1,001.3
1957	520.0	509.8	1,029.8
1958	537.5	530.6	1,068.1
1959	557.2	572.0	1,129.2
1960	512.3	595.6	1,107.9
1961	514.8	625.2	1,140.0
1962	519.7	644.5	1,164.2

[1]Includes industrial as well as commercial sales.

[2]Starting in 1955, totals include all of the City of Winnipeg, but exclude Transcona, Brooklands, and parts of Ft. Garry, East and West Kildonan which represented mainly domestic sales to the City Hydro.

Source: City Hydro.

attributed to this source.[17]

The principle area of competition between natural gas and electricity is in the production of heat, mainly for boilers and certain industrial processes where fuel energy may be employed in place of electrical power. The relative advantage of natural gas may occur at two levels. First, where thermal power is already competitive with new sources of hydro power, the new thermal unit, using natural gas (for example), will pay almost the same price for its fuel as the gas distributer. Distribution facilities have to be provided in both cases, but the power concern will also have to build a generating plant, and the additional investment per unit of energy delivered to the consumer may be several times that involved in the distribution of straight natural gas. In sum, the supply of electricity will be much more capital intensive than gas distribution, and hence more costly.

Heat efficiency and ease of transmission of the energy content will also favour natural gas. About 5% of the original supply may be lost in providing the natural gas service, but 95% will reach the ultimate consumer. By comparison, the thermal-electric station is able to convert only about one-third of the potential energy into power, the rest being lost in waste heat. When system losses are taken into account, a net of perhaps 30% of the original energy is available to the customer. In specific applications, energy is again lost in the reconversion of electricity to heat. Inevitably,

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[17]This is a fairly general view within the industry.

then, uses in which natural gas will have a definite thermo-dynamic advantage will include domestic cooking, clothes drying, water heating, space heating, steam raising, and the heat treatment of metals.[18]

These considerations do not have the same weight when the comparison is made with hydro power. Losses from turbine to point of consumption may be less than 20%. Hence, the main difference will be in the area of capital charges. The higher cost of hydroelectric stations as compared to thermal units, to which must be added the costs of transmission systems, means that the typical hydro utility faces interest, depreciation and other capital charges which may be several times those associated with the long distance transmission and distribution of natural gas.[19]

For example, the hydro project at Grand Rapids is estimated to cost about $365 per kilowatt of capacity, including transmission lines and interconnection with the southern system.[20] Applying a factor of (say) 7 1/2% to cover capital charges, depreciation, maintenance and other operating expenses, and assuming a load factor of 45%, the average cost of power produced from this source would be just over 7 mills per Kwh (compared with present system costs of 8.03 mills for Manitoba Hydro), or the equivalent

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[18]Electricity may have certain advantages at present in the realm of air conditioning and refrigeration, but new equipment based on the use of natural gas and the principle of heat absorption represents somewhat lower operating costs on the basis of existing prices.

[19]Manitoba Hydro.

[20]This is based on a planned 330 megawatt capacity and an estimated capital cost of $120 million.

of about $2.10 per million Btu's.[21] With respect to electricity at the retail level, the average rate for residential power consumed in the City of Winnipeg in 1962, for example, was 8.5 mills,[22] or about $2.50 per million Btu's. But gas is being retailed firm to residential customers for about 90¢ per million Btu's, and the rate is coming down.[23] Consequently, where there is a choice between these two energy forms for uses involving heat, natural gas is likely to displace electric power in many instances.

Experience elsewhere in North America suggests that electric power consumption is greatest where natural gas has not been available to the average homeowner, and lowest where natural gas has been offered in quantity and at competitive rates over a period of time.[24] In prosperous regions such as Ohio, California and Alberta, the average home uses less than 4,000 Kwh per year. Natural gas provides not only space heating but also most of the water heating in many of the urban areas. In Manitoba, Ontario and the Pacific Northwest, on the other hand, electricity has been the only convenient form of energy for many years, and domestic power requirements are still in the 6,000-9,000 Kwh range.

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[21]At a cost of $365 per kilowatt and a factor of 7 1/2%, annual chargesper kilowatt will be $29.38. Now, with a load factor of 45%, each kilowatt of capacity will produce 3942 Kwh (8760 x.45) per year. Thus, electricity from this source will cost 7.19 mills per Kwh, or $2.11 per million Btu's. (Note: one Kwh = 3412 Btu's.)

[22]City Hydro Annual Report 1962, p. 7.

[23]Greater Winnipeg Gas Company Annual Report 1962, p. 21. (Note: the rate charged is 91¢ per 1,000 cubic feet, converted at the ratio of 1,000 cu. ft. = one million Btu's. But if converted at the correct ratio of 1,045 cu. ft. per million Btu's the actual rate is 85.4¢.)

[24]John Davis and David Ross.

However, in new natural gas service areas, installation of gas for one purpose or another such as space heating has led to its use for other functions as well (as a matter of convenience and in order to take advantage of quantity discounts on increased consumption). This has resulted in a displacement of electricity not only for fuel pumps and furnace blowers but also for these other household applications. For example, in new developments in metropolitan Winnipeg such as Windsor Park, Niakawa Park and in St. James, most new homes are being equipped with natural gas for space heating and water heating at least, and gas appliances frequently include ranges and clothes dryers.[25] In turn, new homes using gas from the outset are tending to consume less than 4,000 Kwh of electrical power per year.[26] The electric utilities have endeavoured to meet this competition in the realm of water heating (mainly through the use of rates), but there is no suggestion (as yet) of a reversal of the trend.

Evidently, wherever natural gas is available, it is taking important markets away from both oil and electricity, and residential consumption even in the traditionally high power consumption areas is tending to level off.[27] Elsewhere, and particularly where natural gas has been available for some time, demand for electricity may continue to climb; but in Manitoba, availability of gas will tend to retard the rate of increase

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[25]This is confirmed by Manitoba Hydro.

[26]Manitoba Hydro estimate.

[27]Table 6.2 and Table 6.3.

in the use of power, and authorities agree that it may be some time before consumption resumes its former growth.[28]

Turning to the realm of industry purposes, government, and economic policy, it is apparent that the operation of the industry today is not solely a matter of internal management, but is also related to various other factors in the economy of the region, such as resource use, competition between industries, and importation of fuels. At the same time, electrical power has special economic and commercial advantages associated with its position in relation to public authority in the Province. Consequently, certain questions might be raised as to the proper role of the industry, the extent to which special advantages should be employed to compete with other industries, and the possibility of assisting and employing the industry in the interests of other and perhaps broader economic objectives.

Historically, government concern with the power industry began with the issue of low cost energy and the desire to assure adequate competition in order to protect the consumer.[29] This approach was extended (at the provincial level) to embrace socio-economic objectives for the rural areas, and would eventually include broad responsibilities for operation and development by the Manitoba Government. But the establishment of the

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[28] C.O.M.E.F. op. cit., pp. X-7-6, 9.

[29] Supra, Chapter V.

publicly-owned utilities themselves was a commercial venture in both instances. Apart from certain stipulations as to rates to be charged, the City Hydro was to operate on much the same basis as a private concern. The Manitoba Power Commission, in turn, was intended to be essentially self-supporting, and beyond certain specified financial supports to help defray higher costs of rural distribution was expected to break even, extending service only where it could be justified on the basis of anticipated additional revenue. Further, special arrangements such as the refinancing of the Commission and the joint-pole agreement (and similar later provisions) in the City of Winnipeg were intended to promote rather than limit enterprise, and except for certain policy matters the utilities were expected to exercise full commercial initiative in achieving the objectives laid down for them.[30]

There was a palpable distinction, therefore, between management responsibilities, which were of an essentially restricted commercial nature, and broader economic, social and political concerns which are the responsibility of government. Under present circumstances, it may be just as at least as important to retain this distinction, although a number of factors tend to confuse the issue. The industry is no longer one of mixed private and public enterprise, or of small utilities struggling to provide necessary services. Electrical power is now large, monopolistic, and backed by the credit of the Province. Various fuels also compete with water power to produce electricity, and natural gas competes directly with electric power

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[30]This interpretation is confirmed by J. W. Sanger and W. D. Fallis.

in a number of uses. In this situation, management choices made in the market place and decisions arrived at under the pressure of competition also influence resource utilization and economic development. Consequently, it may be desirable to determine anew what industry policy (or policies) should be, and what government policy and participation with respect to the industry should involve.

Several sorts of questions might be asked. First, (recalling the earlier discussion as to the duties and responsibilities of the utility)[31] what should be expected of a publicly-owned monopoly, especially now that the market has been largely organized and developed and the industry has reached a mature stage?[32] Should it go out of its way to encourage consumption, or merely meet demand if it exists? How far should it compete actively for markets with another industry such as natural gas? The privately-owned utility is governed mainly by the profit motive and the need to maintain satisfactory customer relations, advertising to encourage demand and build goodwill in profitable markets and avoiding (where possible) the unprofitable ones. But the publicly-owned institution does not have any motive in terms of maximizing profits; rather, one of minimizing costs, although the individual manager may have a professional interest in extending service, developing new uses, and so on. What, then, should be the

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[31] Chapter III.

[32] The highly developed organization and operating procedures of both utilities suggested the aptness of the term "mature," as applied to the industry as a whole.

determinants of its policy?

The principal objective, it would seem, should be to supply and distribute electric power efficiently, and in such a way as to improve general welfare. In the past, it was assumed that this would be achieved if monopoly profits were eliminated and if the utility sought to produce and distribute power up to the point where total revenue just managed to cover total costs, or AR = AC,[33] allowing in computations of costs for a modest return or surplus. This was and remains the basic assumption underlying power distribution and development under the aegis of the Province and is implemented in existing legislation governing the Manitoba Hydro.[34] In the case of City Hydro, the same assumptions are made, and although surpluses are permitted (and now even expected, provided rates do not have to be raised) they remain the property of the City of Winnipeg and are used (in part) to supplement tax revenues. This idea, however, while the most widely held approach to utility regulation,[35] reflects an underlying preoccupation with the extension of distribution as a social end in itself and the minimization or control of earnings as the best assurance that the greatest social good is being served.

Another approach with much more significant advantages from an efficiency and welfare standpoint has to do with utility operation and

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[33]AC usually includes allocations for reserves and a modest return or net surplus.

[34]Supra, Chapter IV.

[35]John Bauer, Transforming Public Utility Regulation (New York: Harper and Brothers, 1950).

output based on marginal-cost pricing. Simply stated, electricity may be sold for whatever prices buyers are willing to pay and output extended to that point at which marginal cost (of the last increment of output) is equal to the demand price (MC = P). In effect, the object is to secure an equation of any utility price and marginal cost rather than an equation of price and average or "reasonable" costs of each utility service.[36]

This situation resembles the cost-price relationship in a perfectly competitive market when the producer supplies that amount at which MR = MC = P.[37] Prices are not arrived at in order that TR = TC, i.e., so that the fixed costs of service as well as other costs are covered. In the condition of perfect competition, fixed costs do not (in the short run) enter into the determination of price; hence, in the pricing process they are irrelevant. In the marginal-cost method of utility pricing, they are likewise ignored. This is because in the long run there are no indivisibilities of investment and thus no fixed costs, and in this approach to utility operation it is the long-term benefit to which effort is directed. The procedure therefore concentrates mainly on variable costs, which include normal operating costs and may also take in various miscellaneous items such as "use" depreciation which are difficult to handle in any other way. Capital costs, in turn, are considered only at the time they are incurred.

The underlying principle as it relates to welfare and resource

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[36] Supra, Chapter III.

[37] Marginal Revenue = Marginal Cost = Price.

utilization may be understood in the following way. If the marginal-cost concept is enlarged to refer to the marginal cost of electricity in terms of other goods which must be foregone in order to produce a given amount of electric power, then, for any given set of prices, an output can be determined which represents an optimal set of quantities of both electricity and other goods. In Figure 6.1, a production curve suggests combinations of goods which can be produced with available resources. The slope of the tangent at each point on the line indicates how much of other goods must be given up to obtain additional small quantities of power. In addition, for any given set of prices for the two commodities (electricity and "other goods"), a straight line or budget line can be drawn indicating the various combinations which are of equal total market value ($X + Y =$ constant). In this case, slope measures the price of electricity in terms of other goods. The optimum is reached where the budget line just touches the production curve and $P = MC$.[38] Here, consumers may buy according to their preferences at prices that accurately reflect the relative scarcity of the respective goods, and resources will be employed for various purposes in amounts indicative of both real costs and prices. In other words, following A. P. Lerner's formulation, when price equals marginal cost and marginal cost reflects the value of the alternative product, the marginal cost or sacrifice to society for the use of the resources consumed for the

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[38]This depends on the particular shape of the production curve and its appropriateness. For the purpose of this example this will be taken as given.

FIGURE 6.1

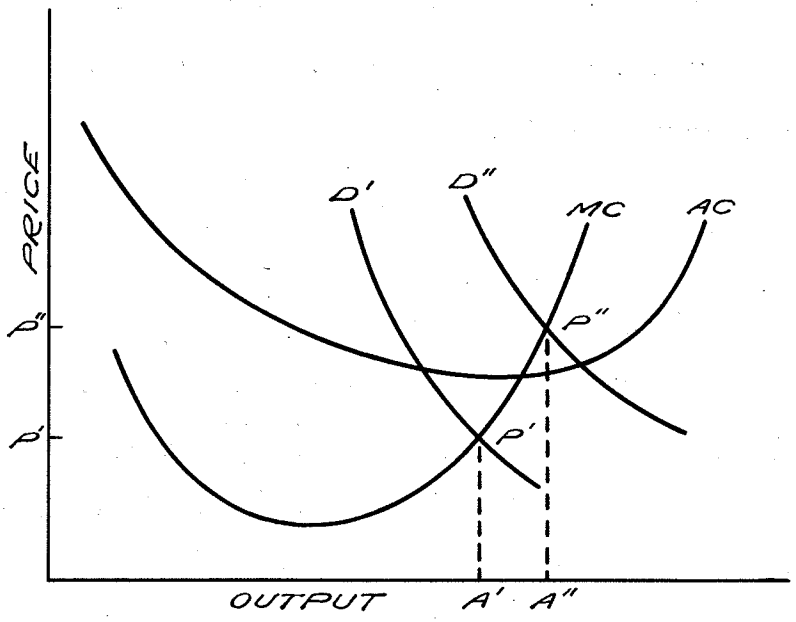

FIGURE 6.2

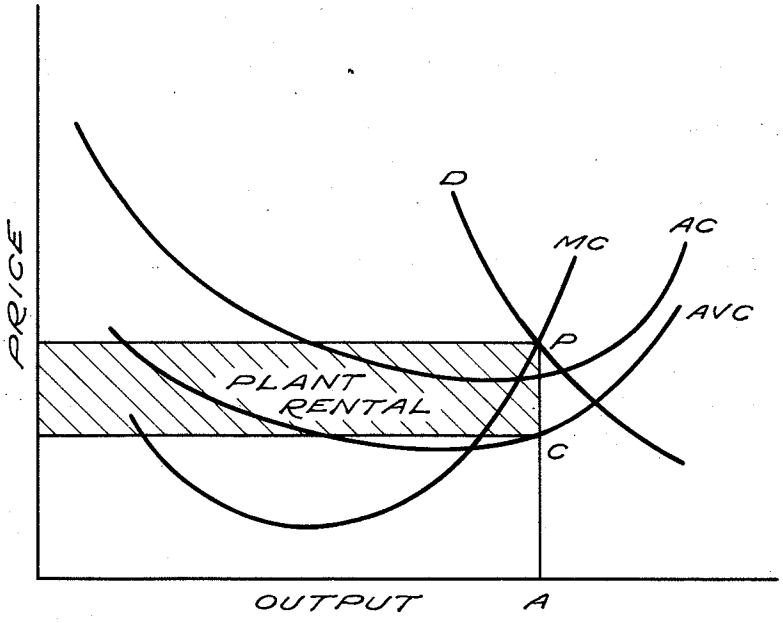

FIGURE 6.3

may be met out of the sale of energy. Following the procedure outlined, the utility can obtain a "plant rental," which is represented by the excess of total revenue over the total variable costs of the system. Rental is thus the revenue over and above the minimum cost of service being produced, a residual sum after the price is set, as shown in Figure 6.3 (shaded area). This is not a fixed amount, but varies in the same direction as changes in demand.

> "If unused plant capacity is scarce and demand is increasing, the plant rental is increasing too, and can be large. If there is much unused plant capacity, however, either because demand decreases or because the (utility) has excessive plant capacity, the plant rental can be quite small."[40]

Fixed charges, therefore, may or may not be covered by the plant rental. Coverage will depend mainly on the consumer demand and the intensity of plant use.

Under certain circumstances, then, the utility may be operating at a loss, and may have to be subsidized from the public treasury. This may not be a disadvantage from an economic standpoint if broad social purposes are being served, but it may be very difficult to secure political acceptance of the scheme, particularly in view of the long-standing reliance on the traditional approach to the financing of electrical power. Marginal-cost pricing clashes with conventional business standards of utility operation; and while the present Government of Manitoba has shown itself willing to do what is necessary to assure adequate power supplies, this radical concept presents special fiscal problems, and benefits of low-cost electricity

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[40] Troxel, op. cit., p. 457.

(under this approach) must be balanced against more taxation or smaller public expenditures. At present, the stringency in Provincial finances[41] might hamper any ready consideration of the proposal.

A variety of problems must be overcome when the principle is applied in practice. These include difficulties of precise definition and measurement of marginal costs, differences in marginal costs among separate plants and user classifications, and the distinction between short-term and long-term marginal costs. Further, only economists use the special concept of marginal cost, and it is often difficult to translate the accounting information which may be available into the necessary terms. However, the process is not so difficult that management cannot adopt the principle and arrive at certain procedures.

One of the first considerations is to distinguish between short-term and long-term marginal costs. The long-term variety are necessary for planning, and may be derived from estimated long-term average costs. These may include increments in all costs--the additions to capital investment, management, and depreciation as well as additions to variable costs. These are difficult to measure, but are nonetheless important. Further, an "average" marginal cost can be computed (to simplify matters) for each productive unit--a whole plant, a complete system, or a single

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[41] Winnipeg Tribune, June 21, 1963. News article reporting address of Premier Roblin to Investment Dealers Association of Canada.

source of output.[42] Marginal costs may similarly be calculated for different user classifications, but the existence of "block" schedules offering lower prices as consumption increases means that for practical purposes marginal costs may be equated to average prices.[43] Finally, the price for utility service need not be changed with every minor shift of the determinants. Perhaps semi-annual or even annual price changes are adequate for most situations. At any rate, a perfect and continuous equation of demand prices is impossible, and the utility probably can do no better than follow the general principle of the marginal-cost plan.[44]

This basic approach also suggests answers to other questions facing the industry, such as whether demand should be encouraged in order to extend service where possible, even though existing customers may have to pay higher average rates. The maintenance of existing rate levels becomes less important, although management may be wary of tampering with schedules, fearing customer reaction, especially at a time when natural gas is making such inroads. The clear alternative is to promote consumption, developing new uses and wants and making it possible thereafter to adjust rates as necessary once a new demand has become established. This

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[42]Marginal cost is not computed for each separate unit of output. Instead a block of cost change is divided by a block of output change. The result is an average cost increment for several or a number of increments of output.

[43]Using a differentiated price schedule, the typical utility sells some service below the marginal cost of production.

[44]Troxel, op. cit., pp. 453, 462, 754-55.

may be particularly desirable where excess capacity exists in order to secure greater use of the facilities--which will also serve to reduce possible deficits or increase the level of plant rental.

In the absence of a formula such as marginal-cost pricing, however, there may be fewer guidelines for a proper policy towards demand. For example, in terms of advertising to encourage additional consumption or maintain existing levels, the utilities may face a dilemma. At the present time, increases in consumption must be met at higher unit costs, so that average costs for the system are increased. This may necessitate increased rates, affecting all customers. Thus, it could be said that because new demand was created, the average cost to customers went up, and this could occur each time a block of power was added to the system. With each block added, average costs would rise, and while the average cost of that power would tend to decline until a new block was required, average costs for the system would increase somewhat, the amount being determined by the average cost of the new power. The question arises, then, whether to discourage growth in demand (or at least not encourage it) in order to maintain existing rate levels (which has been an important aim in the past), or to promote consumption in order to extend service as far as possible, even if existing customers may have to pay a higher average price.

This apparent problem with respect to rate increases has plagued the industry almost from the beginning. Sites progressively more costly on an installed-kilowatt basis have been developed and in many instances, including all postwar additions of hydro and thermal capacity, rate increases

have been considered inevitable by most responsible authorities.[45] Nonetheless, on each occasion the new power was absorbed without a rate increase, and no significant adjustment of rate schedules has been necessary for many years.[46] This has been possible because of increased customers and uses, rising average domestic consumption (until 1959), and higher average rates paid, both residential and overall, within existing (and essentially static) rate structures, as shown in Table 6.3 for City Hydro. Here, the key factor has been the marketing efforts of the utility, developing new uses and selling the public (in both good times and bad) on the benefits to be had from the increased use of electricity.[47] The solution, in other words, has been expansion rather than holding the line, and electrical service has been widely extended with only moderate increases in the average price paid.

In addition, important public benefits seem to derive from the active marketing of electrical power, extending and broadening consumption in a variety of ways where energy is required. This has paved the way for the continuation of low rate schedules in the past, and present efforts in this direction may be equally important for future prices.

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[45] W. D. Fallis, by interview.

[46] During the depression, the problem was under-employment of capacity, and rate increases would have hampered rather than improved the situation. In fact, cut-rate commercial and industrial contracts (in particular, the large ones) were the order of the day.

[47] Supra, Chapter V.

TABLE 6.3

City Hydro: Total Services, and Average Consumption and Rates

Year	Total Services (at Dec. 31)	Average Rate Overall Per Kwh (Cents)	Average Rate Domestic Per Kwh (Cents)	Average Annual Domestic Consumption per Customer (Kwh)
1925	62,508	.908	1.111	2,436
1926	65,674	.782	1.064	2,716
1927	69,548	.756	1.007	3,064
1928	74,504	.742	.961	3,384
1929	80,688	.717	.921	3,741
1930	84,699	.802	.894	4,008
1931	87,353	.796	.879	4,169
1932	91,710	.683	.881	4,321
1933	92,935	.638	.857	4,418
1934	94,012	.597	.829	4,518
1935	94,754	.601	.828	4,616
1936	96,058	.617	.831	4,694
1937	97,703	.638	.827	4,765
1938	99,144	.637	.825	4,838
1939	100,990	.633	.826	4,861
1940	103,007	.647	.827	4,912
1941	105,552	.673	.824	5,040
1942	107,879	.635	.809	5,138
1943	109,938	.628	.803	5,289
1944	112,215	.638	.796	5,445
1945	115,115	.649	.792	5,649
1946	119,671	.661	.785	5,942
1947	125,238	.656	.774	6,088
1948	130,679	.661	.764	6,245
1949	135,172	.663	.758	6,421
1950	139,761	.676	.760	6,672
1951	143,720	.674	.752	6,792
1952	146,911	.692	.749	6,891
1953	151,049	.717	.749	7,037
1954	156,088	.720	.750	7,224
1955	179,761	.792	.755	7,394
1956	183,166	.792	.753	7,637
1957	183,953	.844	.753	7,605
1958	184,763	.887	.754	7,738
1959	184,460	.856	.757	7,869
1960	183,044	.927	.833	7,085
1961	180,528	1.029	.841	6,988
1962	176,843	1.019	.850	6,964

Source: City Hydro Annual Reports.

Should certain applications fail to meet with success in the market place, they can be dropped, and consumer acceptance may be the determining factor of both the level of consumption and the uses to which electricity will be put.

Finally, dealing with the question from an industry standpoint, it seems axiomatic that as long as the industry is expected to provide ample and economical supplies of electrical energy for the Province and, in the process, to remain self-sustaining, management must be permitted (as in the past) full commercial initiative to pursue markets. Furthermore, rates must needs be a matter of the economics and marketing policy of the industry (rather than tradition or politics), and any decisions having to do with rates or service extensions which may be influenced by outside economic or social objectives of government should have special attention drawn to them, and any additional costs or expenses which may be involved should be met from (say) the public treasury, rather than from within the industry itself.[48]

This approach may apply equally to the question of whether a publicly-owned and controlled industry should compete actively with another, private industry such as natural gas. Artificial limitations should not be imposed on the government commercial enterprise any more than they would be on a private concern. All fuels and sources of energy are, and always have been, in competition with each other, and in the process, industry and

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[48]R. S. Edwards "Objectives and Control in Nationalized Industry", Journal I.E.E., April, 1963. (Institute of Electrical Engineering).

the public-at-large may anticipate better service and the development of new uses which might not otherwise take place. At the same time, a relevant question might be whether, on the other hand, the competitive effort should be subsidized in favour of the public enterprise, to the detriment of private companies. Should the public agency have the advantage of public funds and government underwriting of borrowings?

It remains to be determined how far the present industry is actually subsidized. The City Hydro is a special case, being a municipal department and controlling the cheapest power sources in the Province. It pays no corporation or municipal taxes (except on improvements), and its legal and auditing expense is met by the City directly. Capital requirements over the years have been raised on public credit, effecting savings of 1-1 1/2% in interest, and there is no pressure on the utility with respect to earnings. In regard to Manitoba Hydro, similar conditions prevail with respect to taxation and borrowing costs, although the utility bears its own legal and auditing expense. Over the years, the Manitoba Power Commission received annual subsidies from the Province, as listed in Table 6.4, in order to assist rural extension. No longer deemed necessary, these have been discontinued and are not received by the present combined organization.

Perhaps a most important advantage for the Manitoba Hydro lies in the realm of borrowings from the provincial treasury, particularly short-term funds. With the close financial relationship which exists between the operation of the utility and the total liability of the Province, the Government of Manitoba takes a direct interest in the borrowing problems of

the organization. The Hydro is able to secure a large part of its working capital requirements by means of direct borrowing from the Province, and when this short-term indebtedness becomes large enough to justify going to the capital market it may be met from the proceeds of a new debenture issue.[49] For example, up to March 31st, 1962, accumulated advances from the Government of Manitoba included bonded debt in excess of $99.3 million and short-term borrowings of nearly $17.8 million.[50] These facilities represent a tremendous financial advantage not available to private industry and, in fact, assistance most necessary in view of the very large sums needed (such as $120 million for Grand Rapids) for further development.

In summary, it is apparent that both the utilities are subsidized, directly and indirectly. Perhaps the most important elements are the value of the use of public credit and the corporation tax advantage. Applying a factor of (say) one percent to the funded debt of the utilities (as representative of the interest costs saved), present annual savings in capital charges for the Manitoba Hydro and the City Hydro may be estimated at $1.6 million and $265,000 respectively.[51] If these figures were added to the total expenditures of the last fiscal years of the utilities, the result would be a deficit of nearly $2.0 million in the case of the provincial organization, and a reduction of net profit to approximately $1.1

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[49]George Reid, Director of Finance, Manitoba Hydro, by interview.

[50]M.H.E.B. Eleventh Annual Report, p. 13.

[51]Ibid., also City Hydro Annual Report 1962, p. 12.

TABLE 6.4

Direct Subsidies to the Manitoba Power Commission
From the Province of Manitoba
1933 to 1961[1]

Year	Description & Statutory Provision	Amount
1933		$ 96,834.88
1934	Bonus Water Power Rentals	104,261.72
1935	Rentals for Water Powers	104,542.00
1936	(Sec. 8, Chap. 37, S.M. 1931)	106,970.29
1937		112,817.46
1938		113,305.95
1939		119,863.48
1940		128,871.96
1941	Rentals for Water Powers	126,392.62
1942	(Sec. 8, Cap. 166, R.S.M. 1940)	124,635.90
1943		126,598.04
1944		132,269.96
1945		131,696.14
1946	Rentals for Water Powers	149,238.92
1947[2]	(Sec. 8, Cap. 166, R.S.M. 1940 as amended)	50,512.32
1948		158,512.17
1949	Rentals for water powers	207,522.23
1950	(Sec.8, Cap. 166, R.S.M. 1940	318,827.70
1951	as amended)	479,849.78
1952		688,954.94
1953		882,555.92
1954		1,071,573.94
1955	Rentals for water powers	775,000.00
1956	(Sec. 10, Cap. 203, R.S.M. 1954	775,000.00
1957	as amended)	775,000.00
1958	Grant from the Government	775,000.00
1959	of the Province of Manitoba	775,000.00
1960	(Sec. 10, Cap. 203, R.S.M. 1954	275,000.00
1961[3]	as amended)	275,000.00
	TOTAL	$9,961,608.32

[1]There is no record of the subsidy having been given prior to 1933.

[2]Report is for 4 months ended 31 March, 1947. Previous reports ended 30 November.

[3]Final Payment.

Source: Manitoba Power Commission Annual Reports, Manitoba Hydro.

million in the case of the municipal agency.[52] In the instance of the Manitoba Hydro, this would have the effect of a 10-12% increase in the wholesale costs of power, and would require an immediate revision of rate schedules in order to bring revenues more in line with expenses.[53] With respect to corporation taxes, this would represent (at the applicable 50% rate) in the case of City Hydro a further cost of about $550,000. The tax consideration might not affect Manitoba Hydro to the same degree, except as allocations for contingencies and general reserve might be taxable as income, since operating plans do not provide for major surpluses and financing does not include any equity which, otherwise, would necessitate surpluses (taxable as income) sufficient after taxes to pay dividends.

Now it must be determined how far this situation may be justified. Possible answers may be found in the context of the wider responsibilities of government. The assumption of responsibility for the power industry by the Government of Manitoba required, first, that the Province put its weight behind the combined operations which it eventually brought together in the Manitoba Hydro. This was all the more important in view of the very large capital investment represented (some $296.6 million in 1962)[54] and the essential risks involved in large power projects. The demonstrated importance of electrical power in the economy of the Province meant that there could be no uncertainty as to the adequacy and continuity of supply.

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[52] Ibid.

[53] Manitoba Hydro.

[54] M.H.E.B., op. cit.

Further, the credit of the Province was now inextricably bound up with the credit of the industry, and savings on borrowing costs would also be in the interests of the Government. It seems justifiable, therefore, that financing would be assisted and underwritten by the public authority concerned.[55]

This approach might apply equally to both utilities in Manitoba. Beyond this general support, however, it may be argued that exemption from payment and responsibility for the various types of expense items discussed represents direct public endowment of the general operations of the utilities which is unrelated in any specific way to economic or social purposes, and is therefore difficult to justify. Except for special provisions which may be maintained for specified purposes (which themselves stand scrutiny), such exemptions should be abolished, and the commercial enterprise and competitive ability of the utilities left to determine whether the industry will have to retrench or will be able to grow and flourish without them. In the case of City Hydro, this would mean expense items such as legal work and auditing being charged to the utility, and amounts approximating taxes which would be paid if the utility were privately-owned plus a reasonable surplus on operations (in lieu of dividends) budgeted for and returned to the City of Winnipeg each year.[56] With regard to Manitoba

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[55]It could also be argued (as suggested by E. V. Caton) that the necessary capital required for the electrical power industry today could not be raised readily, if at all, without the assistance (and possibly the guarantees) of government. Consequently, even private industry would have to go "into partnership" with public authority to some degree, and under the circumstances the question of subsidization (in this respect) becomes less relevant.

[56]Political realities make it obvious that no funds could be turned over to the Province or the Government of Canada in lieu of corporation tax payments.

Hydro and the Province, similar arrangements might apply. And in the event that existing revenues might not be sufficient to meet these increases in expenses, rate structure should be revised (over a period of time, if necessary) in order to bring them more in line with actual utility expenses.

In view of these various considerations, then, it behooves industry management to seek out and to develop new markets where opportunities permit; specifically, to encourage new applications and promote high load factor consumption. In this, time is also a factor, not only on account of competition, but also because a major slowdown in the rate of growth may mean smaller units of capacity being added in succession rather than large single developments (such as northern hydro) which, in the long run, is likely to result in higher capital and operating costs.[57] Consequently, it is necessary to campaign actively by all means available--advertising, appliance merchandising, and so on--in order to attract customers.

In this latter respect, it is apparent that after the reorganization of the industry in Manitoba between 1953 and 1955 effort of this kind noticeably declined. Industry advertising was reduced, and with the Manitoba Power Commission planning to vacate the appliance field there was pressure on the City Hydro to do likewise. However, in the face of competition from natural gas, major additions to capacity about to enter service (Grand Rapids), and uncertainties as to existing consumption forecasts for

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[57] Supra, Chapter III.

the next few years, the need for intensive advertising and for appliance outlets as a means of promoting and selling consumers on electrical uses may be greater now than at any time in the past. Only the electric utility has an assured interest in electrical appliances as such (the dealer may be happy to sell a gas range), and it is questionable how far independent outlets have the resources (or even the basic interest) to carry on an effective campaign against natural gas competition.

Brief mention might be made as to the form effective competitive effort from the industry might take. It is usually assumed that the success of electrical power for many uses in the past has been solely a matter of price advantage over other energy sources. But convenience, adequacy and ease of supply and ease of application are frequently more significant from a consumer standpoint than price. In this same respect, gas holds certain advantages over oil for space heating, while oil is superior to the old-fashioned stoker. None of these, however, provide heating as economical as hand-fired Souris coal, if this is the prime wish of the potential customer. Nevertheless, natural gas is having the greatest current success in this particular market. Following the same analogy, the electrical power industry hopes to compete in other ways, in addition to price, and has entered the market for domestic space heating (admittedly more costly) on the basis that electricity provides greater comfort, safety, and freedom from odor. Similarly, the industry remains to fight for water heating (with some current success), and is intent on developing new uses, particularly for residential customers.

Also important to the competitive position of the industry is the ability to maintain high load factor consumption. At the present time, demand for electricity varies significantly on a daily and seasonal basis, and load factor has remained between 50% and 60%. This situation was improved by the introduction of water heating controls during peak periods, removing perhaps 65 megawatts from the daily peak demand.[58] Recently, however, peak cut-off was found to have shortcomings, such as reducing the element of convenience and continuity of hot water supply wanted by customers and making it more difficult to compete with natural gas in this market. As a result, no more controls are being installed and existing ones are being removed where necessary in order to retain customer goodwill.

There do not seem to be any other ready uses in which controls can be applied, although the problem is under continuous review by both utilities. Off-peak consumption could therefore be encouraged and promoted. The main area for study in this regard would appear to be in developing ways of counteracting the wide seasonal variations in load. Certainly the adoption of air conditioning on an increasing scale would help raise the summer load and hence the system load factor.[59] The use of electrical space heating might also help, providing storage of heat is part of the principle of operation. Energy requirements would not affect peak demand,

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[58]Manitoba Hydro.

[59]This is dependent on electrically-powered air conditioning units being competitive with natural gas units.

and peak controls would not provide serious difficulties from the consumer standpoint. However, there is no evidence to suggest that electrical space heating will make a significant impact on the domestic market, and it is difficult to determine how far this form of consumption will become a factor in utility operations.

Turning now to the broader economic and social purposes of government, the role of the industry with respect to resource development and economic growth might be explored. In this realm, development of the industry may serve both as a tool and as an end in itself. For example, large power supplies available at low cost may help attract power-intensive industries and assist the competitive position of companies producing for export from the Province. At the same time, industry expansion itself represents a growth factor in the economy and electrical power contributes both directly and indirectly to the relatively high standard of living enjoyed in the region.[60] Specific policies on the part of the Government might include encouragement and support of hydro projects where feasible (as against thermal development) and the promotion of electrical energy in competition with natural gas in order to reduce the dependency of the Province on imported fuels and perhaps improve the import-export balance

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[60]The use of the word "region" usually implies or refers to an area with certain natural geographical factors, unifying or setting it apart from other areas. In Manitoba, however, the term is increasingly being used in a more insular sense to refer to the territory bounded by the Provincial limits. To avoid confusion, this will be the sense in which the term will be used.

of the region. Contrariwise, authorities may be satisfied to see the industry compete on a reasonably equitable basis with other industries in order to assure proper use of resources and prevent undue concentration of effort and capital in uneconomic use of electricity or any other energy form. While the policies of the Province in this respect are not clear at the present time (if, in fact, any have been developed) it is reasonable to assume that the Government will (as in the past) adopt a pragmatic approach to the subject and do what seems necessary at any given time to protect the service as a public asset and to keep the industry reasonably sound and prosperous.

In view of the foregoing, several suggestions might be made as to suitable government policy with regard to the industry during the next 10 to 15 years. First, the Province should seek to complete the integration of all generating and transmission facilities in Manitoba under the aegis of the Manitoba Hydro. This would eliminate the present unwieldy management of the Winnipeg River, and by ending the joint decision-making process afflicting so many industry matters (capital development, rate-making, marketing analysis, and so on) achieve an undoubted increase in efficiency and possible economies of operation.

With regard to development, the Province might encourage and assist exploitation of domestic hydro such as the Nelson River system. It is generally believed (though not fully substantiated by field studies as yet) that this resource could be developed now if large enough markets could be assured, and that it will never be more competitive with other sources of power than it would be if completed at present construction costs,

although present high interest rates provide something of a problem.[61] The actual decision to go ahead will be based on a variety of considerations, such as the possibility of securing much of the necessary capital at long-term interest rates of say 4-5%, arranging export of power on favourable terms (including provision for recapture), and developing grid interconnections with utilities in Minnesota and North Dakota. In all this, the active participation of the Government would be essential, and perhaps a crucial factor if cost considerations were found (in the final analysis) to favour the project. Further, by special efforts to attract power-intensive industries to the Province, the Government might assist in the load building necessary to justify the additional power for eventual use within the region. The final outcome of these various efforts, however, must depend on realistic cost and market analyses and the impetus likely to be given to both the industry and the regional economy. Such projects must never be permitted to become mere shibboleths or hobby-horses for political purposes, nor risked on the basis of vague or uncertain advantage which might accrue for the future.

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[61] This represents a concensus of views expressed informally by a number of senior personnel in the industry. However, in view of the fact that the entire subject is very topical and still under study, none with whom the matter was discussed was prepared to enlarge on the subject or be quoted.

CHAPTER VII

CONCLUSION

At the beginning, it was suggested that the character of the industry lent itself to analysis from the point of view of management policy. In proceeding with the study, several sorts of questions were asked of the material,[1] and these provided the basis of the approach taken throughout. In bringing the work to a close, some of the main elements may be summed up in terms of these original questions.

The principal objectives which have been determined for the industry have been to provide an ample supply of electric power at rates approaching the actual costs of service. A corollary of this has been the intention that electricity be paid for by the consumers, and not subsidized by taxpayers out of the public treasury, so that the industry (as a whole) might be essentially self-supporting. Equally significant for many years was the adoption in Winnipeg of competition in place of regulated monopoly control. Provision was in fact made for regulatory supervision, but this was never required, except in the early years, and subsequently was never utilized or imposed upon the industry. In rural Manitoba, a government monopoly provided for distribution of electrical service to the various municipalities, subject to the supervision of the Minister of Public Utilities and the scrutiny of the Legislative Assembly.

Underlying these objectives was the early vision of the seemingly boundless energy resources of the Winnipeg River, the important

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[1] Supra, pp. 52, 62-63, 136-37.

industries which might be attracted from the East, and the prosperity and "good life" which might be brought to the people of this Province. The benefits of electrification in the home and on the farm were within the reach of all, it was said, and might provide convenient and inexpensive lighting, cooking and water heating. This popular idea took hold during the early controversies surrounding the Winnipeg Electric Company and the apparent high cost of electricity. For promoters of publicly-owned power, an economic vision of potential development opened up and provided the impetus and momentum for the establishment of what eventually became the City of Winnipeg Hydro Electric System.

With the establishment of City Hydro and the charge to provide electricity at or near cost, the City of Winnipeg effectively set the rate at which power might be sold (i.e., at prices determined, in the final analysis, by the particular costs of the municipal utility). Beyond this, competition was left to be the essential regulatory force assuring maximum effort and efficiency on the part of both systems. This was facilitated by the joint pole agreement which reduced very substantially the distribution costs of each utility and provided a pattern for future cooperation at the operating level, while leaving competitive effort virtually unrestricted at the marketing level.

Policy objectives of the provincial utility were set by the Manitoba Government, but the operating side of the system was left largely to the administrative personnel of the organization. Free enterprise philosophy shaped official as well as public attitudes towards the publicly-

owned systems, and as long as statutory provisions and official directives were complied with both utilities were left virtually independent to pursue their respective objectives in the same fashion as commercial entities. The long-term object, even in the case of rural distribution which was assisted by the Province out of revenues from water rentals, was a self-supporting utility service requiring a minimum of public supervision, and most efforts were directed towards this end.

Finally, perhaps the key decision determing the course of events in the long-term expansion of generating capacity and consumption was the political decision respecting the 3 1/3¢ domestic rate in Winnipeg. This became almost the sine qua non of utility operation in the area, and led to the strenuous sales efforts of both City Hydro and the Winnipeg Electric Company, particularly in the early period between 1911 and 1929. Much of the subsequent development was based on the conditions and events which it precipitated.

After the Depression, the center of gravity in the industry shifted from the City of Winnipeg to the Province of Manitoba. The problems associated with the further development of generating capacity on the Winnipeg River and elsewhere placed the responsibility squarely on the doorstep of the Provincial authorities. While political intrigues might forestall the reorganization which would transfer existing generating capacity to the Province, this emerging responsibility was clearly apparent before the Plan C controversy actually ignited. Consequently, the new arrangements which followed simply accomodated the requirements of the situation, and the

retention of hydro generating stations by the City of Winnipeg did not, in substance, alter conditions or the main trend of events. Today, the initiative is in the hands of the Province, and the primary development authority and policy-making body is the Manitoba Hydro. Future development, it would seem, will be carried out on an integrated basis for the industry as a whole.

The actual development which took place over the years, however, was the result of the characteristics of hydro projects and the existence of major resources close to the principal market area. Low-cost power could be transmitted to Winnipeg from several suitable sites relatively cheaply, while the large potential market for electricity justified the large initial outlays required for the generating plants and distribution facilities. At the same time, high overhead costs and indivisibilities of investment (resulting in major additions each time new capacity was needed), when combined with the enforcement of 3 1/3¢ rates, brought about the great expansion of the industry indicated earlier. On the occasion of each new addition to capacity, new means had to be found to put the facilities to work, and the cumulative growth in the levels of demand required, in turn, further periodic additions to capacity.

This condition continues to exist today with the question of large power projects in the North, and even with the question of very large thermal generating stations. However, the terms are now somewhat reversed. Major developments are decided on the basis of whether large increments (at lower average costs) are necessitated by the rate of growth of demand

(rather than small additions of thermal capacity), and, if so, whether the possible savings in costs will justify the attendant risks. Smaller thermal units may be added in succession, although at higher long-term average costs. In any event, the development may be tailored to meet demand requirements, rather than vice versa.

The use of rates in the metropolitan area was conditioned by the domestic rate and the competitive struggle between the two utilities. The basic 3 1/3¢ rate, once established, enabled rapid extension of electric lighting, and it also led to the special cooking and water heating rates initiated for load-building purposes. Special industrial and commercial rates were used to secure important contracts for their addition to load, and the prestige associated with certain accounts was often important in determining the rate actually charged. Under the Manitoba Power Commission, rates tended to be promotional in nature in order to develop rural consumption, but standard rate schedules tended to be adhered to and there was not the same urgency in load building that was associated with the efforts of the generating utilities.

The most important market, from the City Hydro standpoint, was the domestic market, and considerable efforts were made to secure the major part of it. Competition was equally strong in the realm of commercial and industrial accounts where the Winnipeg Electric held sway, but there was little profit here even with the informal agreement to eliminate the more strident forms of competition between the two systems. The most profitable market remained the bourgeoning residential requirements, particularly after the Second World War.

Attempting to assess the extent to which public policy influenced the development of electrical power, it may be questionable how far public policy could have had a more significant result or positive effect on the early growth of the industry. Prior to the Second World War, governmental policy tended to be conservative and restrained where public projects were concerned (a reflection of the temper and training of the generation) in order to minimize both political and financial risks. But the net effect of the early political issues and decisions in the City market area was to initiate a lively competitive development which, when combined with the relatively prosperous times prior to 1930, was highly beneficial from the consumer standpoint and had remarkable results in terms of increasing capacity.

At the provincial level, there was not what could be described as a comprehensive "power policy," and the objectives associated with the establishment of the Manitoba Power Commission were fairly modest. During the Depression, there was a virtual hiatus in public policy with respect to power, and the concern of the authorities was limited mainly to solvency. However, the beginnings of a new awareness of basic social responsibilities on the part of the Province emerged during this period (brought about by the investigations and reports of the Royal Commission on Dominion-Provincial Financial Relations), and these found fruition in the Schmidt Report and the postwar farm electrification program. In turn, the Hogg Report served to delineate the responsibilities of the Province in terms of development and the integration of the entire industry. This

responsibility was in fact assumed in 1948 with the creation of the Manitoba Hydro-Electric Board and the beginnings of development at McArthur Falls.

Since that time, a positive though modest approach to power development seems to have been taken by successive governments in office. Integration and consolidation of the industry has proceeded as far as the political situation in Winnipeg has permitted, and development of generating capacity has continued in step with the needs of the market. The Manitoba Government does not as yet have a free hand, however, and as long as there are two generating and distributing systems involved in the decision-making processes planning and research (as well as management) will be much more cumbersome than necessary.

As indicated once previously, the problems of electric power today are related mainly to specific development objectives and technical questions of new means of supply. Most questions of organization, regulation and social purposes have been decided, resolved, and satisfied. Intensive development of the available resources has brought the potential to fruition and resulted in a well-developed electrical power system. The dream of electrification has been largely realized. Nevertheless, this has come about only during the past 15 to 20 years. Much more could have been achieved earlier, particularly during previous periods of prosperity. From 1911 to 1929, governments were largely neutral. Little was accomplished before the change in viewpoint during the 1930's (especially with respect to the Manitoba Power Commission), and it is

possible that some pronounced effort in the direction of farm electrification in the 1920's might have eased the severity of the decline subsequently suffered by Manitoba agriculture.[2] At the same time, events move quickly; the seriousness and extent of the slump was not immediately apparent. But once the economic hazards were understood and, after the War, the nature of the development problems became apparent, various solutions were found the necessary policies were formulated and applied. Government policy in the postwar made up in full for most of its previous shortcomings.

What, then, of the future? Briefly, public policy with respect to electric power should be geared to the promotion of more efficient resource use and improvements in general welfare. A suitable means of working toward this end was offered in the marginal-cost approach to utility operation and rate making. However, there is little likelihood of this approach being adopted in the near future. Nevertheless, the basic principle may provide justification for the present subsidizing of the industry, inasmuch as average prices in each class of use may approximate or approach marginal costs,[3] and existing special financial advantages have their greatest impact in the realm of (reducing) the fixed charges of the utilities. In other words, the operating position and financial

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[2]There is no universal agreement on this point, however.

[3]Block rates are used in all classifications, hence an equation of average and marginal costs is almost unavoidable.

basis of the utilities may approach or parallel that of the system under marginal-cost procedures, and existing special financial provisions should therefore be retained.[4]

Beyond this, government policy should be directed towards synchronizing development and extension of service with the growth of the regional economy and the emergence of new uses for electrical energy. What this will entail in terms of specific policies, however, is impossible to forecast. To paraphrase the librettist, circumstances will certainly alter cases. And, as a matter of record, this has been the history of the industry in Manitoba.

In the course of the investigation, a number of areas worthy of further study have been opened up. However, the inherent limits of this work precluded the additional investigation which they undoubtedly deserve. One avenue of possible research would be a more thoroughgoing analysis of the demand for electricity in an attempt to determine with much greater precision the character and dimensions of the various components. Much of this might be statistical analysis, but by a study of the historical requirements of selected firms, industries, and residential communities something more might be learned about the essential nature of the demand curve for power. Another subject would be an examination of present rate

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[4]This would not, under a rigorous application of the principle, apply to operating expense items, as discussed in Chapter VI. But, under the circumstances, this may be hair-splitting. The main problem is how to remove or offset fixed charges, and any reduction in annual outlay (i.e., of items which are normally fairly regular) would help to serve the purpose.

schedules, the manner in which they accomodate the various classes of demand, and the extent to which they may contribute to efficient use of resources or (contrariwise) promote maladjustment. Finally, the attempt might be made to determine the historical relationship (if any functional relationship has existed) between the growth of electrical power and the economic development of the Province. It is often suggested that the availability of electrical energy has been important to the growth of the economy, while some (including this student) suspect it has been beneficial but definitely a secondary factor. But no detailed study of the matter has ever been undertaken.[5] An investigation of this kind might also throw additional light on the theory of economic development. In any event, further study in these various directions will have to await other works and other occasions.

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[5] *i.e.*, none is known to present officials in the industry or is on file at the principal libraries.

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APPENDIX

APPENDIX

Comparative Rates for Electric Power In Winnipeg and Elsewhere Typical Power Bills - 1960

City	(1) Residential ($ per month)	(2) Commercial (¢/KW hr.)	(3) Industrial (¢/KW hr.)	(4) Large Industrial (¢/KW hr.)
Ottawa	4.37	1.94	-	-
Seattle	5.84	1.58	0.90	0.63
Montreal	5.87	2.09	1.38	0.79
Portland, Ore.	6.95	1.72	0.96	0.52
Hamilton	-	-	1.15	0.75
Toronto	7.88	2.25	1.45	0.90
Winnipeg	9.87	2.39	1.45	0.83
San Francisco	11.26	3.08	1.42	1.07
Detroit	11.64	3.25	2.12	1.05
Vancouver	11.86	3.35	1.53	0.87
Chicago	12.16	4.16	1.70	1.03
Cleveland	12.81	3.10	1.71	1.09
New Orleans	13.33	4.44	1.34	0.77
New York	19.68	4.39	2.22	1.54
Boston	13.33	5.59	2.07	1.26
North American Average	11.05	3.28	1.60	0.96

1. Typical Home - 600 KW hr. per month.
2. Typical Middle-sized general account - monthly demand 12 KW and 1500 KW hr. per month.
3. Average Manufacturing Plant - monthly demand 1000 KW; using 200 hours (1 shift) per month; consumption 200,000 KW hrs. per month.
4. Large Manufacturing Plant - monthly demand 3500 KW; using 400 hours per month (3 shifts, 5 days/wk.); consumption 1,400,000 KW hrs. per month.

Source: John Davis and David W. Ross.