ANALYSIS OF THE EFFICIENCY OF THE ELECTRIC UTILITY INDUSTRY DURING THE PERIOD OF 1954-1973

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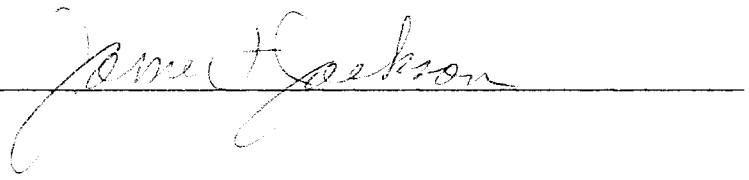
Scope and Method of Study: This report consists of an analysis of the efficiency of the electric utility industry during 1954-1973 in the area related to energy, plant and equipment, profitability performance and solvency. Several models of ratio analysis are developed to measure the efficiency of all investor-owned electric utilities which are available in The Utility Compustat Tape. The results obtained are applied to the industry as a whole.

Findings and Conclusions: The conclusion reached in this study is that the electric utility industry is now having a financial problem. Specifically, the industry will have difficulties in raising sufficient capital because of depressed earnings which can be generally attributed to the inflationary impact on the following areas: (1) high interest, (2) plant and equipment, and (3) fuel. An additional factor is the difficulty in obtaining timely rate increases because of regulatory friction. The financial problems facing the industry are severe and require public recognition of its need to provide adequate capital funds to meet the growing needs of electricity in the years ahead. The basic solution is to have adequate rate increases that will impress potential investors.

ADVISER'S APPROVAL 

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CHAPTER I

INTRODUCTION

An industrialized and affluent society such as the United States is fundamentally dependent on its energy supplies. Electricity is a form of energy that now plays an important role in the area of human activity.

The actions we now take to deal with the new energy situation, a "crisis" with both acute and chronic aspects, are not likely to reverse the historical trend toward electrification of the energy economy. Even though conservation efforts may tend to slow the previous growth rate of electricity consumption, as well as consumption of energy in other forms, the use of electric power in transportation may increase substantially in the future. Moreover, if mass transit systems are employed extensively in metropolitan areas, and many promising pollution control techniques are electric-intensive, the trend toward electrification of energy demand is expected to increase. Whereas today about one-quarter of the energy we use is in the form of electricity, in 2000 this proportion is forecast to reach one-half.[1] In short, electricity is likely to be the dominant form of energy consumed in the "post-industrial" society of the future.

At present, about 78 percent of the electric energy used in the United States is produced by investor-owned utilities. The remainder is supplied by a variety of federal, state, municipal, and cooperatively

owned agencies. Most of America's electric power needs are thus being met by a private sector composed of corporations owned by millions of individuals and thousands of institutional investor-pension, retirement, life insurance, and mutual funds. In a substantial sense, therefore, the electric utility industry and American economy are interdependent.

Statement of the Problem

Historically, the utilities have had relatively little difficulty in raising the large amount of capital that they required. The very stable nature of their earnings and the large proportions that they regularly paid out made their stocks and bonds attractive to investors.

Events in the last few years have undermined this situation. Inflation and a number of other factors have seriously eroded utility earnings. At the same time, the cost of money has risen rapidly. As a consequence of this combination of events, many utilities are rapidly approaching or have already reached the point where they are simply incapable of raising all the capital they need.

Even though the problems of raising capital are severe within the whole industry, this study will concentrate on the investor-owned segment of the industry due to the fact that non-investor-owned utilities receive advantages in the areas of regulation, financing, and taxes not accorded the investor-owned electric power companies.

Purpose of the Study

The purpose of this study is to ascertain the relative strength of some factors which have significant impact on the electric utility earnings. The selected factors to be analyzed in this study are the fuel cost, the interest cost and the required investment in plant and

equipment. The combination of the increase in fuel cost, cost of debts and required investment in plant and equipment due to inflation, and a number of other factors have contributed to the deterioration of utilities' earnings. At the same time, investors require much higher returns if they are to be persuaded to advance the needed capital. As a consequence almost all electric utilities find that there are strong financial incentives pressing them toward reduction of constructive programs.

Selected Models of Ratio Analysis

To assess the impact of the factors mentioned above, the following models of ratio analysis have been developed to measure the efficiency of the electric utility industry over the twenty year period of 1954-1973.

Energy Efficiency. The first model is designed to measure the energy efficiency, the ability to offset rising energy cost through technology in the short run. This model indicates the relationship between energy used and the output produced.

Alternate Efficiency Measurement. The second model attempts to measure the efficiency of plant and equipment. This measure can be illustrated in different ways. The first approach can be illustrated by the ratio of total net plant and equipment to the amount of output generated in a certain period. The second approach can be measured by the ratio of total net plant and equipment to net income. The last approach measures the relationship between total net plant and the operational level or load factor during the period of study.

Profitability Performance Measurement. Two models are developed

to measure the industry's operational performance. The first model is the return on investment (ROI), which is the ratio of net income to total assets. The other model used to indicate the profitability efficiency is earnings-per-share (EPS). EPS is used as a basis for predicting dividends and growth and hence future market values of common shares. EPS is the ratio of net income after interest, taxes, and preferred dividends to the number of common shares outstanding.

Solvency Measurement. The fifth model measures the ability of the electric utility industry to meet the fixed charges on long-term obligations. This model can also be illustrated in different ways. One of these is by coverage ratio, which is the very important financial ratio entering into consideration of the credit worthiness of an electric utility industry. This measure is defined as the ratio of income (before payment of interest and taxes) to interest obligations. Another ratio which seems more appropriate to measure the ability to pay fixed charges is defined by the ratio of cash flow to the fixed charges. The above models will be discussed in detail in Chapter IV.

Methodology of the Study

There are several ways by which the relationships between the factors and the efficiency of the electric utility industry can be developed. The first approach is by looking at a specific case and applying the results to the industry as a whole. The second approach can be developed by taking a number of samples from the whole population. The last approach is by examining the whole population of the investor-owned electric utility which is available in The Utility Compustat Tape. Each approach has both advantages and disadvantages. For the first two

approaches, the advantages are of conveniences and simplicity. However, according to the number of different characteristics of individual electric utilities such as their size, geographic area, and the differing views held by various state regulatory agencies, these two approachs, while feasible, would have a certain major drawback of any general applicability of the results for the industry as a whole. The last approach seems to be the best method, for it measures all companies within investor-owned electric utility. Still, there is the limitation in this approach since investor-owned companies generated about 78 percent of the electric utility industry. The remainder is owned by non-investor owned utilities which have different characteristics in terms of benefits received in the area of regulation, financing, and taxes as mentioned before. The results obtained might bring some bias in referring to the industry as a whole. However, this approach seems to be the best method of all three. The methodology to be utilized in this study will follow the one indicated in the last approach. This approach is used because of the advantages stated above and also because the data source for the purpose of ratio analysis is available in The Utility Compustat Tape. In the case of the first two approaches, it is considered that detailed information is needed to analyze each case or sample, which is far from the purpose of this study.

Organization of the Study

The present study is organized in six chapters. The first chapter, based upon the discussion presented above, is intended to present the purpose of this study. Chapter II is the brief overview of the history and nature of work of the industry. The objective of this chapter is to

provide a common background for the discussions in the subsequent chapters. Chapter III relates the characteristics of the electric utility industry with particular reference to the function of regulation on profit, trend in plant and equipment, and trend in financial requirement. Chapter IV is organized in two parts. The first part of this chapter involves the current problems of the electric utility industry in raising capital requirements, while the second part is concerned in detail with several models of ratio analysis which are developed to measure the effects of the selected factors on the efficiency of the electric utility industry during the twenty year period of 1954-1973. Chapter V is the presentation of analysis of the results of the models presented in the previous chapter. The final chapter discusses some recommendations to the financial problems of the electric utility industry.

FOOTNOTES

[1]Mason Willrich, "The Electric Utility and the Energy Crisis," Public Utilities Fortnightly, Vol. 95, (January 2, 1975), pp. 22-29.

CHAPTER II

REVIEW OF LITERATURE

The present chapter is devoted to providing a general background of the electric utility industry. A discussion will be made throughout this chapter of the following topics:

1. the history of the industry,
2. the nature of work in the industry,
3. the importance of the industry, and
4. the growth in the industry.

History of the Industry

The electric power industry in the United States began in the late 1870's as a street lighting and electric railway business, principally by electric companies. During a depression period when electric companies were unable to secure funds for expansion, municipally owned electric systems were established to provide street lights and to replace arc lighting systems. The Federal government entered the commercial power industry only incidentally when electric power was produced as a by-product of irrigation development and flood control. Power not needed in the operation of the projects was sold commercially. In 1932, electric companies owned 93 percent of the generating capacity in the country; municipally owned electric systems owned almost 6 percent; other government power agencies accounted for the remainder. The

segment of the industry owned and financed by government became more important in 1933. Numerous Federal multi-purpose projects, including power, were undertaken.(1)

At the present time, there are five ownership segments of the electric power industry. Besides those three segments mentioned above, state and power agencies and rural electric cooperatives are another two important power producers. State and district power agencies were formed with financing provided by the Public Works Administration. The latter were formed with financing provided by the Federal government.

In the electric utility industry, investor-owned companies receive less advantages in areas of regulation, financing, and taxes in comparison to the other four producers. By 1973 the share of the electric power industry owned by the electric companies had decreased to 78 percent when measured by generation of electricity. The Federal government's share was close to 11.5 percent; municipal and state and district agencies had the same percentage of 4.3 and cooperatives the remainder.

Table I indicates the share of privately, publicly, and cooperatively owned when measured by generation of electricity during 1962-1973.

Nature of Work

The electric utility business is inherently monopolistic because of the investment required in the business given a high ratio of investment to revenue. In addition the supply of electric service affects the public interest and is essential to public welfare. Direct competition is wasteful, uneconomical, and unsatisfactory in general.(2) The principal solution to this problem, which had been evolved over a

TABLE I

THE SHARE OF PRIVATELY, PUBLICLY AND COOPERATIVELY OWNED DURING 1962-1973

Year	Total	Privately Owned	Municipal	Power Districts, State Projects	Federal	Coopera-tives
1962	100.0	76.4	4.9	4.4	13.6	.7
1963	100.0	76.5	5.1	4.1	13.6	.7
1964	100.0	76.8	5.1	4.1	13.2	.8
1965	100.0	76.7	4.7	4.0	13.8	.8
1966	100.0	77.0	4.6	4.1	13.4	.9
1967	100.0	76.5	4.8	4.4	13.3	1.0
1968	100.0	76.7	4.8	4.6	12.8	1.1
1969	100.0	76.5	4.8	4.8	12.7	1.2
1970	100.0	77.4	4.7	4.3	12.1	1.5
1971	100.0	77.4	4.5	4.3	12.1	1.7
1972	100.0	77.6	4.5	4.2	11.9	1.8
1973	100.0	78.1	4.3	4.3	11.4	1.9

Source: Federal Power Commission, Statistics of Privately Owned Electric Utilities in the United States.

considerable number of years is to permit franchised monopolies to operate under government regulation.

Regulation serves to assure that the economies resulting from using a single supplier are passed on to the customers served by that supplier. In the United States, regulation of investor-owned electric utilities is generally performed at the state level, although with many exceptions. The primary emphasis of state commissions has been on regulation of rates; however, their activities extend into many phases of company operations such as granting the basic franchise, approving financing, establishing uniform accounting systems, auditing, reviewing depreciation policies, safety and adequacy of service, environmental factors, etc.

Electric utilities were made subject to Federal regulation in certain aspects by the Public Utility Act of 1935. One part of this Act, known as the Public Utility Holding Company Act of 1935, requires utilities to file a great amount of data with the Securities and Exchange Commission relating to issuance on securities, etc. The second part of the Act is called the Federal Power Act, which provides for regulation by the Federal Power Commission of the interstate business of utility companies.(3)

The process of supplying electric service is a highly mechanized operation and the product must be manufactured and delivered at the instant the customer desires it. No storage of the product is possible. This means that the electric utility plant, that is generating stations, transmission lines, substations and distribution circuits, must be of sufficient capacity to supply the maximum demand that all the utility's customers may make for service at any one time. Because of the highly

mechanized nature, the ratio of investments to revenue is higher than it is in most other businesses.

In the early days of this industry, many communities had their individual generating plants; however, there were a number of economies in large-scale operation, and by the process of integration over a period of years, nearly all private firms were vertically integrated, providing generating, transmitting, and distributing services as a single firm or through separate companies controlled by the same holding company.(4)

Importance of the Industry

The production of electric power is one of the most important industrial activities carried out in a modern economy. The generation of electric energy is a useful measure of a nation's economic strength and progress. During 1973 nearly 1.85 trillion kilowatt-hours (kwhr) were generated in the U.S. by utility and industrial power plants. Utilities accounted for nearly 95 percent of the U.S. total. Investor-owned electric utilities accounted for 78 percent of the total generated by utilities. Table II indicates the net generation of electricity in the U.S. by privately, publicly, and cooperatively owned during the period of 1962-1973.

Growth in the Industry

The electric utility industry has grown by leaps and bounds. This growth can be measured by a number of significant factors such as generating capacity, number of customers, kwhr sales, and revenue received. The following are some figures which indicate the growth of the industry.

TABLE II

ELECTRIC UTILITY NET GENERATION, UNITED STATES 1962-1973

Millions of Kwhr

Year	Total	Privately Owned	Privately, Publicly and Cooperatively Owned					
			Subtotal	Municipal	Power Districts, State Projects	Municipal Subtotal	Federal	Cooperatives
1962	854,796	653,076	201,720	41,840	37,889	79,729	115,926	6,065
1963	916,793	701,253	215,540	46,292	37,959	84,251	124,340	6,949
1964	983,990	756,183	227,807	50,263	29,675	89,938	129,935	7,934
1965	1,055,252	809,474	245,778	49,940	42,036	91,976	145,231	8,571
1966	1,147,364	883,851	263,513	52,627	46,644	99,271	153,067	11,175
1967	1,217,349	931,423	285,926	57,789	53,350	111,139	162,399	12,388
1968	1,332,131	1,022,000	310,131	63,804	61,352	125,156	170,834	14,141
1969	1,445,282	1,105,262	340,020	69,614	69,648	139,262	183,245	17,513
1970	1,532,796	1,186,069	346,727	71,490	66,023	137,513	185,755	23,459
1971	1,613,936	1,250,005	363,931	72,535	69,678	142,213	194,490	27,228
1972	1,747,323	1,356,677	390,646	78,922	73,378	152,300	206,736	31,610
1973	1,849,260	1,444,927	404,333	78,536	79,754	158,290	210,873	35,170

Source: Federal Power Commission, Statistics of Privately Owned Electric Utilities in the United States.

(Growth statistics of the electric utility industry during 1954-1973 are shown in Table III.)

The present chapter provided a common background in the history and nature of work in the industry. The characteristics of the electric utility industry were described. The following chapter attempts to relate these characteristics with reference to the function of regulation on profit, trend in plant and equipment, and trend in financial requirement of the industry.

TABLE III

GROWTH STATISTICS OF THE ELECTRIC UTILITY INDUSTRY
DURING 1954-1973

Source: Edison Electric Institute

Year	(In Thousands) Number of Customers	Kwhr Sales	(Investor-Owned) Revenues
1973	61,030	1,578,121	28,675,244
1972	59,329	1,464,740	24,979,520
1971	57,796	1,358,452	22,024,600
1970	56,581	1,289,454	19,532,614
1969	55,392	1,215,801	17,804,600
1968	54,385	1,105,950	16,352,225
1967	53,313	1,004,762	15,064,241
1966	52,424	942,474	14,227,979
1965	51,248	853,826	13,264,730
1964	50,269	791,201	12,549,784
1963	49,559	732,289	11,903,999
1962	48,699	685,711	11,282,872
1961	47,829	631,279	10,556,672
1960	47,074	599,107	10,008,002
1959	46,037	558,560	9,395,388
1958	44,857	506,981	8,619,067
1957	43,923	496,929	8,225,677
1956	42,800	473,367	7,703,278
1955	41,469	431,875	7,127,367
1954	40,241	374,917	6,487,152

FOOTNOTES

[1]Murray L. Weidenbaum, Financing the Electric Utility Industry, New York: Edison Electric Institute, (1974), p. 24.

[2]Russell E. Caywood, Electric Utility Rate Economics, New York: McGraw-Hill Book Company, Inc., (1972), p. 2.

[3]Ibid., p. 4.

[4]Stephen G. Breyer and Paul W. MacAvy, Energy Regulation by the Federal Power Commission, Washington: Brookings Institute, (1974), p. 90.

CHAPTER III

ELECTRIC UTILITY INDUSTRY

This chapter is devoted to provide a general background in the areas of rate regulation, the trend in plant and equipment of the electric utility, and the trend in its financial requirement. These three areas play the major roles in the financial problems of the electric utility industry.

Characteristics of Regulation on Profit

A utility has the problem of meeting all operating costs, earning a sufficient return on its investment to attract new funds for expansion and maintaining the integrity of the investment. This problem has to be done with rates that meet competition, that is, rates that do not exceed the value of service to the customer.

Prior to the early 1870's regulation of railroads, street railways, and gas companies was accomplished by charter, if there was any regulation at all. But in 1877, the Supreme Court ruled in the Granger cases and in Munn V. Illinois that rate control is a legislative function under the police power. The emphasis was on the right of the state to establish maximum charges with no thought of the owner whose property was in public use.(1) This case suggests the concept of a public utility.

Objectives and Nature of Rate Regulation

Although differences on specifics of the general functions of rate regulation may emerge, there is virtually universal agreement that the most important activity of the regulatory authority is to function as a regulator of utility earnings as a substitute for the direct competition found in the field of non-utility enterprise. In simplest terms, regulators perform two tasks. The first is to determine the company's overall requirements. These must be sufficient to cover all costs (which include operating expenses, depreciation, interest and taxes) and to yield a fair profit, or "rate of return" which enables the company to attract the necessary capital for maintenance and expansion of its services. The second task is to devise the appropriate rate structure consisting of a schedule of charges, which when applied to the various services that the company provides, will satisfy the overall revenue requirements. For both of these steps it is necessary to determine the value of the "rate base" - the company's capital investment in plant and equipment used in providing each regulated service. The amount of profit that the company is allowed to earn is expressed as a percentage of the rate base.(2)

The historic case of Smyth V. Ames (169 U.S. 466-1898) introduced the concept of fair value in the regulation of rates.(3) At that time, the reproduction cost was less than the original cost, the case coming at the end of a long period of price decline following the War Between the States. A definite ruling on the question of price change was avoided, but some guidance was given on the determination of reasonableness. The famous case of Smyth V. Ames was apparently the origin of the term "fair value." The reproduction cost idea was sharply drawn

during and immediately following World War I. This idea was due to abrupt price increases, together with unfair treatment of the utilities by the commissions, that put the companies in financial difficulties. The utilities went to the extreme with the reproduction cost idea to get relief.

It was not until 1942 in the Natural Gas Pipeline case, and 1944 in the Hope Natural Gas Company case, that the court said that the end result was controlling. The Commission was not bound to the use of any single formula or combination of formulae in determining rates. Instead, the U.S. Supreme Court laid down guidelines for utility regulation. The followings are excerpts from the Hope case:

> It is important that there be enough revenues not only for operating expenses but also for the capital costs for the business. These include service on the debt and dividends on the stock . . .By that standard the return to the equity owner should be commensurate with risks on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital.(4)

This sounds as though a substantial measure of financial protection is assured by law. However, public utilities are not, in any sense, guaranteed any rate of profit or level of earnings. This has been clearly stated by the Supreme Court in the Natural Gas Pipeline case (1942), as follows:

> Regulation does not insure that the business shall produce net revenues, nor does the Constitution require that the losses of the business in one year shall be restored from future earnings . . . the hazard that the property will not earn a profit remains on the company in the case of a regulated, as well as an unregulated business.(5)

Today, many concepts of value and rates of return have been supported and used to the great extent to which utilities are subject

to the eccentric action of individual regulatory commissions. They vary very substantially in the pattern of their decision making as well as in the manner in which they apply rates of return. Some commissions tend to grant higher returns to their electric utilities than do other commissions. This variation is likely to be the result of decentralized regulation responding to a variety of economic, political, geographic, and social circumstances. The considerable variation in the overall rates of return which are allowed to individual companies is apparent. The results were shown in a special survey conducted by the Edison Electric Institute covering 219 electric rate cases which were settled during the three-year period of 1971-1973. The allowable rates of return were ranging from less than 6 percent to over 9 percent (as shown in Table IV).

In addition to differing views held by various state regulatory agencies, the other aspect of regulation which appears to have provoked the greatest amount of interest during the recent period of rapidly rising utility costs has been the delay or "lag" involved in regulatory commissions acting on requested changes in electricity rates.

Regulatory Lag

There is widespread feeling that many regulatory practices are badly in need of overhaul. Many agencies are so concerned with current consumer attitudes that they are adopting and enforcing rules that may have serious uneconomic effects on future generations, especially in permitting new facilities construction. Current policies, often reflecting the years of the 1930's depression, pay inadequate attention to the nature of today's economic environment, with its higher prices,

TABLE IV

VARIATIONS IN ALLOWABLE RATES OF RETURN
(IN ELECTRIC RATE CASES SETTLED DURING PERIOD)

Time Period	Less than 6%	6 - 7%	7 - 8%	8 - 9%	9% and Over	Total
1/1/71 - 3/31/72	1	17	48	14	0	80
4/1/72 - 6/30/72	1	3	13	6	0	23
7/1/72 - 9/30/72	1	2	8	8	0	19
10/1/72 -12/31/72	2	2	10	9	1	24
1/1/73 - 3/31/73	5	0	11	5	1	22
4/1/73 - 6/30/73	1	3	8	4	0	16
7/1/73 - 9/30/73	0	3	9	5	0	17
10/1/73 -12/31/73	1	4	5	8	0	18
Total	12	34	112	59	2	219

Source: Edison Electric Institute

rapid growth, and fuller employment.

In the past few years, however, utilities have suffered, as regulatory commissions continued to rely on original cost and have not sufficiently recognized the increased cost of debt and equity money resulting from excessive inflation. Action by regulatory agencies often is slow, but with today's economy of rapidly changing prices and interest cost, such delays can become very expensive. As interest rates rise, the lag between an approval for a rate increase and the sale of securities may be so great as to make the rate of return even, if it is increased, unfair.

In an informal survey of electric utilities, undertaken in May, 1974, the Federal Reserve System reported that the regulatory process had not been accelerated . . . despite the severity of the financial problems which these firms face.(6)

One measure of the increasing dimensions of the "backlog" problem can be found in the data on the number and value of the increases pending at the end of each quarter for the period of 1970 through the second quarter of 1974 (as shown on Table V). There has been a fairly steady and substantial increase in the backlog of pending rate cases, measured both in terms of number of cases and total amount of rate changes requested.

Another measure of the increasing backlog problem can be seen from the figures on new filings for rate increases made by investor-owned companies (as shown in Table VI). An extremely rapid increase has been occurring during the last few years, in the period 1970 through the second quarter of 1974.

TABLE V

BACKLOG OF ELECTRIC UTILITY RATE CASES

Quarter Ending	No. of Cases Pending	Total Dollar Value of Increases Pending ($ Millions)
3/31/70	45	512
6/30/70	46	615
9/30/70	47	435
12/31/70	59	679
3/31/71	71	939
6/30/71	86	986
9/30/71	105	1,237
12/31/71	99	1,157
3/31/72	96	938
6/30/72	104	1,067
9/30/72	102	1,317
12/31/72	99	1,123
3/31/73	96	1,059
6/30/73	123	1,572
9/30/73	112	1,283
12/31/73	137	1,656
3/31/74	144	2,052
6/30/74	169	2,678

Source: Edison Electric Institute

TABLE VI

NEW FILINGS FOR ELECTRIC RATE INCREASES

Quarter Ending	No. of Cases Filed	Total Dollar Value of Requests for Increases Filed in Quarter ($ Millions)
3/31/70	12	89
6/30/70	21	209
9/30/70	16	61
12/31/70	31	437
3/31/71	31	451
6/30/71	36	325
9/30/71	29	361
12/31/71	17	231
3/31/72	22	171
6/30/72	35	412
9/30/72	26	442
12/31/72	27	180
3/31/73	22	114
6/30/73	45	703
9/30/73	24	280
12/31/73	47	762
3/31/74	45	638
6/30/74	55	1,188

Source: Edison Electric Institute

Some Approaches of Regulatory Practices

During the past year, a number of commissions and courts have given consideration to the changes which have occurred in price levels. The degree of acceptance and the methods of allowing for the price changes have shown a wide range of variation, and there has been little indication as yet of any consolidated opinion as to the best procedure to be followed. Among the methods which have been used are:

Rate Bases. Traditionally, most state commissions have used the original cost of the applicable company investments to estimate rate base. Recently, a modest number of commissions have used a replacement or "fair-value" basis. In a period of rapid inflation, the latter approach is likely to yield a higher base for rate making.

Interim Rates. In some states, interim rate increases may be granted while a rate increase is being considered by the regulatory commission; typically, the interim rate is lower than the request being considered. This clearly is an effort to reduce the length of regulatory lag. A recent approach is for the commission to grant a temporary approval of the requested increases, with the proceeds held under bond; thus, if the commission ultimately rejects the increase or approves a lesser amount, all or a portion of the proceeds must be refunded to the customers.

A Future Test Period or a Future Rate Base. Some commissions have been experimenting with the use of estimated future costs as a basis for fixing rates. In July, 1973, the Federal Power Commission issued order No. 487 providing for a twelve-month test period beginning as late as the date when the increased rates were proposed to go into effect. The

order covers wholesale rates where the proposed increase is in excess of $1 million; for smaller increases, the use of a future test period is optional.

Automatic Cost Pass-Throughs. To deal expeditiously with the frequent increases in the cost of fuel purchased by electric utilities, many regulatory commissions have authorized companies to add an automatic adjustment to utility bills to cover such increased and relatively uncontrollable costs. The use of these automatic devices tends to reduce regulatory lag, but not to eliminate it. Although automatic pass-throughs of fuel and other cost increases can be useful to utilities, it should be realized that they do not provide a panacea. These rate adjustments are one-for-one pass-throughs, with no increase in net income.

The methods mentioned above are some of the means which have been used by the commissions to help utilities in meeting the financing requirement during the period of inflation.

Regulated Industry Earnings During Period of Inflation

Though inflation is serious and a long-range problem for most sectors of the economy, it is especially significant for the electric utilities due to a number of factors concerning the nature of the industry. One of these features is their tremendous need for new capital. A typical utility requires about $4 of capital to generate one dollar of revenue. In contrast, the average manufacturing company needs only 75 cents to produce a dollar of revenue. Inflation increases both the cost of capital and the amount needed. It is significant that a typical utility takes substantially less than 100 percent of its return

into earnings. The rate of return applied to a utility's rate base equates to the net operating income, or is the result of a company's operations after the Federal income tax, but before interest and other capital costs. Rising interest rates alone during period of inflation could erode the return on common equity substantially. At the same time, the expansion and replacement of the property at higher unit costs brought the decrease of the net earnings of some utility companies resulting from higher depreciation expense and property taxes. In addition, most manufacturing companies have equipment with a much shorter life. The more rapid turnover of plant and equipment investment enables the manufacturing company to react more quickly in pricing its products. They are also able to adjust prices, control expenditures, vary product and inventory lines, and effect other internal policies with greater freedom.(7)

Professors Kamerschen and Wallace of the University of Missouri also stated that:

> Regulated industry is exposed to more risk than non-regulated industry during period of inflation in that regulated firms cannot readily adjust prices to compensate for the effects of inflation, whereas non-regulated industry historically has had the ability to adjust prices promptly in response to inflation. Regulated industry must await the effects of inflation on earnings before an application can be made, there is an additional waiting period to allow for consideration of the application by the commission. This increases the risk of inflation for regulated industry. Also, regulated utilities have less opportunity to exit from old markets and enter new ones than do industrial firms because of the large fixed investment tied to a particular market and the necessity of obtaining authorization to make such changes which itself is a costly, time-consuming task.(8)

At present, the high rate of inflation has increased the costs of everything such as labor, fuel and especially the cost of construction and investment in plant and equipment.

Trend in Plant and Equipment

The electric utility industry has the highest ratio of investment to any sector of the industrial economy. For investor-owned electric utilities this ratio has consistently averaged near 4. Other industries normally have much lower ratios of net assets to revenues. A large number of manufacturing industries turn over their assets in less than one year.

Historical Trend

Over most of the history of the electric utility industry, plant costs per kilowatt of capacity remained stable or showed a downward trend. The gain from advancing technology and increasing plant size in accordance with economies of scale available in production, transmission, and distribution were sufficient to offset the effects of inflation.

During the past few years, the dollar cost of additional capacity is above the historical costs of facilities. This increasing cost is due to a number of factors, such as the higher degree of inflation which increased the cost of capital and magnified the amount needed for investment. In addition, some of the rise in plant investment per kilowatt is due to the installation of more complex, capital-intensive plant. These upward pressures result from the construction of facilities which are noticeably different in characteristics from existing equipment. Nuclear power stations are a primary example of such a new plant. Fossil fuel stations equipped with elaborate environmental protection devices can also be said of underground distribution plants.

All these factors not only eroded the earnings of utilities but also increased the new higher level of risk due to the long-term life of plants and equipments and the limitations given to the regulated industry.

Projected Plant Construction for 1975-1980

Forecasts of capital spending by investor-owned electric utilities are made regularly by the Edison Electric Institute and by trade publications such as Electric World. Normally, these estimates are on a constant dollar basis with possible rates of inflation suggested for developing current dollar figures. Edison Electric Institute has estimated that investor-owned electric plant construction will entail the expenditure of $57,250 (on constant 1973 dollars).

TABLE VII

PROJECTED PLANT CONSTRUCTION BY ELECTRIC UTILITIES

Year	Constant 1973 Dollars (Millions)
1975	$13,800
1976	14,160
1977	14,460
1978	14,830
Total	$57,250

Source: Edison Electric Institute

Forecasts of the industry's future capital expenditures are also prepared by numerous organizations outside the electric utility industry. Most emanate from the financial community and are generated by analysts particularly conversant with utilities. Some estimates are made

by academic researchers and by experts in fuel supply and equipment manufacturing industries for which electric utilities represent important customers.

Recently, almost all utilities find that there are strong financial incentives pressing them toward reduction of their construction program.

Faced with the problem of raising capital needs along with the changing pattern of electricity demand, the Detroit Edison Company announced that it was reducing its five-year capital spending plans from $3.6 billion to $2.95 billion, an 18 percent cutback.(9)

Consumers Power Company of Michigan has said that it will delay for about a year the planned openings of two major electric plants originally scheduled for the late 1970's and early 1980's because its internal projections suggest "a reduction in the rate of growth in the electric demand over the next 5 to 10 years."(10)

Commonwealth Edison Company of Chicago in July cancelled plans to build two 500,000 kilowatt-fired generating plants because of "reduction in the estimates of peak loads."(11)

A group of 10 electric companies reported to the Delaware River Basis Commission that the area needs three fewer new nuclear power plants during the next 15 years than the originally proposed in 1972.(12)

Trend in Financial Requirement

One of the characteristics which, at least in the past, has been associated with regulated utilities as a general proposition is the stability of net income growth. The investor-owned electric utility industry is one of the beneficiaries. Reliance on the past pattern of the stability of its net income growth, the industry is characterized

by a highly leveraged capital structure, a far higher proportion of debt to stockholders' investment than is present in most other industries. This stability in earnings growth allowed the common equity investor to view high debt ratios with little concern because of his confidence in the availability of adequate earnings. Other industries, which lack stable growth in their net income, have depended less on debt financing and normally seek to generate a large portion of their new capital internally. When outside financing is needed, firms in these industries more often resort to the sale of new equity.

Sources of Capital Funds

Normally about 60 percent of an electric company's capital needs will be covered from external sources, although this figure can vary from year to year. In period of rapid expansion external sources may have to be relied upon for as much as 70 percent of the investments. Whereas in 1972, all non-financial corporations, on the average, obtained 55 percent of their funds from internal sources, far more capital intensive electric utilities got only 31 percent in that fashion.(13) This heavier reliance on external sources is due to the fact that despite its massive size, the industry does not have the internal financial reserves to weather periods of stress in capital markets or in the electric utility industry especially.

For external financing, electric utilities rely heavily on capital markets whereas other companies generally obtain a portion of their funds via bank loans and other short-term indebtedness. The great and rather unique dependence of electric utilities on capital markets arises from a combination of factors. One of these is the highly capital-intensive

character of the industry and its continual need for new capital. The modest availability of retained earnings is not sufficient to finance its large capital programs; hence the industry depends heavily on external sources. According to its long-term capital projects, it is to a minor extent that short-term financing could be expected to be utilized, and thus the great dependence is on continually attracting new long-term capital into the industry.

Factors Which Restrict Leverage in Recent Years

In all utility long-term debt indentures there is a limitation on the issuance of debt securities, usually referred to as the "coverage requirement." The general effect of this limitation is that the company may not issue new bonds or debentures if the ratio of earnings to interest charges has been less than the specified minimum for twelve of the fifteen months prior to the month in which the new securities are to be issued.

The survey done by Edison Electric Institute indicated that in 223 electric utility rate cases settled during the three-year period 1971-1973, 212 or 95 percent of the utilities had indentures which specified that interest payments must be covered at least 200 percent by earnings before interest and income taxes. (This is shown in Table VIII.)

Over the past few years, electric utilities have seen their interest burdens increase rapidly because of two factors. One of these is the dramatic rising in long-term interest rates. The other is the steadily expanding construction programs which required more capital. Since 1964, yields on utility bonds have nearly doubled while annual

TABLE VIII

MINIMUM INTEREST COVERAGE REQUIRED BY INDENTURE
(IN ELECTRIC RATE CASES SETTLED DURING 1971-73)

Required Interest Coverage	No. of Cases	Percent of Total
Less than 2.0	11	5
- 2.0	192	86
2.1 - 2.5	17	8
2.5 - 3.0	1	*
3.0 and over	2	1
Total	223	100

*Less than 1 percent.
Source: Edison Electric Institute

TABLE IX

ELECTRIC UTILITY CAPITAL OUTLAYS AND BOND YIELDS
DURING 1964-1973

Year	Overall Average Yields on Utility Bonds End of Year Average (%)	Electric Construction Expenditures ($ Million)
1964	4.53	3,567
1965	4.85	4,050
1966	5.63	4,962
1967	6.56	6,140
1968	6.85	7,168
1969	8.57	8,323
1970	8.29	10,182
1971	7.87	11,939
1972	7.48	13,435
1973	8.21	14,979

Source: Moody's Investor Service; Edison Electric Institute

construction expenditures have more than quadrupled. (As shown in Table IX.)

The concurrent rise in capital requirements and interest rates has produced a rate of increase in debt service charges exceeding the growth of electric utility earnings. This in turn has led to a steady decline in the ratio of earnings to interest, a decline so pronounced that for many companies this key index has fallen to the minimum level permitted by indenture restrictions and effectively arrested the issuance of additional debt.

In a few indentures, the ratio is as low as 1.75 and in some cases, over 3.0, where in the majority of cases, the required coverage ratio is 2.0. The effect of this limitation is that new long-term debt cannot be sold if the company's earnings, before the payment of Federal income tax, is not at least double the amount of interest it is required to pay on its long-term debt securities outstanding and proposed to be issued.(14)

In addition, as the coverage ratio declines toward the specified minimum, the utility's bond rating is likely to be reduced, which means an increase in the interest cost of new debt and further aggravation of the coverage problem, and also further restrictions on the potential market for future bonds.

According to the dramatic increasing in interest burdens, the maintenance of previous debt/equity ratios could only result in a substantial climb in the annual level of interest charges on long-term debt. Reacting to these pressures, electric utilities have attempted to alter the mix of their incremental long-term financing by expanding their sales of preferred and common stocks. Trends in the mix of new long-term financing illustrate the new construction since 1968. In

addition to the markedly heavier reliance on common stocks, preferred stock has been an instrument for fixed-interest financing when problems of diminishing coverage ratios threaten the expansion of debt. Table X illustrates the changing importance of the major sources of the industry's capital from 1968 to 1973.

TABLE X

COMPOSITION OF NEW LONG-TERM CAPITAL FROM 1968 TO 1973
(PERCENTAGE DISTRIBUTION)

Year	Long Term Debt	Preferred Stock	Common Stock	Retained Earnings	Total
1968	64.3%	9.3%	9.2%	17.2%	100.0%
1969	65.3	7.2	11.5	16.0	100.0
1970	57.6	12.7	19.3	10.4	100.0
1971	50.0	17.1	24.5	10.8	100.0
1972	45.3	20.1	23.0	11.6	100.0
1973	45.9	15.1	26.6	12.4	100.0

Source: Edison Electric Institute

Capability of the Industry to Finance Its Capital Needs

The internal generation of capital does not play as important a role in the financing of electric utility expansion as it does in most other industries. Normally, about 40 percent of an electric company's capital needs will be covered from internal sources. Large increases in construction budgets over the past several years of high inflation have been reflected in a reduction in the relative importance of internally generated funds as a source of financing. The percentage was reduced to as much as 30 percent of the industry's capital needs.

Three principal sources of internal funds are retained earnings, depreciation and amortization, and provisions for deferred or future income taxes. Of the three, depreciation and amortization is the most important, providing more than 60 percent of the total internal funds flow. Retained earnings are the second most important source. Deferred income taxes are still a relatively minor contributor to the overall flow but have increased rapidly since 1966 as various tax measures designed to stimulate investment have begun to make their influence felt.

The contribution of depreciation charges to the flow of internal funds will depend on the trend in average annual depreciation rates. Over the past several years, the average depreciation rate has shown a tendency to decline. This is due to the effects of several factors such as regulatory influences, company depreciation policies, a rising proportion of plant with a longer expected useful life, and increased construction work in progress.

Conclusion

From Chapter III it can be concluded that during the period of inflation, regulated industry such as electric utilities suffer more than non-regulated industry. This is the result of the characteristics of rate regulation on profit coupled with regulatory lag.

It is noted that the electric utility industry will have to rely heavily on external financing due to the large amount of investment required and the inability to generate a sufficient amount of internal funds. Despite its massive size, the utility does not have the internal financial reserves to meet periods of stress.

Recently, rapid inflation and the ecology movement have eroded the utility earnings. Moreover, high interest rates have reduced the ability of utilities to carry debt. It is the vast capital expenditure program, coming at a time when utility finances are in a weakened condition, which is bringing about a financial crisis in the industry. The following chapter will discuss in detail the current problems of electric utility industry in raising its capital requirements.

FOOTNOTES

[1]Caywood, p. 178

[2]The Monopoly Makers, Ralph Nader's Study Group Report on Regulation and Competition, New York: Grossman Publishers, (1973), p. 75.

[3]Smyth V. Ames, 169 U.S. 466 (1898).

[4]F.P.C. vs. Hope Natural Gas Co., 320 U.S. 519, (1944).

[5]Charles Tatham, Measures of Public Utility Bond Quality, New York: Bache and Co., (1970), p. 19.

[6]Weidenbaum, p. 105.

[7]David R. Kamerschen and Richard L. Wallace, "Opportunity Cost and the Attraction for Utility Rate Regulation," Public Utilities Fortnightly, Vol. 91, (February 15, 1973), p. 44.

[8]Weidenbaum, p. 105.

[9]Detroit Edison Cuts its Spending Plans 18% Due to Finance Woe," The Wall Street Journal, (May 22, 1974), p. 27.

[10]"Consumers Power to Delay Opening Two Electric Plants," The Wall Street Journal, (May 3, 1974), p. 4.

[11]"Big Chicago Utility Drops Plans to Build Two Coal-Fired Units," The Wall Street Journal, (July 5, 1974).

[12]Sanford Jacobs, "Money Raising Problems Cause Utilities to Cut Spending for New Electric Plants," The Wall Street Journal, (July 19, 1974), p. 26.

[13]Weidenbuam, p. 57.

[14]William R. Brown, "Rate Cases and Utility Financing," Public Utilities Fortnightly, Vol. 91, (February 15, 1973), p. 39.

CHAPTER IV

DERIVATION OF ANALYTICAL MODELS

This chapter is organized in two parts. The first part involves the current problems of the electric utility industry in raising its capital requirements while the second part is devoted to provide several models of ratio analysis to measure the efficiency of the industry during the period of 1954-1973.

Current Problems in Raising Capital Requirements

Since 1950, the total capitalization of the investor-owned electric utility industry has approximately doubled every 10 years, an average annual growth rate of 7.2 percent. Since 1966, the rate of increase has exceeded this figure by an increased amount each year. In 1971, the growth rate was over 13 percent. This increase in growth rate is largely the result of inflationary increases in costs, rather than any acceleration in the rate of real growth.(1)

Typical Financing Methods

There is a great deal of similarity in the financing methods employed by the major investor-owned utilities. In part this can be accounted for by the fact that most companies were subject for a time to the SEC's regulatory authority under the Public Utility Holding Company Act of 1935 and, even if not now so subject, their basic

mortgage indentures and corporate charter provisions relating to financing are likely to have been determined while they were. Even for those companies that were never subject to SEC regulation, the Statements of Policy of the SEC relating to first mortgage bonds and preferred stock (and the SEC's antecedent, less formally articulated, policies) have provided a general framework.

The typical electric utility capital structure includes funded debt, preferred stock and common stock. Such funded debt will almost invariably include first mortgage bonds and may also include unsecured long-term debentures. Although there has been some utilization of debt instruments of a shorter maturity, the pattern is one involving first mortgage bonds maturing 30 years after issuance with no cash sinking fund and, where they are used at all, unsecured debentures maturing 25 years after issuance with a cash sinking fund that will retire a little less than half of the issue prior to maturity.(2)

Although not all major investor-owned electric utilities have issued preferred stock, the majority have done so. The SEC's statement of Policy relating to preferred stock of subsidiaries of registered holding companies provides that the preferred stock terms shall limit the utility's permissible unsecured indebtedness to not more than 20 percent of total capitalization, of which not more than one-half shall be of an original maturity of less than 10 years.

The capitalization ratios of electric utilities represent a balance between the security requirements of investors, (represented by the SEC) and rate regulatory bodies, which at times have urged higher debt ratios because of the lower cost of this component of capital to rate payers. The issue of security is raised squarely by the current

implementation of environmental laws, which may affect the timing of commercial operation of new units and their qualifications as bondable property under existing utility trust indentures. Certainly, utilities experiencing major setbacks and delays in new units for environmental reasons have seen these problems reflected in the market price of their common stock.(3)

Not only are the capital requirements of the electric utility industry large in absolute magnitude, they are accelerating. The total amount of capital expenditures of the investor-owned electric utilities in the 20 year period from 1941 to 1960 was $40.1 billion. This figure understates the total expenditures of the entire industry but represents the general magnitude. In the succeeding decade, 1961 to 1970 expenditures by the total industry were almost $74 billion.(4)

Financial Crisis

The electric utilities are embarked upon an unprecedented program of capital expansion. The invested capital of the electric utilities will be expanding at an average annual rate in the neighborhood of 12 percent. It is this vast capital expenditure program, coming at a time when utility finances are in a weakened condition, which is bringing about a financial crisis in the industry.(5)

A number of factors have played a role in the ripening of this general financial crisis of the electric utility industry. Rapid inflation has eroded earnings while the conservation movement has led to still further reductions. High interest rates have reduced the ability of utilities to carry debt, in addition to having the effect of further erosion of earnings. Some of the conflicts in the current public

policies such as environmental regulation, antitrust rulings as they affect pooling and ratemaking as it affects the cost and availability of capital also affect the electric utility industry. These three areas mentioned above are interrelated. Environmental policies may affect the amount of capital required by a utility system and rate making policies may affect the cost of the new capital. Similarly, antitrust policies may influence the structure of growth in the industry and consequently its ability to comply with environmental policy. A weakened stock market in addition to all these other problems, is severely limiting the ability of utilities to sell new issue of common stock. Thus, at the very time when the electric utilities are least capable of raising capital in any form, their need for capital, and especially their need for externally generated capital, is unprecedently great.

The utilities will have to rely on an unusual degree on external sources of funds in order to finance their capital expenditure programs. In the mid 1960's, external financing accounted for about half of the capital expenditures of the electric utilities, the remainder being provided for by depreciation and retained earnings. Thus far in the 1970's, however, external financing has accounted for about 75 percent of capital expenditures.(6) This heavy reliance on external financing is due to the fact that the amount of funds which the utility can generate internally is relatively fixed in proportion to its existing net plant; depreciation funds are generally allowed for as a fixed proportion of investment in plant, and the rate of earnings is also proportional for the regulated utility industry on the investment in plant which it has made. The high rate of capital expenditure relative to existing plant produces strange consequences. In the mid 1960's capital expenditures

by investor-owned electric utilities averaged 5 to 6 percent of gross plant; now they run at twice that rate. But internally generated funds are only 4 or 5 percent of plant. Thus, to pay for construction which is running at 12 or 15 percent of plant requires massive external financing.(7) The reason is rather simple. The rise in the internally generated funds is not parallel with the rise in capital expenditures. So the former will account for only 25 or 35 percent of capital expenditures, while the rest must be raised externally. Thus, in relative terms as well as in absolute terms, the electric utilities are much more dependent on raising external funds for the financing of their capital expenditures program than they were only a few years ago.

Events in the last few years have depressed the steady growth of the utility earnings. Many utilities have experienced declines in earnings and traditional dividend increases have not been forthcoming. This situation has been compounded by a general deterioration of the securities markets and the weakness of many of the firms in the securities industry. These circumstances have had a profound impact on utilities' efforts to raise sufficient capital.

Problems in Selling Senior Securities

One of the factors which causes the problems of selling senior securities is that all electric utilities are required by the SEC to show their coverage ratios in prospectuses accompanying issues of new debt securities. These coverage ratios are heavily relied upon by the financial rating agencies in evaluating the quality of utility bonds. In the past six years, utility coverage ratios have declined greatly, and the bonds of many utilities have had their ratings downgraded by the

rating agencies. But an even more serious problem is that the bond indentures of earlier issues of utility bonds have provisions which prohibit the utility from issuing additional bonds when the coverage ratio falls below a given level, usually 2.0 times. Many utilities are rapidly approaching or have already reached the point where they are legally prohibited from selling additional bonds. Moreover, as utilities continue to sell some new bonds at today's very high interest rates, the coverage ratios will tend to decline even more rapidly. This would occur even if the rate of return on equity were not to be deteriorated.

It is recognized that the electric utilities will not be able to finance their projected capital expenditures without heavy reliance upon new issues of common stock. Given their continuing needs for fresh capital, utilities just cannot afford to be cut off from the debt market which gives them nearly 60 percent of external financing. But neither can they afford to allow their debt - equity ratios to deteriorate, because a declining debt - equity ratio also rapidly gets a utility's bond downgraded. Utilities are forced, therefore, to sell common stock in quantities surpassed only by the quantities in which they sell debt. For most utilities today, this is a crunch.(8)

Problems in Raising Common Equity

The basic problem which the electric utilities face in raising common equity capital in the market rises out of the combination of two factors: first, the sheer amount of stock that will have to be sold year after year, and second, the prices of utility stocks have been depressed below their underlying book values.

In the mid sixties, utilities were selling around $200 million

worth of new common stocks a year. The forecasting made by Charles A. Benore, a vice president at brokers Mitchell, Hutchins, Inc., who is regarded by financial institutions as Wall Street's top utility expert, indicated that from now through 1978, the utilities will be asking the markets to buy an average of $3.3 billion of new common stock a year.(9)

To get stocks sold, utilities are accepting the hitherto unthinkable as commonplace: they are offering it way below book value. These low market to book ratios for the electric utility industry are of relatively recent vintage. In January 1973, virtually every company in the industry had a market price equal to or above book value; the leading exception, Consolidated Edison, had a market to book ratio of 0.83. While market prices drift down during most of 1973, owing to the growing awareness of energy problems, there were still only a minority of companies whose stocks were selling below book value. Then came the Arab oil embargo, and by December 1973, the average company's stock market price was just below its book value, and more than half of the companies had market prices below book value. Since then, utility stock market prices have continued on their downward drift, depressed by a combination of factors such as declining earnings due to conservation, sharply rising interest rates and the passing of the dividend by Consolidated Edison Company. The latter event altered many investors to the very real possibility that not all electric utilities could be counted on to be able to maintain, let alone increase, their dividend rates. In fact, investors began to be concerned about the large proportion of reported utility earnings which appears to be "paper earnings" and which called into question the apparent ability of utilities to continue to meet their dividends.

According to these factors, investors in electric utility stocks were now requiring substantially higher rate of return prospects. Today, with the average utility stock selling at 80 percent of book value, most utilities have no option, even though they are well aware that selling below book doubles the difficulty of improving earnings per share and dilutes new stockholders' real-ownership.

The mere fact that the sale of stock results in a decline in earnings per share, while an unhappy fact for those who have invested in the company's common stock, is not itself financially disastrous. But it can become financially disastrous if the company embarks upon a succession of large stock sales of this character. There is a real danger that attempts to sell huge amounts of common stock at today's low prices, which are partly due to inadequate earnings, will initiate downward spiral in utility stock prices, in which lower book values per share result in lower allowed earnings and still lower market prices which in turn drive book value down further--all to the point of making investors unwilling to buy any large amounts of utility common stock.(11)

Today a substantial number of the companies are clearly in a situation where their market-book ratios were so low that they will be unable to raise enough common equity capital to finance any really substantial growth. Moreover, the overwhelming majority of companies are in a situation such that they have a strong incentive to avoid growth in invested capital in the financial interests of their stockholders. Others have developed new methods of raising needed capital, which often have turned out to be more expensive than the traditional means. Many others have reluctantly postponed, cutback or cancelled capital projects.

It is the purpose of this study to indicate the relative strength

of some factors which have significant impact on the electric utility earnings. The selected factors to be analyzed in this study are the fuel cost, the interest cost, and the required investment in plants and equipments. The combination of the increasing in fuel cost, embedded cost of debts and additional investment in plants and equipments due to inflation have contributed to the deterioration in utility earnings. At the same time, investors require much higher returns if they are to be persuaded to advance the needed capital. As a consequence almost all electric utilities find that there are strong financial incentives pressing them toward reduction of their construction programs.

Models of Analysis

Several models of ratio analysis have been developed to analyze the efficiency of the electric utility industry over the twenty year period of 1954-1973.

The major objective of using ratio analysis is considered to be the facilitation of financial statement interpretation. This is basically achieved by reducing the large number of financial statement items to a relatively small set of ratios. The number of different ratios that can be computed from financial statement items is large. However, since most of these ratios are economically meaningless, a large part of the information contained in financial statements could be conveyed by a relatively small number of ratios. Such ratios allow a meaningful comparison of financial data over time.

The financial analysis literature usually views ratios as indicators of firm deficiencies, such as poor liquidity or low profitability. Thus, the negative function of ratios is emphasized--an

unfavorable ratio is significant.[12] Financial ratios are not intended to provide definite answers; their real value is derived from the questions they provoke. Ratios are, therefore, symptoms of the industry's economic condition. For this study all the investor-owned electric utilities are analyzed in time series rather than cross-sectional analysis since the major purpose is to look at the trend of the industry as a whole.

Selected Methodology

Three approaches can be developed to indicate the relationship between the selected factors and the earnings in the electric utility industry. The first approach is to look at a specific case and infer the results to the industry as a whole. The second approach is to select sample from the entire population of investor-owned electric utilities. The third approach is to examine the entire population. Information on the population is available on The Utility Compustat Tape.

For the first two approaches, the advantages are convenience and simplicity. However, because of the different characteristics of individual electric utilities such as their size, geographic area, and the differing views held by various state regulatory agencies, these two approaches would have a certain major drawback of any general applicability of the results for the industry as a whole. The last approach seems to be the best method since it measures all companies within investor-owned electric utility. However, the limitation in this approach is that investor-owned companies generated about 78 percent of the electric utility industry power while the remainder was generated by non-investor-owned utilities which have different characteristics in

terms of regulation, financing, and taxes. The results obtained from examining only investor-owned utilities might bring some bias in referring to the industry as a whole. This approach seems to be the best method. The methodology to be used in this study will examine the entire investor-owned utilities, as available on The Compustat Tape.

Selected Models of Analysis

The selected models of ratio analysis which have been developed to analyze the efficiency of the electric utility industry over the twenty-year period (1954-1973) are as follows.

Measurement of Efficiency

Energy Efficiency. The first model intends to measure the energy efficiency which is the ability to offset rising energy costs through technology. Coal, fuel oil and natural gas are three major kinds of fuel used in the generation of electricity. This model indicates the relationship of energy used and outputs produced, which is the ratio of fuel cost to the amount of kwhr sold in a certain period. Fuel cost (expense) can be defined as the total cost of fuel used in the production of steam for the generation of electricity. Specifically included are labor involved in purchasing and handling of fuel, storage costs, maintenance costs, freight involved with fuel, excise taxes and other related expenses. The formula for the energy efficiency can be written as:

$$E = \frac{F}{G}$$

where

E = energy efficiency

F = fuel cost

G = total kilowatt hours of electricity sold to all classes of customers in a certain period.

Alternate Efficiency Measurement

The second model intends to measure the efficiency of utility plant. Three approaches are selected for this study.

Efficiency of Net Plant. The first approach can be illustrated by the ratio of total net plant to the amount of outputs (kwhr) sold in a certain period. Total net plant can be defined as the total fixed plant and equipment (usually reported at cost) that is employed in the normal business operations of the utility company less the accumulated depreciation. Specifically included are funds allocated for plant construction, construction in progress, improvements to leased property and nuclear fuel. The formula for this ratio can be written as follows:

$$P = \frac{NP}{G}$$

where

P = plant efficiency

NP = total net plant

G = total kilowatt hours sold

Return on Net Plant. The second approach to measure the plant efficiency can be illustrated by the ratio of total net plant to net income after minority interest. Net income after minority interest can be defined as income after all operating and non-operating income minority interest but before preferred dividends including subsidiary, preferred and common dividends. It is also stated before all

extraordinary items that are listed in the company's public reports as being net of taxes. This ratio indicates the return on net plant. The formula can be written as:

$$Q = \frac{I}{NP} \times 100$$

where

Q = return on net plant

I = net income after minority interest

NP = total net plant

Load Factor. The third approach for this model intends to measure the operational level or load factor in different periods. The load factor is the ratio of actual output to the potential output associated with around-the-clock use of maximum annual supply. Load factor is a useful figure because it is an indication of the efficiency to which utilities use their capital assets.

The ultimate price that must be charged for electricity is related to the cost of capital, depreciation, insurance, and property tax. To keep total cost per unit of output as low as possible, a utility must seek to spread these fixed costs over the largest output possible. Therefore, a high load factor would indicate that the fixed assets are being efficiently utilized and that the percentage of fixed cost to total cost is reduced. Therefore, this load factor is important to a capital intensive industry.

Because of inflation during the period of study, the real figure of investment will be derived from the actual figure by using a price index factor.

Performance Measurement

Return on Investment (ROI). The third and fourth models are profitability ratios which are designed for the evaluation of the industry's operational performance. The numerator of the ratios consists of periodic profits while the denominator represents the relevant investment base. The ratios thus yield an indicator of the industry's efficiency in using the capital contributed by stockholders and lenders. One of the profitability ratios selected in the study is return on investment, which is the ratio of net income (after minority interest) to total assets. This ratio is a measure for the average profitability of the firm's assets. It is designed to indicate the efficiency of capital employment.

Since the numerator of the ratio represents a flow over the entire period while the denominator reflects the stock of assets at a given point in time, it seems preferable to measure total assets as the average of the beginning and ending balances of total assets.

The limitation of this ratio is that the historical valuation of assets in the balance sheet will bias this profitability measure upward during periods of rising price levels. While the numerator of the ratio is measured in current values, the denominator is measured in historical prices which are usually lower than current prices. This ratio can be written by the following formula:

$$ROI = \frac{I}{A}$$

where

ROI = return on investment

I = net income after minority interest

A = average balance of total assets

Earnings Per-Share (EPS). The other approach used in this study to measure the industry's operational efficiency is earnings per-share (EPS). EPS is a well-known and widely used indicator of the performance of the industry and firm. The earnings per-share figure plays a prominent role in practical investment analysis. It represents the amount of earnings allocated to one share of common stock. Earnings per share is the ratio of net income after interest, taxes, and preferred dividends to the number of common shares outstanding. The amount of net income remaining after deductions of preferred dividends is a crude but indispensable measure of the increase in well-being of common shareholders. Earnings per-share is used as a basis for predicting dividend and growth and hence future market values of common shares.

Despite its wide use in practice, the EPS figure also has some limitations. One of these is that it is often an ambiguous measure of performance because of the earnings retention phenomena. Since most industries or firms periodically retain a portion of their earnings, the amount of equity per share of these firms tends to increase overtime. Consequently, EPS will increase even though the industry's or firm's profitability of operations has not changed or even decreased. Given the retention phenomenon, EPS changes cannot be directly attributed to changes in the industry's performance. Despite this limitation, EPS figure still plays a prominent role in practical investment analysis. The formula for this ratio is

$$EPS = \frac{B}{N}$$

where

B = net income available for common

N = the number of common shares outstanding at year end

Solvency Measurement

Coverage Ratio. The fifth model intends to measure the ability of the electric utility industry to meet the fixed charges on long term obligations. This model can also be illustrated in different ways. One of these is the coverage ratio, which is an indication of the credit worthiness of an electric utility. The coverage ratio is defined as the ratio of income before payment of interest and taxes to interest charges. It is an indication of the safety margin of the fixed payments to lenders; the higher the ratio, the larger the safety margin. The formula for coverage ratio can be written as:

$$C = \frac{K}{S}$$

where

C = coverage

K = income before interest and taxes

S = interest charges

Cash Flow Coverage. Since the ability to pay interest is being examined here, another approach seems to be more appropriate than coverage ratio. This approach is defined by the ratio of cash flow (i.e. income plus depreciation) to total fixed charges. This ratio is shown by the following formula:

$$T = \frac{M}{S}$$

where

T = cash flow coverage

M = cash flow (income plus depreciation)

S = interest charges

Summary

The purpose of this chapter is to pinpoint the major problem of the electric utility industry in raising its capital funds. It is considered that this major problem is due to the deterioration in earnings. This deterioration can be highlighted by a study of the following areas: energy, plant and equipment, profitability, and solvency.

In order to measure the efficiency of the utilities in the areas mentioned above, several models of ratio analysis are developed to accomplish this purpose. Even though financial ratios are not intended to provide definite answers, they are symptoms of the industry's economic condition. Their real value is derived from the questions they provoke.

The following chapter will be the presentation and analysis of the results obtained from all investor-owned electric utilities available in The Utility Compustat Tape during the period of 1954-1973.

FOOTNOTES

[1]Financial Problems of the Electric Utility before the Senate Interior and Insular Affairs Committee Pursuant to S. Res. 45, The National Fuels & Energy Policy Study (Serial no. 93-50 (92-85)) Washington Government, (1974), p. 85.

[2]Ibid., p. 79.

[3]Ibid., p. 85.

[4]Ibid., P. 88

[5]Herman G. Roseman, "Utilities Financing Problems and National Energy Policy," Public Utilities Fortnightly, Vol. 94, (September 12, 1974), pp. 19-29.

[6]Ibid.,

[7]Irwin M. Stelzer, "Electric Utilities' Capital Supply: The Regulator's Challenge," Edison Electric Institute Bulletin, Vol. 42, (May/June, 1974), pp. 98-101.

[8]"Energy: The Problems of Raising Capital," Business Week, (May 25, 1974), pp. 102-108.

[9]Ibid.

[10]Ibid.

[11]Stelzer, pp. 98-101.

[12]S. Gilman, Analyzing Financial Statements, New York: The Ronald Press Company, (1934), p. 44.

CHAPTER V

PRESENTATION AND ANALYSIS OF THE RESULTS

Chapter IV has provided several selected models to measure the efficiency of the electric utility industry during the twenty-year period of 1954-1973. This chapter attempts to analyze the results of those models presented in the previous chapter. To accomplish this analysis, the results of the models are shown both in tables and graphic forms. (The tables are included in the appendices.)

Numerical quantities used to determine the model values were obtained from the OSU computer facility. Specifically, the data was extracted from The Utility Compustat Tape by computer. Since data are stored by individual companies, averages were computed for each variable to be used in the models.

Measurement of Efficiency

Energy Efficiency

This model indicates the relationship between the cost of fuel used and the amount of output produced. Among the three major kinds of fuel used in the generation of electricity, coal is the most abundant fossil fuel and provides the primary energy for about 54 percent of total electric generation.(1) Residual fuel oil contributes about 20 percent to the generation. Since 1965 fuel oil consumption by electric

utilities increased gradually. In 1965 generation by fuel oil was 7.5 percent compared to 19.7 percent in 1973.[2] The remainder of the electricity produced by fossil fuel is generated by natural gas which is the cleanest burning fossil fuel. It contains essentially no ash or sulfur and produces no significant sulfur oxides or particulate matter which accounts for its high use as a boiler fuel.[3] The average cost of fuel used per kwhr of output during the period of 1967-1973 is shown in Figure 1.

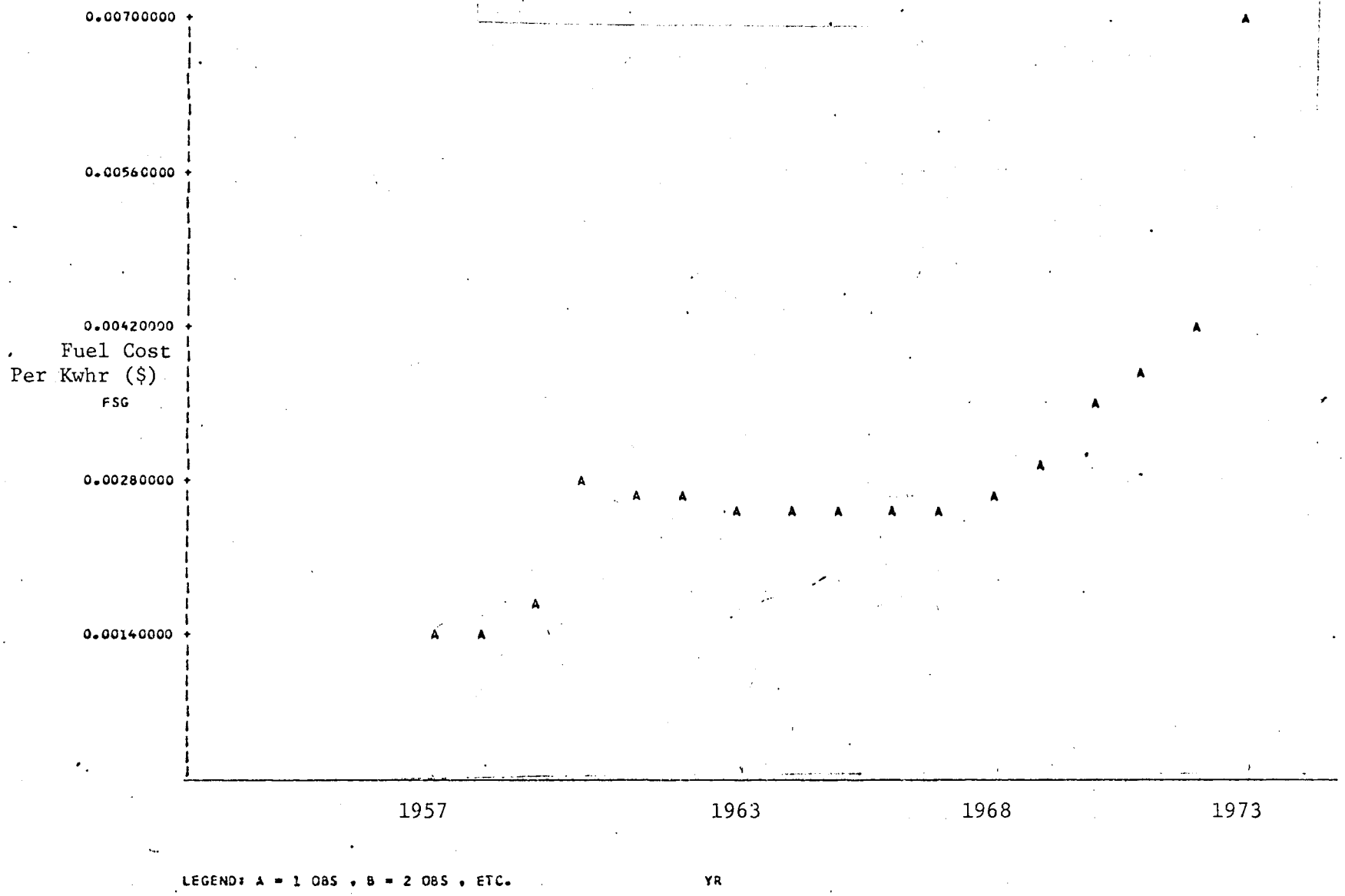
From Figure 1 it is recognized that during the period of 1960-1967 the cost of fuel per kwhr of output was stable with a slight downward trend. (The fuel cost per kwhr of output is also illustrated in Appendix A.) The stability of fuel cost despite inflation is due to the declining price of all fossil fuels especially coal, which is the most important fossil fuel used to generate electricity.

During this period (1960-1967), the growing number of large mines and an increase in the proportion of total coal output produced from these mines together with a declining trend in the average price of railway coal transport led to decreases in the price of coal to electric utilities.[4]

Starting in 1968, however, the fuel cost per kwhr has increased significantly. This increase in fuel cost can be seen clearly from the upward trend illustrated in Figure 1. The significant increase in fuel cost is the consequence of many factors. A rapid rise in total United States energy consumption, coupled with the issue of environmental protection and delays in nuclear plant construction programs have resulted in unprecedented high levels of demand for all fossil fuels.

During the past several years there has been a slow down in the

Figure 1. Trend Indicates the Cost of Fuel Per Kwhr During 1957-1973. All Investor-Owned Electric Utilities Available in The Utility Compustat Tape.)



development of new coal mines because of the growing competition from nuclear generating units and because of uncertainties about the quality of coal which would be demanded by electric utilities to meet air quality control regulations. In 1969 and during the first half of 1970, the demand for coal out-paced supply which caused a serious shortage of coal. The cost of coal increased substantially. For natural gas, the shortage seems to be due to the fact that the large gas producers cannot develop at an adequate rate because of government-controlled low prices.(5) At present there is great upward pressure on the price of natural gas. This situation also served to magnify an equally tight situation in residual oil supply. Recently, the increased demand for low-sulfur residual oil and its present scarcity have led to large price increases.

Some idea of the order of the magnitude of these increases may be obtained from the petition of Boston Edison to state and local pollution control authorities for a variance excusing it from meeting the one percent sulfur limit which became effective October 1, 1970, in the Boston area.(6) Boston Edison pointed out that meeting the one percent requirement would add $22.5 million a year to customers bills, amounting to an average increase of 7 percent for residential users, 8 percent for commercial users, and 14 percent for industrial users. Although fuel adjustment clauses have been helpful, regulatory lag and exclusions from these clauses have slowed the rate of cost recovery.(7)

From the historical trend, it can be concluded that the fuel efficiency of the electric utility is declining and that this trend will continue to decline due to the cancellation of nuclear plant which will push the cost of fossil fuel upward.

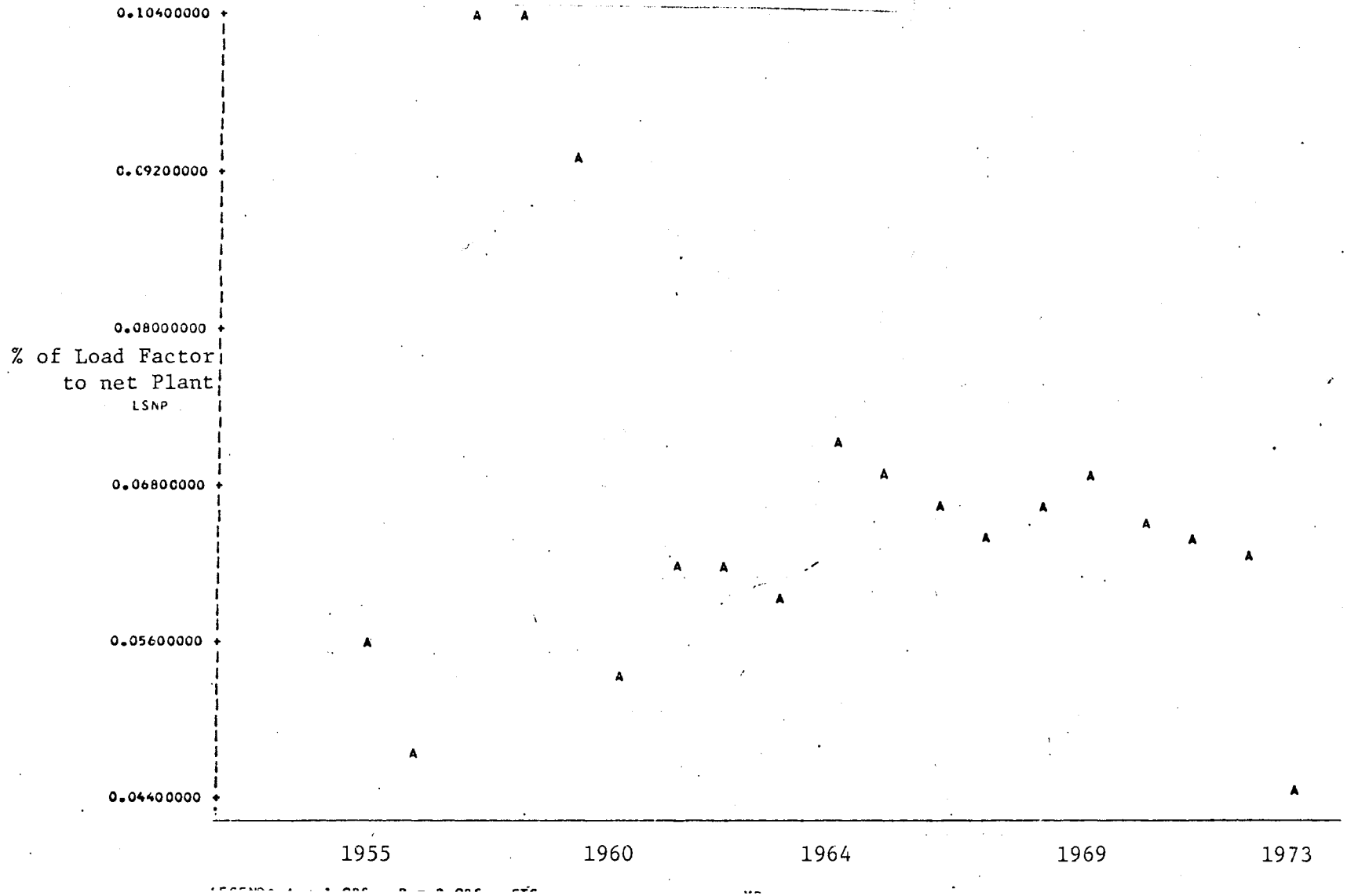
While this model is developed to measure the efficiency of the electric utility industry in generating fuel which is the largest component of variable cost, the following models tend to measure the efficiency of plant which has a major effect on the cost and pricing of electric service.

Alternate Efficiency Measurement

Load Factor

Normally, about 50 percent of the total cost of electric service can be termed "fixed" or not directly related to output. This percentage can vary from year to year primarily as a function of fuel cost, which is by far the largest component of variable cost. Recently, the percentage of fixed cost is increasing as a consequence of both the higher incremental costs of capital and the increasing emphasis on facilities with a high capital cost and low operating cost (e.g. nuclear generating station and extra high voltage transmission). To keep its total cost per unit of output as low as possible, a utility must seek to spread these fixed costs over the largest output possible. Thus, load factor is important in utility economics. To the extent that the load factor is increased, the cost of net plant per kwhr will decline. Figure 2 indicates the trend of the relationship between load factor and net plant during the period of 1954-1973. Since 1960 the trend of load factor fluctuated over time. Started in 1970 this trend moved downward rapidly and reached its lowest point in 1973. This declining trend is basically due to the decrease in the consumption of electricity in the early 1970's.

Figure 2. Trend of the Relationship between Load Factor and the Net Plant During 1955-1973. (All Investor-Owned Electric Utilities Available in The Utility Compustat Tape.)

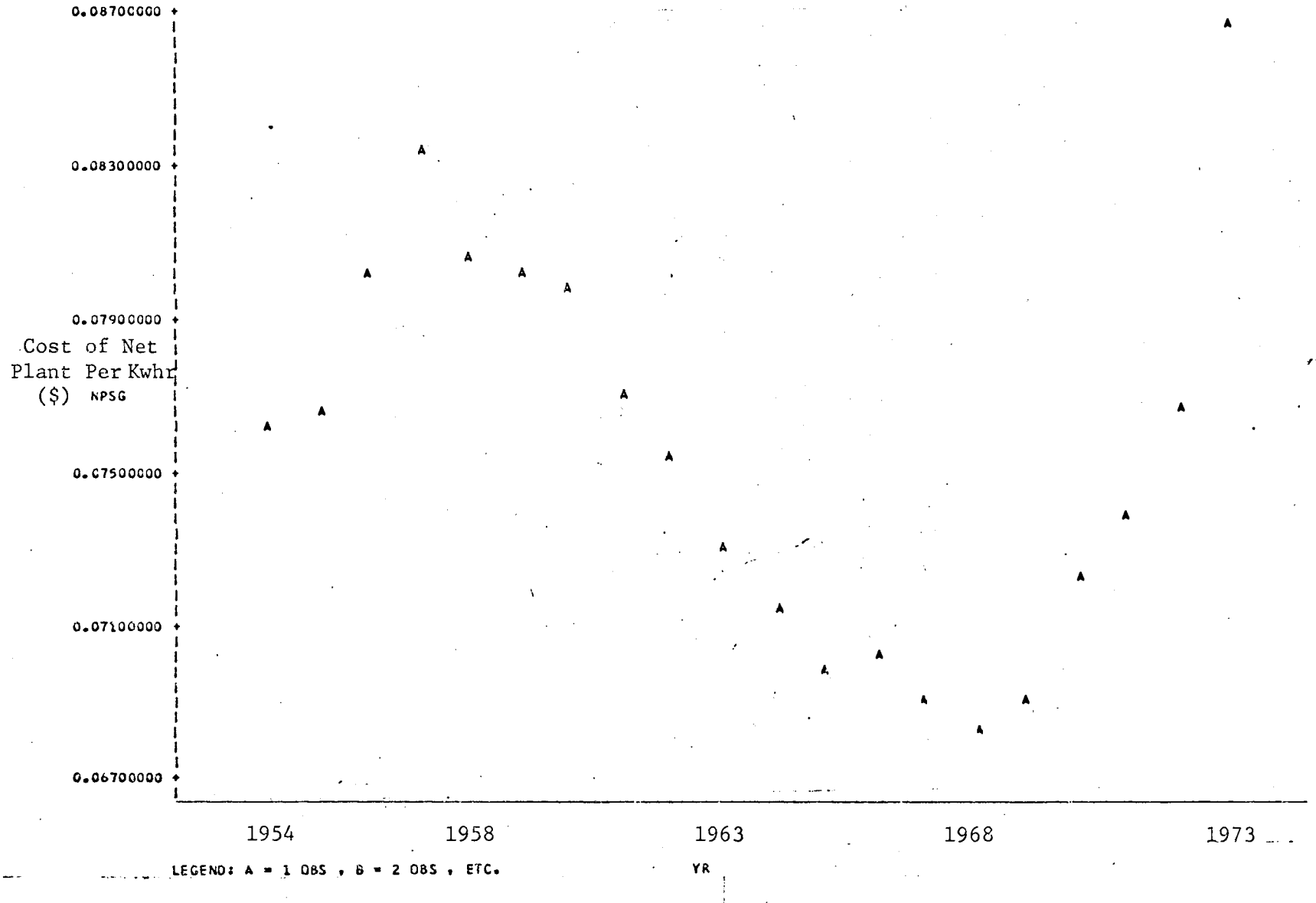


The decline in load factor has a major impact on the increasing cost of net plant per kwhr of output during the past several years. The increasing cost of net plant will be discussed in more detail in the measurement of plant efficiency.

Plant Efficiency

Figure 3 indicates the cost of plant per kwhr of output during 1954-1973. From Figure 3 it is recognized that during the period of 1958-1968 plant cost per kwhr of capacity had a downward trend. The decrease in the cost of plant per kwhr during this period is the consequence of the gains from advancing technology and economics of scale available in production, transmission, and distribution. These gains were normally sufficient to offset the effects of inflation. Toward the end of the 1960's and during the early 1970's a variety of factors combined to produce a profound reversal in the economics of electric utility operations. Basically, incremental costs were abruptly pushed well above historical average costs of most utility systems. Since 1969-1973, the decreasing trend in the load factor is reflected in an increasing cost of net plant per kwhr. This increase in cost of net plant is illustrated by the upward shifting of the trend as shown in Figure 3. (The cost of net plant per kwhr is also provided in Appendix C.) Thereafter, the percentage of fixed cost can be expected to climb unless the load factor is noticeably increased. In short run, the rapid rise in fossil fuel prices will tend to keep operating costs at a historically high proportion of revenue. As new and more expensive plant is added to utility systems and as nuclear energy supplies become an increasing share of total generation, the relative importance of plant costs will increase.

Figure 3. Trend Indicates Cost of Net Plant Per Kwhr During 1954-1973. (All Investor-Owned Electric Utilities Available in The Utility Compustat Tape.)



Return on Net Plant

The return on net plant is the relationship between the investment in net plant and net income. The cost of net plant per kwhr and the return on net plant are inversely interrelated. As the cost of net plant per kwhr of output increases, the return on net plant decreases.

Figure 4 indicates the trend of the return on net plant during 1954-1973. It is recognized that during the period of 1959-1965 the trend of the return on net plant shifted upward steadily. The increase in the return on net plant can be attributed to the advances of technology and economics of scale. Starting in 1966, the trend of the return on net plant decreased gradually. This declining return on net plant happened because of the rapid rise in the incremental cost of investment in plant and equipment and because of the economic regulation which based on historical or original costs.

Some of the factors which cause the rapid rise in the incremental cost of investment in plant and investment are the construction of facilities which are noticeably different in characteristics from existing equipment. In addition the new environmental ground rules, though beneficial to society as a whole could be very costly to electric utilities and hence to their customers. In other words, a kwhr of electricity produced with less polluting equipment will cost more than a kwhr of electricity produced with older equipment.

On top of all, inflation has a significant effect on the rapid rise of investment in plant and equipment. Inflation increases both the cost of capital and the amount of investment required. Table XI indicates the actual amount invested in plant in comparison to the real

Figure 4. Trend of the Return on Net Plant During 1954-1973. (All Investor-Owned Electric Utilities Available in The Utility Compustat Tape.)

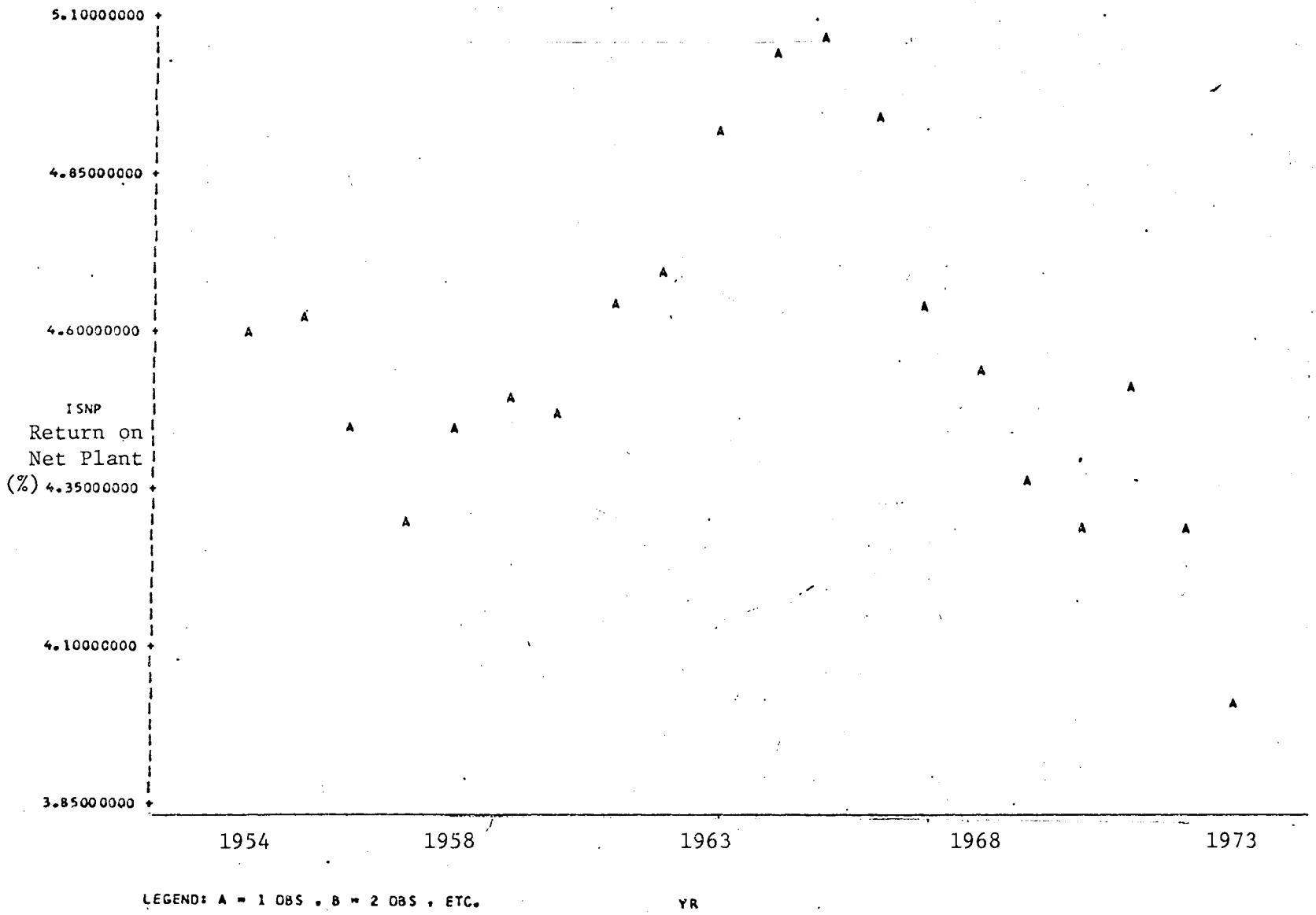


TABLE XI

AMOUNT OF ACTUAL INVESTMENT IN COMPARISON TO REAL AMOUNT (AFTER ADJUSTED WITH PRICE INDEX) DURING 1954-1973

Year	(a) Price Index (1967 = 100)	(b) Actual Amount Invested In Net Plant (Millions of Dolalrs)	Real Amount Required In Net Plant (Millions of Dollars)
1973	138.5	$114,558	$82,713
1972	127.3	101,710	79,897
1971	123.1	90,573	73,576
1970	119.1	80,539	67,623
1969	112.9	71,850	63,640
1968	106.4	65,384	61,451
1967	101.6	59,886	58,942
1966	98.6	55,288	56,073
1965	95.4	51,739	54,233
1964	93.6	49,095	52,451
1963	92.5	46,993	50,803
1962	91.0	45,008	49,459
1961	89.9	42,982	47,810
1960	89.3	40,725	45,604
1959	88.0	38,214	43,425
1958	86.7	35,991	41,512
1957	85.2	32,748	38,436
1956	82.7	29,782	36,012
1955	80.4	28,083	34,929
1954	80.1	25,092	31,325

Source: (a) and (b) from Edison Electric Institute, Statistical Year Book.

figure of required investment (after adjusted with the price index) during the twenty year period of 1954-1973.

While the above three approaches are developed to measure the efficiency of net plant in the electric utility industry during the period of 1954-1973, the following will concentrate more extensively on the profitability performance of the industry during the same period.

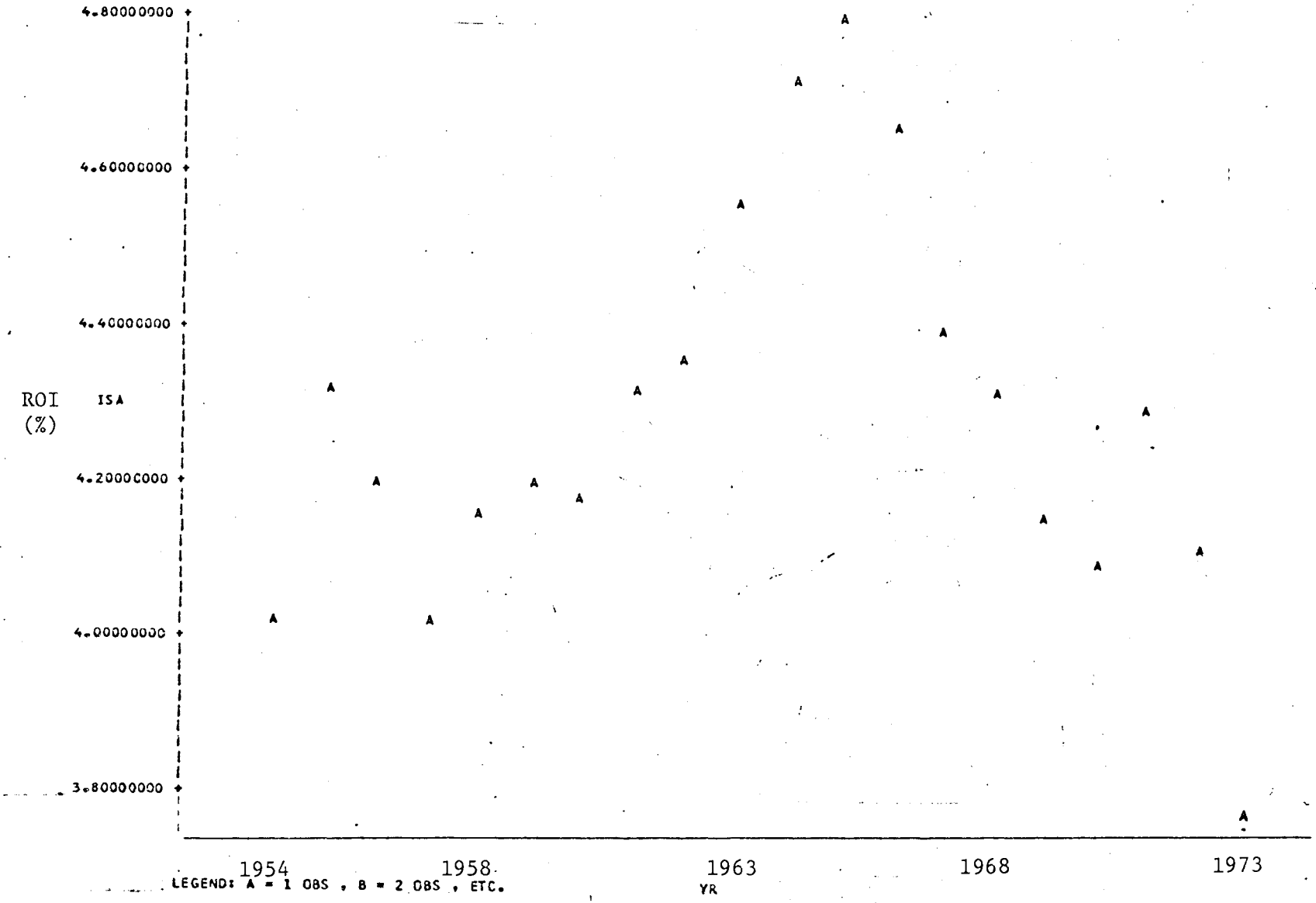
Profitability Performance Measurement

Return on Investment (ROI)

This model attempts to indicate the industry's efficiency in using the capital contributed by stockholders and lenders. ROI is the relationship between total assets and net income. The following analysis will concentrate on the factors which have major impact on the deterioration of the utilities' earnings during the past several years. The trend of ROI during the twenty-year period of 1954-1973 is illustrated in Figure 5. From Figure 5 the trend of ROI indicates that over most of the history of the electric utility industry, the performance was efficient. The stable growth of the industry can be seen from the upward trend of ROI during 1954-1965. (The ROI figure is also available in Appendix E.) In 1966, however, ROI began a declining trend. This decline continued steadily and was more significant during the early 1970's.

The decrease in ROI is the consequence of a number of factors. Inflation, as mentioned before, caused the price of equipment to rise rapidly. Together with the complexity of design and the new environmental ground rules, the cost of new investment was pushed further upward.

Figure 5. Trend Indicates Return on Investment (ROI) During 1954-1973. (All Investor-Owned Electric Utilities Available in The Utility Compustat Tape.)



In addition operating expenses (mainly fuel) have rapidly climbed. The buyers' market in fossil fuel, which persisted more or less from the end of World War II has now shifted to a sellers' market. The price for all forms of fossil energy resources are likely to persist at historically high levels for the future. Among other things, it is recognized that during period of inflation regulated firms suffer more than non-regulated industry. Regulated firms have no freedom to adjust prices. There is a time lag before an adjustment in rates is allowed by the commission. This inflexibility increases the risk of inflation for regulated industry. In addition it is significant that the rate of return applied to the utility's rate base equates to net operating income, or the results of a company's operations after Federal income tax, but before interest and other capital costs. Rising interest alone during period of inflation erodes the return on common equity substantially.

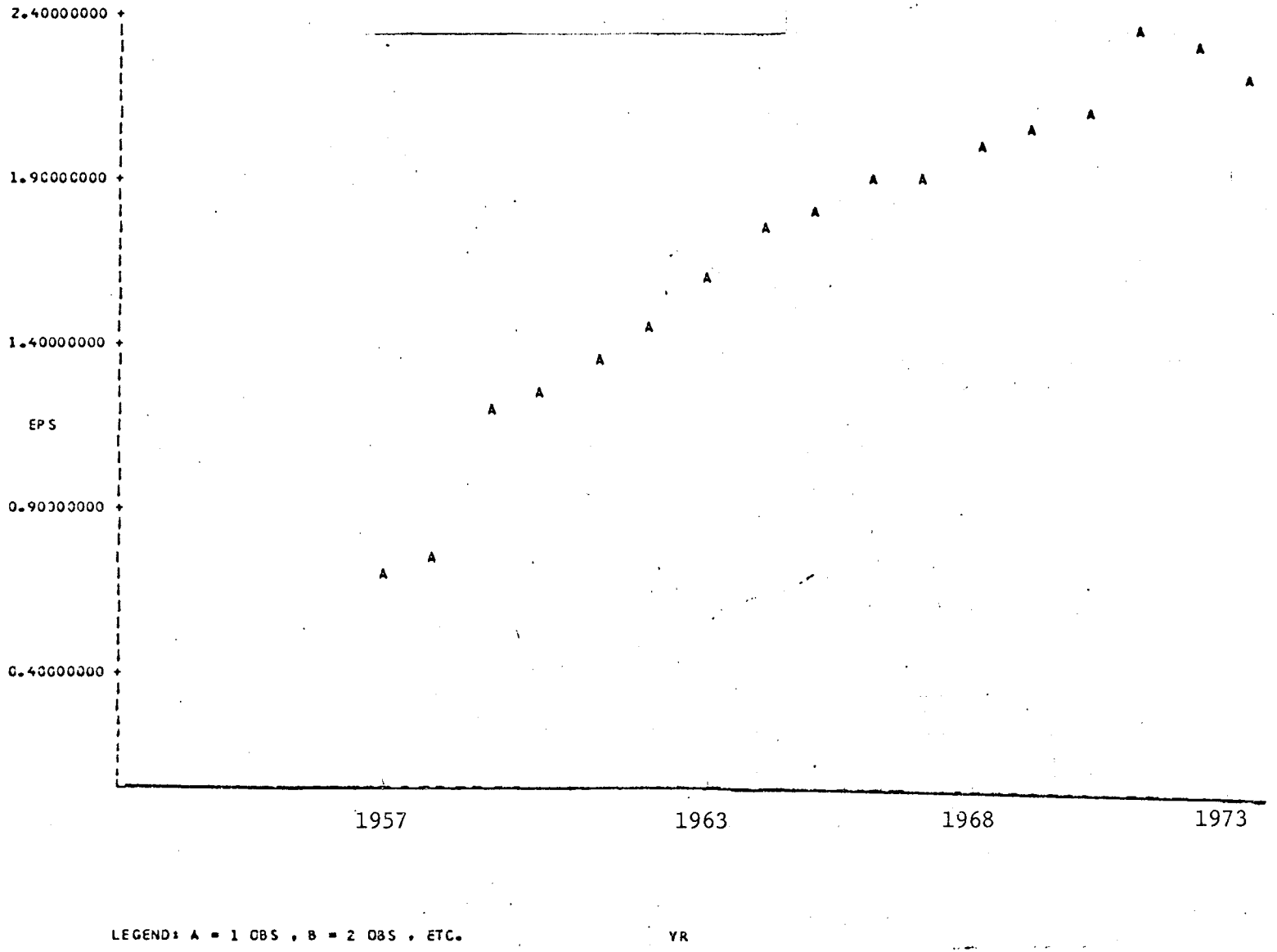
Return on investment has a major effect on the amount of earnings allocated to one share of common stock. The following analysis will indicate the relationship between ROI and EPS during the period of 1957-1973.

Earnings-Per-Share (EPS)

EPS is widely used as the indicator of the performance of the industry. The EPS figure has a very important role in practical investment analysis since it represents the amount of earnings allocated to one share of common stock. Figure 6 presents the trend of EPS in the electric utility industry during the period of 1957-1973.

Beginning in 1957 the trend of EPS has been upward which is the

Figure 6. Trend of Earnings-Per-Share During 1957-1973. (All Investor-Owned Electric Utilities Available in The Utility Compustat Tape.)



consequence of the stable growth in the industry. Not until the early 1970's did this trend start to decline. This decline is basically due to the result of the upward sweep in interest rates during the 1960's. This rapid rise in interest rates makes the traditional financing leverage benefits accruing to existing common stockholders quickly fall by the wayside. In addition, the cost of debt financing is compounded by the fact that the problem of refunding outstanding debt will continue to grow. The result is that electric utility common stocks will continue to suffer. The high cost of money is exerting a squeeze on earning available for common stock and such erosion will be reflected in a diminished rate of growth of future years' earnings.(8)

During the past few years investors continued to decrease the number of dollars that they have been willing to pay for a dollar of utility earnings. The investors have shown this distaste because they realize that electric utilities are capital intensive and with high interest rates, the earnings on equity and earnings per share are going to be affected adversely. Utility market prices have continued on their downward career. Recently, attempts to sell huge amounts of common stock at low prices have resulted in a decline in earnings-per-share. In the case of a regulated utility the allowed earnings are directly proportioned to the book value. If dilution reduces book value per share by 1 percent, it will also reduce EPS by 1 percent. It can be expected that if dilution is repeated year after year, it can be very significant. Dilution will wipe out any growth from retained earnings.

While ROI and EPS are two approaches used to indicate the profitability performance of the electric utility industry, the next two models which are coverage ratio and cash flow coverage are developed

to measure solvency of the industry during 1954-1973.

Solvency ratio and profitability ratio are interrelated. Declining interest coverage ratios have required an increase reliance on common stock sales with their diluting effect on earnings-per-share. The following attempts to illustrate the trend of coverage ratio during the period of 1954-1973.

Solvency Measurement

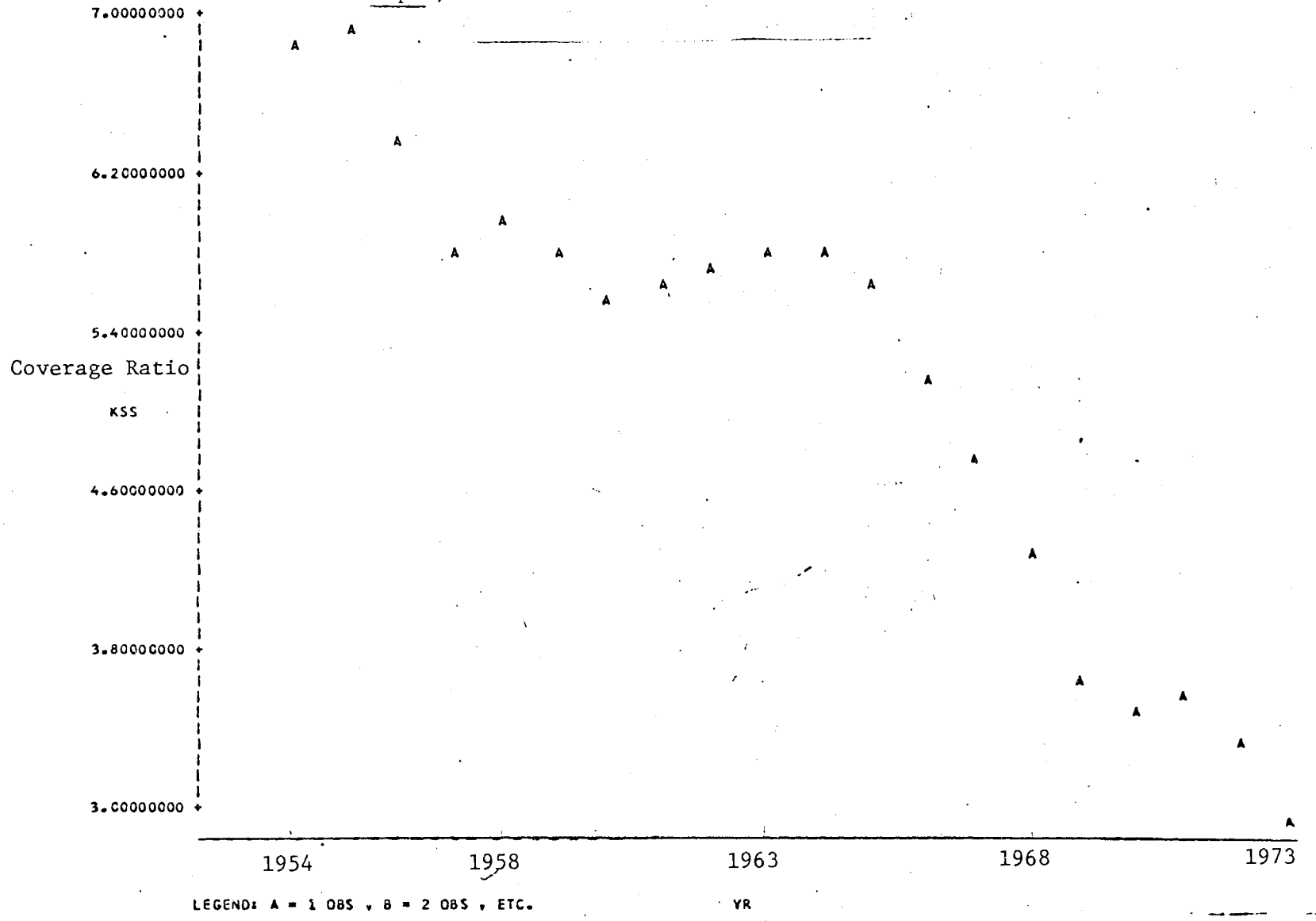
Coverage Ratio

Coverage ratio indicates the relationship between net income (before income tax) and interest obligations. Coverage ratio plays an important role in consideration of the credit worthiness of the industry since it measures the ability of the industry to meet fixed charges on long-term obligations.

Figure 7 is the trend of before income tax coverage of interest charges during 1954-1973. From Figure 7 it is recognized that during the twenty-year period of 1954-1973, the trend of coverage ratio decreased steadily. This decreasing trend became more substantial during the period of 1964-1973. Hunton, and Williams stated that

> Many factors contributed to the decline in coverage, but one of the most significant was the combination of income tax deductions and credits made available to amortize the cost of property much more rapidly for income tax purposes than for rate making and financial accounting purposes. (Within the past two decades, these have included accelerated amortization and liberalized depreciation under Section 167 and 168 of the Internal Revenue Code, the 3 percent Investment Tax Credit, the "guideline lives," the asset depreciation range system and the 4 percent job development tax credit.) in some cases as a matter of choice, but in most cases as a result of rate regulatory requirement (demonstrated or anticipated), electric utilities utilized some or all of these deductions or credits to reduce their income tax costs.(9)

Figure 7. Trend Indicates Before Income Tax Coverage During 1954-1973. (All Investor-Owned Electric Utilities Available in The Utility Compustat Tape.)



These income tax deductions and credits have the effect of postponing or permanently reducing income taxes. However, the beneficiaries of the tax reductions have been the customers of the electric utilities, not the investors. Specifically, rate regulation of the investor-owned electric utility industry has generally operated so that the reductions in income taxes not offset by "normalizing" charges did in fact "flow through" to customers if only to reduce rate increases that might otherwise have been allowed and the reserves created by "normalizing charges" were used to reduce the rate base for the benefit of the customers.

Interest coverage is unquestionably the most important element in the appraisal of bond quality; and, therefore, interest coverage plays an important part in determining the potential market and interest rate for utility bonds. Recently, for many companies the lack of adequate interest coverage has been a barrier to the sale of long-term debt securities in the quantities appropriate to maintain capitalization ratios. This is because most long-term debt security indentures contain provisions prohibiting the sale of additional long-term debt unless the utility's earnings before income taxes in 12 out of the last 15 calendar months were at least a specific multiple (typically two times) of the annual interest requirements on those of the utility's long-term debt securities that will be outstanding after giving effect to the proposed debt issue.

Cash Flow Coverage

Concurrently, utilities needed more and more money. Lead time for nuclear plants stretched from two or three years to as much as eight or nine years, tying billions of dollars in unfinished, unproductive

facilities. Figure 8 presents the trend which indicates the relationship between cash flow and interest obligations. From this figure it is seen that cash flow coverage decreased substantially. Since 1966, utility expenditures on new plant and equipment nearly tripled from an annual rate of $7.4 billion to $21.5 billion. Coupled with this, regulatory agencies were particularly shortsighted by forcing utilities to "flow through" to rate deduction's the funds generated by accelerated depreciation, they dried up perhaps the most important source of money for investment in new plant.(10)

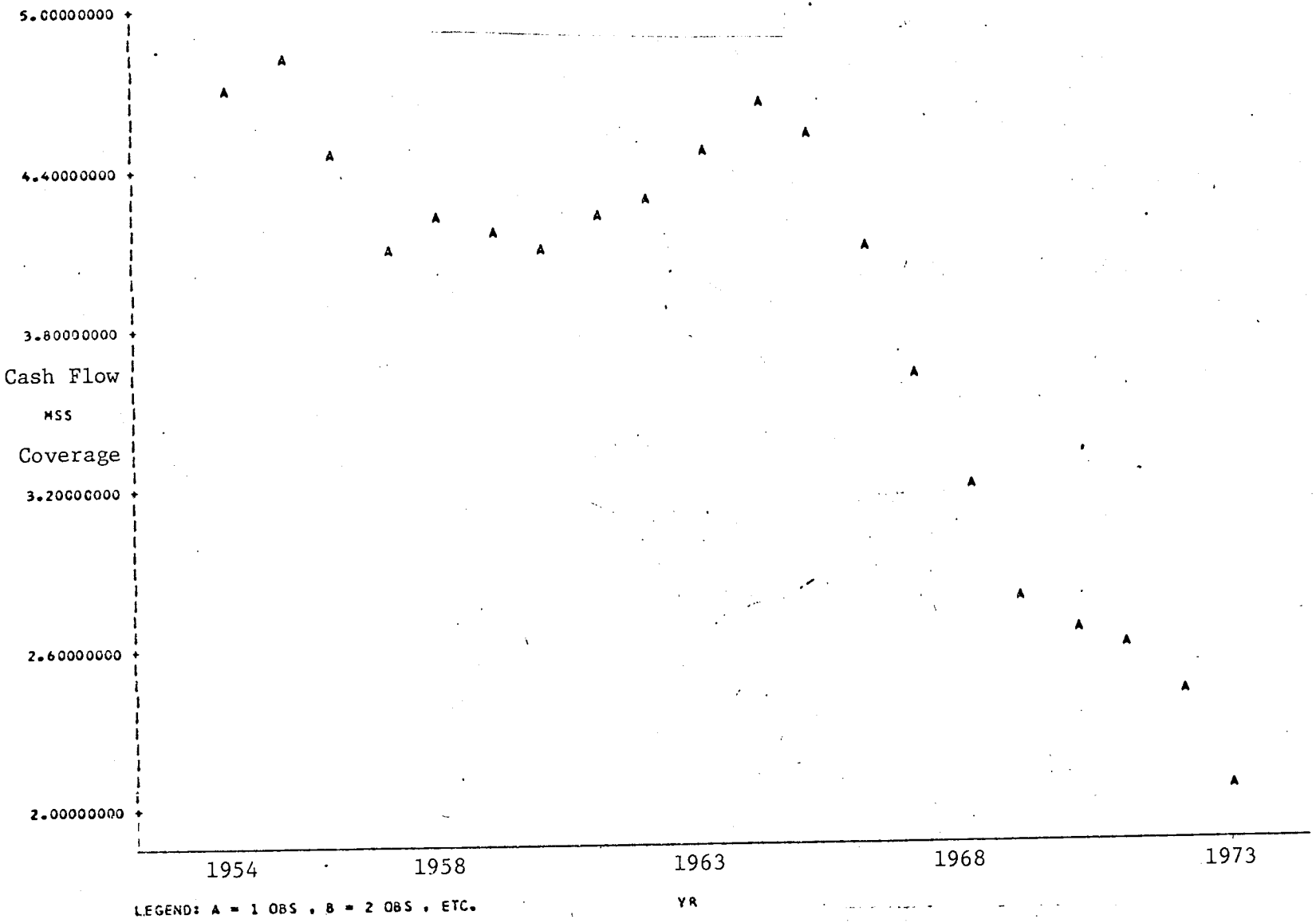
General Interpretation and Limitation of the Results

From the results obtained from all investor-owned electric utility industry available in The Utility Compustat Tape, it can be interpreted that the electric utility industry is now in a tight situation. This conclusion is supported by the negative nature of all ratios developed to measure the efficiency of the industry during the period of 1954-1973.

The results indicate the industry's weaknesses are reflected in the economic decline in the efficient use of energy, which is the largest component of variable cost, and the decline in economic usage of plant and equipment. The latter has a major effect on the cost and pricing of electric service. In addition, the industry is faced with poor liquidity and profitability from the combination of the increasing fuel cost, cost of debts, and additional investment in plant and equipment due to inflation.

Although, financial ratios are not intended to provide definite answers, the unfavorable ratios are significant since they indicate symptoms of the industry's economic condition. It is considered that

Figure 8. Trend Indicates the Relationship of Cash Flow and Interest Obligations During 1954-1973. (All Investor-Owned Electric Utilities Available in The Utility Compustat Tape.)



the results obtained from this study might bring some bias in applying to the industry as a whole since the investor-owned electric utilities are different from the non-investor-owned electric utilities in the areas of regulation, financing, and taxes. Despite this limitation, the approach used in this study seems to be the best and feasible method to apply to the industry as a whole since investor-owned utilities generated almost 80 percent of the electric utility industry.

The final chapter attempts to provide some of the approaches for financial relief. Two major sources which the utilities hope will alleviate their financial problems are also discussed. Finally, recommendations are given to improve their financial problems.

FOOTNOTES

[1]Edison Electric Institute, Statistical Year Book, (1973).

[2]Ibid.

[3]Henry R. Linden, "Current Trends in U.S. Gas Demand and Supply," Public Utilities Fortnightly, Vol. 86, (July 30, 1970), pp. 27-38.

[4]The 1970 National Power Survey Federal Power Commission Part 1, Washington: U.S. Government Printing Office, (1971), p. I 4-3.

[5]Thornton, pp. 33-40.

[6]Ibid.

[7]Ralph S. Saul, "Energy and the Capital Markets," Public Utilities Fortnightly, Vol. 93, (January 31, 1974), pp. 33-38.

[8]C. H. Selegson, "High Rates of Return are Inevitable," Public Utilities Fortnightly, Vol. 83, (June 19, 1969), pp. 87-92.

[9]Financial Problems of the Electric Utility, p. 81.

[10]"Utilities: Will the Government Bail Out the Utilities?", Business Week, (September 14, 1974), p. 138.

CHAPTER VI

SUMMARY AND CONCLUSIONS

From the analysis in Chapter V, it can be seen that the electric utility is faced with serious financial problems. These problems require the public recognition of the industry's need to procede adequate capital funds. Chapter VI provides some recommendations to the financial problems of the industry. Two major sources of relief which the utilities seek to find their way out of the financial problems are carefully discussed.

Financial Relief

The severe financial problems currently faced by the electric utility industry was recently dramatized by Consolidated Edison's near collision with bankruptcy. These financial problems, in varying degrees of severity, confronted the great majority of electric utilities. The utilities are being pressed by these financial difficulties into pursuing courses of action which are in stark conflict with important aspects of national energy policy, and which are also contrary to the long-run economic interests of consumers of electricity.(1)

Many approaches have been suggested in order to enable utilities to finance their capital requirement. Some of these approaches are:

1. providing government assistance in financing,
2. reducing the dividend-payout ratio, and
3. changing accounting practices.

Providing Government Assistance in Financing

The first approach would be government assistance in financing. William Rosenberg, Chairman of the Michigan Public Service Commission, has recently recommended that the Federal government guarantee utility bonds as to interest and principal. There are two possible benefits to the utility industry claimed for such a program.

First, it might make it possible for utilities to greatly increase their debt ratios and not need to rely on common stock financing. Whether this is the case would depend primarily on the legal question of whether the provisions of existing utility bond indentures would permit exclusion of interest on such bonds from the coverage calculation, and whether the indentures would permit the sale of such bonds to begin with. But even if the indentures would not permit these bonds to be sold, it might still be possible to form new generating companies financed largely with government-guaranteed debt.

Second, government-guaranteed debt would presumably have a lower interest rate than ordinary utility bonds.(2) There are two reasons to doubt, however, that this would actually be very substantial in effect. First, utility bonds even today have yields that are about 1 percentage point higher than those of treasury bonds. And this large a yield spread is of fairly recent origin and may not reflect the difference in risk. The yields on treasury bonds seem to have declined relative to utility bonds at least in part because of the decline in the volume outstanding of treasury bonds relative to utility bonds. Second, there is no reason to think that a government-guaranteed utility bond would be regarded as a substitute for a treasury bond which has a very high

degree of marketability and that it would bear the same rate as a treasury bond. Apparently, a government-guarantee of a loan does not make the loan equivalent to a government borrowing.

One cannot, therefore, assume that electric utility bonds, if guaranteed as to interest and principal by the U.S. government, would therefore bear interest rates similar to those on government bonds. It does, however, seem reasonable to assume that the interest on guaranteed utility bonds would be at least a little lower than they otherwise would be, especially in the case of low-rated issues.

Reducing the Dividend-Payout Ratio

Another possible way of avoiding the financing problem might be to reduce the dividend-payout ratio. A utility earning 12 percent on its book equity could, if it paid out none of its earning in dividends, increase its total equity capital by 12 percent per year. That this would be a policy of last resort need no longer be emphasized. Clearly, a utility which stops paying dividends loses any chance it might have had of raising new equity money on the market.

One of the dividend policy approaches which a number of companies seem recently to have adopted, is to cease increasing dividends per share, so that as earnings per share rise over time, the retained earnings rise by equal amounts while the dividend-payout ratio declines. Such a policy may marginally improve the financial situation, but at the expense of discouraging investors about future growth in dividends. Those who buy utility stocks as an income stock may at least require that dividends per share rise by enough to offset inflation.(3)

Changing Accounting Practices

Another way of strengthening the finances of utilities would be to change some accounting practices for ratemaking purposes so as to allow for a higher cash flow while leaving the consumer no worse off in the long run. An increase in cash flows would reduce the need for external financing especially the need for common stock sales. One method of a possibly helpful step would be to switch from flowthrough to normalization in states which have not yet done so. Perhaps, more significant, however, would be the inclusion of construction work in progress (CWIP) in the rate base. If this had been done, it would have reduced the utilities need for external financing by approximately $1 billion in 1972.(4)

The specific recommendations mentioned above along with many others should help to slow down electric rate increases. But there is no reasonable approach which would avoid the likely prospect of further increases in the cost of producing electricity and hence in its price in the period ahead.

With today's inflation and with today's expansion requirements, what utilities really need is rate regulation that provides steady, predictable and satisfactory growth in their earnings.(5)

Despite the opportunities for improvements in the regulatory process and in utility rate structures, there would still seem to be a key role for the adjustment of rates to reflect the substantial rise in cost being experienced by the entire economy and especially by the electric utility industry. Adequacy of earning is basic to the ability of electric utilities to perform their franchised function of meeting rising demand for electricity on the part of an expanding population

and growing economy. The low rates of profitability allowed by the ratemaking authorities are threatening to destroy the industry's ability to raise the enormous volume of capital it needs to do its job.

Two Major Sources of Relief

There are two major sources of relief which the utilities can seek to find the way out of their financial problems. First, they may seek to increase substantially their cash earnings and their rates of return on common equity capital. Second, they may seek to reduce substantially their capital construction budgets, thereby alleviating to a greater or lesser extent the enormous pressures of raising capital under conditions which lead to very severe and possibly destructive rates of dilution of stockholders' equity.

Rate Adjustment

With substantial improved earnings, the utility's financial situation would be improved in several important regards. First, the higher level of earnings would provide utilities with more cash flow from retained earnings, thereby reducing their reliance on capital market for additional capital. Higher retained earnings would also reduce or tend to offset the effects of dilution on book value per share, while maintaining the dividend rate and even making it more secure. Second, higher equity earnings would improve coverage ratios and make it possible to sell more debt. The third and the most important effect of higher earnings level would be to raise substantially the market prices of electric utility stocks. Large enough earnings would necessarily mean that the market prices of the stocks of most utilities would be

equal to or greater than their book values, and that they would not then face either an inability or a disincentive to engage in capital expenditure programs.

Cancellation in Construction Budget

Although increased rates are a method of achieving financial relief, regulatory bodies may not be willing to provide this avenue without some thorough and time consuming justification. The electric utilities are therefore increasingly compelled to look to the second avenue of relief; namely,to reduce their construction budgets. They are impelled in this direction partly because they seek to protect their stockholders from the effects of dilution through sale of stock at prices below book value, and also because their attempts to raise additional capital may simply fail. The effect of a failure in attempt to raise capital--i.e., a bond or stock issue which can not be sold to the public--would be permanently to damage their credibility as an investment instrument both in the eyes of investors and underwriters. Even more serious is the possibility that a utility seeking to raise long-term debt or equity capital in order to pay off short-term debt incurred for construction might find that the long-term market refuses to provide the needed funds, leaving the utility in very grave danger of defaulting on its short-term debt and falling into bankruptcy. The recent example of Consolidated Edison, provides an example of what might happen. Rather than face this very serious hazard to the financial future of the utility, the utility management must be inclined to cut the construction budget where that is at all feasible.

Effects of Cancellation in Construction Budget

It should be noted any kind of cut in the construction budget, whether for this year or for later years, will ease the utility's current financial problem. The reason is that one of the things making investors leery of buying the utility's securities today is the prospect that the utility will be engaging in further security sales in the years to come. In the case of a common stock investor, the chief fear which the prospective buyer must hold is that there will be large additional sales of stock in the future, diluting the value of the stock he is considering buying today. If the utility can substantially cut its construction budget for future years, investors today will have less to fear from future security sales, and will be more willing to buy the securities today.

But what portions of the utility's construction budget can it most logically seek to cut? Much of the utility's distribution investment must be made if the utility is to be able to extend service to new customers in new homes, and it is usually a legal obligation that the utility do so. Moreover, distribution investments typically have relatively short time lags between the incurrence of the investment expenditure and the time that the facility goes into service. Even where new developments are not at issue, the utility's distribution investment will often be compelled to be made in order to serve growing loads in its existing distribution territory; the failure to make such investments will in relatively short order result in local outages, intensive customer dissatisfaction, and ultimately even larger expenditures to restore adequate service. To be sure, some portion of utility

distribution investments, for example, the undergrounding of residential service, is not an absolute necessity for the provision of electric service to its customers, but it is required by regulatory commission fiat.

Nuclear Generating Plant

Since the great bulk of utility construction expenditures will be for generating facilities, this is where the major cuts must come. For many electric utilities, the most likely candidate for being cut out of the construction budget is the new nuclear generating plants.(6) There are two reasons why this is so.

First, nuclear plants are, from the standpoint of their capital cost, the most expensive of all types of generating equipment. Thus, the more substitution of fossil fuel steam plants and combustion turbines for nuclear power plants can very substantially reduce the capital requirements for many electric utility companies.

Second, the construction of nuclear generating plants has a very long lead time over the time that they go into service. The fact that nuclear power plants have long construction periods means that the cancellation or delay of a nuclear power plant will have no effect on the utility's generating capabiiity for another five or ten years. Thus, the present and very pressing problems of capital supply can be translated by the utility into the much more remote and indeed more uncertain problem of inadequate generating capacity at some later date.

In light of the recent and promised future conservation efforts in this country, the utility's confidence in the amount of generating capacity it will need in the future is necessarily lessened. Thus, the

utility can, if present problems are sufficiently pressing, persuade itself that presently planned generating plants may very well not be needed at the scheduled future dates. Moreover, if as the years advance, it becomes evident to the utility that the generating capacity will be sufficient at the originally planned date, the utility still has the option of waiting a few years and then commencing the construction of a new fossil fuel burning plant which could be put into service at the same time as the nuclear plant would have been, because it generally takes a few years less to plan and construct a fossil fuel plant than it does to plan and construct a nuclear plant.

Taking the matter still further, even the fossil fuel plant may be delayed and the utility can be confident of having enough capacity to meet its peak requirements in the future because the combustion turbine has an even shorter period of planning, construction, and installation, as well as lower capital costs. Thus, the utility can cancel altogether or substantially delay the construction of planned nuclear power plants without running any very great risk of being unable to meet capacity demands in the future because it will always have available to it the option of building even lower cost plants consuming fossil fuels.

The reason why the utility undertook to install nuclear power plants even in light of the shorter lead times and smaller capital costs of fossil fuel steam plants and combustion turbines is that the fuel cost of operating a nuclear power plant is much lower than for any type of fossil fuel plant, especially given today's fuel prices. Moreover, the fossil fuel steam plant has very substantially lower fuel costs than does a combustion turbine, the latter being the less costly capital equipment but the more costly in terms of operating expenses. In the

long run, the total cost to the utility will be higher by the virtue of the higher fuel costs of the fossil fuel plants. But the utility has a much higher degree of confidence at being able to recover these fuel costs in its rates than it does in its present ability to be able to raise the capital to finance the construction of large nuclear power plants.(7)

Thus far, the electric utility has not en masse abandoned its nuclear power construction program. It is, however, under very considerable financial pressure to do so, and it is a course of action whose ill effect will not appear for five or ten years and will probably affect consumer and the general public more unfaborably than it will the utility companies. The total capital and operating costs of nuclear power plants can be expected to be, very roughly, one cent per kilowatt-hour cheaper than costs for fossil fuel plants, this course of action would entail additional charges to electricity consumers of about $3.5 billion per year beginning in the 1980's.(8)

A number of electric utilities have announced significant reductions in their construction programs. EEI figures show that between April 1, 1974 and October 1, 1974, a total of 72,000 megawatts of capacity has been delayed or cancelled. Of this total, 58,000 megawatts were nuclear power plants, most of which were due to be completed by 1980 or later.(9) It should also be borne in mind that a number of companies that will announce reductions in their construction programs may lengthen rapidly in months ahead. Gilkeson, the Chairman of EEI noted that this situation has potentially serious two-pronged impact on the nation.(10) It could mean an insufficiency of electric power for the economy as a whole, and it will mean higher electricity prices to customers.

Recommendations

The critical role of rate increases in attracting adequate capital to the electric utility industry has been noted by many experts. A vice president of the investment banking firm of Dean Witter and Co. described the relationship succinctly:

> The single most crucial item in being able to finance this magnitude growth will be the amount of rate relief that will be granted by the various regulatory agencies.(11)

A utilities consultant described the situation as follows:

> Certainly, investors are becoming increasingly concerned with not only the university and inevitable failure of utilities to earn the returns to which commissions say they are entitled, but also with the declining return on the common equity of many individual companies. They will also become more selective in their investment decisions as they become more concious of the ability, or inability, of individual companies to obtain adequate and timely rate increases and to maintain a satisfactory return which is essential to permit financing at a reasonable cost.(12)

A similar analysis was provided by a former president of the American Stock Exchange, now Chairman of the management committee of the First Boston Corporation:

> Rate relief is urgent for the utility industry to attract equity capital. Without rate relief, the investor-owned electric utility industry will have great difficulty in meeting projected external financing requirements.(13)

In essence, the financial problems facing investor-owned electric utilities are severe, but in total they are not unique to the private sector of the American economy. The basic solution is to achieve greater

public recognition of the need to provide adequate capital funds to meet the growing needs of the American society in the years ahead. Having adequate rate increases in the short run is the way to maintain relatively low utility rates in the long run. The basic reason is that payments to bondholders and other suppliers of capital are a very major share of total utility costs. A utility that impresses potential investors as providing a relatively assured return on their investment thus, can raise new capital at lower rates than companies that are considered to be higher risks.

FOOTNOTES

[1]Roseman, pp. 19-29.

[2]William G. Rosenberg, "Rates, Consumer Pressure, and Finance," Public Utilities Fortnightly, Vol. 93, (January 31, 1974), pp. 28-32.

[3]Stelzer, pp. 98-101.

[4]Ibid.

[5]Weidenbaum, p. 37.

[6]Roseman, pp. 19-29.

[7]Ibid.

[8]Ibid.

[9]R. Gilkeson, "EEI Speaks of Utility Problems and Opportunities," Public Utilities Fortnightly, Vol. 95, (January 30, 1975), pp. 33-34.

[10]Ibid.

[11]Kenneth Hollister, "Regulatory Ratings," Public Utilities Fortnightly, Vol. 92, (September 27, 1973), p. 19.

[12]Truslow W., Jr. Hyde, "Regulatory Ratings," Public Utilities Fortnightly, Vol. 92, (September 27, 1973), p. 21.

[13]Saul, p. 38.

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APPENDIXES

APPENDIX A

COST OF FUEL PER KWHR DURING 1957-1973

(All Investor-Owned Electric Utilities Available in The Utility Compustat Tape)

(Dollars/Kwhr)

Year	Fuel Cost
1957	0.0013
1958	0.0014
1959	0.0016
1960	0.0027
1961	0.0026
1962	0.0026
1963	0.0025
1964	0.0025
1965	0.0025
1966	0.0025
1967	0.0025
1968	0.0026
1969	0.0029
1970	0.0034
1971	0.0037
1972	0.0041
1973	0.0070

APPENDIX B

RELATIONSHIP BETWEEN LOAD FACTOR AND NET PLANT

DURING 1955-1973

(All Investor-Owned Electric Utilities Available in The Utility Compustat Tape)

Year	Percentages
1955	0.0551
1956	0.0470
1957	0.1030
1958	0.1034
1959	0.0927
1960	0.0531
1961	0.0611
1962	0.0609
1963	0.0590
1964	0.0716
1965	0.0685
1966	0.0663
1967	0.0644
1968	0.0667
1969	0.0683
1970	0.0653
1971	0.0642
1972	0.0621
1973	0.0446

APPENDIX C

COST OF NET PLANT PER KWHR DURING 1954-1973

(All Investor-Owned Electric Utilities Available in The Utility Compustat Tape)

(Dollars/Kwhr)

Year	Cost of Net Plant
1954	0.0761
1955	0.0764
1956	0.0799
1957	0.0833
1958	0.0805
1959	0.0801
1960	0.0796
1961	0.0768
1962	0.0754
1963	0.0729
1964	0.0714
1965	0.0696
1966	0.0701
1967	0.0689
1968	0.0680
1969	0.0687
1970	0.0719
1971	0.0738
1972	0.0766
1973	0.0865

APPENDIX D

RETURN ON NET PLANT DURING 1954-1973

(All Investor-Owned Electric Utilities Available in The Utility Compustat Tape)

Year	Return on Net Plant (%)
1954	4.59
1955	4.62
1956	4.43
1957	4.30
1958	4.45
1959	4.49
1960	4.46
1961	4.65
1962	4.68
1963	4.91
1964	5.05
1965	5.07
1966	4.93
1967	4.63
1968	4.53
1969	4.36
1970	4.29
1971	4.51
1972	4.30
1973	4.02

APPENDIX E

RETURN ON INVESTMENT (ROI) DURING 1954-1973

(All Investor-Owned Electric Utilities Available in The Utility Compustat Tape)

Year	ROI (%)
1954	4.09
1955	4.32
1956	4.20
1957	4.01
1958	4.16
1959	4.20
1960	4.18
1961	4.32
1962	4.36
1963	4.56
1964	4.72
1965	4.80
1966	4.66
1967	4.39
1968	4.31
1969	4.15
1970	4.09
1971	4.30
1972	4.11
1973	3.78

APPENDIX F

EARNINGS PER SHARE (EPS) DURING 1957-1973

(All Investor-Owned Electric Utilities Available in The Utility Compustat Tape)

Year	Earnings per Share ($)
1957	0.6925
1958	0.7350
1959	1.1846
1960	1.2443
1961	1.3476
1962	1.4102
1963	1.5810
1964	1.7021
1965	1.7858
1966	1.8660
1967	1.8863
1968	1.9851
1969	2.0246
1970	2.0785
1971	2.3046
1972	2.2770
1973	2.1761

APPENDIX G

BEFORE INCOME TAX COVERAGE DURING 1954-1973

(All Investor-Owned Electric Utilities Available in The Utility Compustat Tape)

Year	Coverage Ratio
1954	6.7602
1955	6.8671
1956	6.3285
1957	5.7318
1958	5.8809
1959	5.7731
1960	5.5496
1961	5.6169
1962	5.6566
1963	5.7857
1964	5.7778
1965	5.5903
1966	5.1196
1967	4.7184
1968	4.2195
1969	3.6155
1970	3.4244
1971	3.5062
1972	3.2868
1973	2.8760

APPENDIX H

RATIO OF CASH FLOW TO FIXED CHARGES

DURING 1954-1973

(All Investor-Owned Electric Utilities Available in The Utility Compustat Tape)

Year	Ratio
1954	4.6934
1955	4.8109
1956	4.4408
1957	4.0999
1958	4.2117
1959	4.1485
1960	4.0477
1961	4.1756
1962	4.2692
1963	4.4400
1964	4.6223
1965	4.4683
1966	4.0852
1967	3.5695
1968	3.1594
1969	2.7432
1970	2.6117
1971	2.5762
1972	2.3869
1973	2.0014

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