CAPITAL INTENSITY:

A PROBLEM FOR UTILITIES DURING INFLATION

by

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Problems of the utility industries have recently been receiving considerable visibility: *Fortune* discusses the looming energy crisis[1] and the end of the energy "joyride"[2]; *Business Week*, the high price of more electric power[3]; *Public Utilities Fortnightly*, why public utility stocks are in the "doghouse"[4]; and the Florida press, the justification (or more likely, the lack of it) for passing through to the customer, the new state corporate income tax[5]. These are just a few examples of what might be called a burgeoning national concern about electric power, particularly, and, more generally, about the utilities industries.

After having almost taken for granted a situation where power production doubled every decade[6], where the price per KWH fell, or at least held constant when other prices were rising[7], and where public utility common stocks were so highly regarded that they were recommended as being as safe as bonds but with better income and inflation hedge characteristics[8], this sudden awareness of industry problems seems to come almost as a surprise.

Are the problems real? If so, why do we suddenly seem to have problems in the utility industry, contrasted to, say, automobiles, or chemicals, or food, or drugs, or cosmetics? Do not the utilities, as others, depend on capital investment and material and technology and people in the production and sale of their product?

The answers to these types of questions cannot be a superficial "yes," for, while utilities do indeed have serious problems, a thoughtful examination of them indicates that many are due to the inherent differences between the utilities and other industries, often overlooked by the general public.

Two outstanding differences which are immediately apparent are that utilities are "regulated" industries and that the very nature of their operation requires a much greater capital investment per dollar of revenue than is true of other industries. The latter is really a cause of the former and in our socio-economic-governmental structure it was decided many years ago that it would be in the public interest that utilities should be regulated monopolies. We take this as a "given" and will not discuss it further. This, we feel, is generally understood and accepted by the American public.

Not so generally understood is the fact that the tremendous capital investment required by utilities in proportion to the value of their output may cause serious economic problems under certain circumstances, which, in turn, the utilities find difficult to handle because of regulatory constraints.

For instance, utilities require by far the greatest investment in plant and equipment per dollar of

revenue produced of all the industries. This results in a greater amount of depreciation cost per dollar of sales. Plant assets of utilities are longer lived than assets of other industries; for example (in the extreme) a hydro-electric dam may last up to a hundred years. Replacement costs of long-lived assets, in periods of rising price levels, can easily be several times the cost of the original asset being replaced. Under these conditions, regulatory practice, existing tax laws and inflation combine to put the utilities in a triple squeeze.

First of all, depreciation costs, recovered in utilities' revenues, are based on historic cost, so that the customer is really getting a bargain: he is paying for a proportionate amount of plant purchased at a much lower price level than exists today. These bargain prices tend to result in excessive demand for utilities' services, which, in turn, contributes to excessive growth in the industry.

Secondly, when assets are replaced at today's prices, the company has recovered through depreciation only sufficient dollars to cover the original cost of the asset—not the expenditure required today even for replacement of like assets. Tax laws prohibit taking depreciation in excess of original cost and regulatory bodies apply similar constraints. Thus the utilities must go to the capital markets for huge amounts of new funds, caused jointly by expanding demand and rising price levels.

Finally, although non-regulated industries have similar problems, they are better able to compensate for them than the utilities because they are better able to adjust their prices to current conditions than are the regulated utilities. One might say that the non-regulated industries price closer to a marginal cost basis, whereas utilities price on an average cost basis.

This is obviously an extreme simplification of the problem and to discuss in detail its many facets would be far beyond the limits of this paper. Innovation and technology changes and levels of interest rates and a host of other factors also are key considerations.

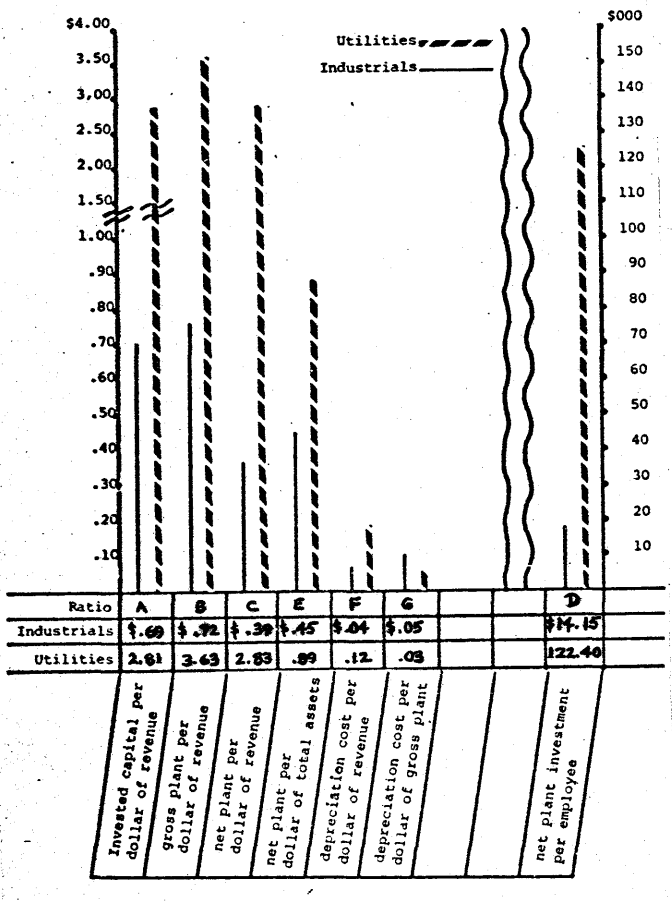
The purpose here is to present a series of data sets, which have been assembled in order to give visibility to some of the economic factors underlying the more general descriptions of the problem just set forth: that the combination of high capital intensity and regulation causes serious difficulties for the utility industries during inflation. It is believed that, while many people have a vague idea that utilities are capital-intensive industries, few realize just how capital-intensive they really are. Fifteen ratios depicting capital intensity as well as other measures of financial performance of utilities compared to industrials have been compiled. Data were obtained from the Compustat Tapes[9] which currently provide 60 items of data for 20 years for 1,711 industrial firms in 265 industries and 68 items of data for 20 years for 165 utility firms in four industry groupings. Comparisons were limited to the 100 largest industries, in terms of market value of the shares of the component firms, which comprise over 90 percent of the total market value of industries included on the tape. Utility industries included are: telephone companies, electric utility companies and natural gas companies. The results are summarized in Figures 1-4 with explanatory comments in each area.

Figure 1, Measures of Capital Intensity

Ratio A, Invested Capital per Dollar of Revenue: In examining the results of the computations for Ratio A, the relatively far greater capital requirements of utilities vis a vis other industries becomes immediately apparent. Invested Capital, as defined for the numerator of this ratio, comes reasonably close to what is normally used as a "rate base" in the determination of public utility rates, with the exception of a modest allowance for working capital. In the usual type of rate determinations, public utilities are allowed to include in price, their production costs, plus a rate of return on their rate base, equal to what is estimated to be their cost of capital. The latter figure, while somewhat controversial in concept and difficult to determine with precision, is generally conceived to be the weighted average of the investors' expected returns on the company's stock, also preferred stock, and the cost of the company's debt. For every dollar of sales in 1971, the average industrial firm required only 69 cents of invested capital (other than a provision for net working capital) whereas the average of all types of utility firms

Figure 1

MEASURES OF CAPITAL INTENSITY
Industrials vs. Utilities in 1971
Source: Compustat Tapes



Ratio	A	B	C	E	F	G	D
Industrials	$1.69	$ .92	$ .39	$ .45	$ .04	$ .05	$14.15
Utilities	2.81	3.63	2.83	.89	.12	.03	122.40

A: Invested capital per dollar of revenue
B: gross plant per dollar of revenue
C: net plant per dollar of revenue
E: net plant per dollar of total assets
F: depreciation cost per dollar of revenue
G: depreciation cost per dollar of gross plant
D: net plant investment per employee

required $2.81. In fact, electric utility firms (not shown separately on the graph) required $3.31 in invested capital for each dollar of sales, or revenues, as they are commonly called in the utility industries.

Ratio B, Gross Plant per Dollar of Revenue: In this ratio, the capital intensity of the utilities is even more dramatic, as the numerator here depicts the gross value of plant and equipment not reduced by accumulated depreciation. Even this underplays the utilities' financing problems, as, when assets are replaced, they must be replaced at today's higher prices, whereas these ratios are based on book values, or historical costs; plus the fact that expansion requirements must also be met. Since utility facilities are largely long-lead items, this means financing construction now, to take care of future demand. In 1970, investor-owned electric utilities expended $10.182 billion for construction of new plant and equipment, or, about 11 percent of their $92.5 billion investment in total plant. Of this amount, depreciation provided $2.404 billion, or only about 23.6 percent, leaving $7.778 billion to be raised in the capital markets and through reinvested profits. About $950 million was generated by profits after dividends and $111 million through charges to deferred tax accounts. This would indicate that $6.717 billion, or about 66 percent, would have to come from the capital markets. Actually, $7.886 billion of new capital was raised in the capital markets in 1970, about 77.5 percent of new construction expenditures.[10]

Ratio C, Net Plant per Dollar of Revenue: For utilities, the value of this ratio is similar to Ratio A, Invested Capital/Sales. This is because the preponderance of utilities' assets comprise plant and equipment and their value (net after deduction of accumulated depreciation) is close to the amount used as the rate base. The relatively lower ratio for industrials here, as compared to Ratio A, is caused by their greater investment in working capital (such items as inventories and accounts receivable). The author does not mean to give the impression that working capital items are unimportant, especially for the industrials. They are. However, the current nature of the investment in these items does not tend to create the problems attending investment in long-lived plant assets, in times of rising price levels. Inventories and accounts receivable have rapid turnover and the price gap between the cost of inventory contained in cost of goods sold and its replacement cost, for instance, is much less significant than between original cost and replacement cost of plant assets.

Ratio D, Net Plant Investment per Employee: This ratio is sometimes given as a measure of capital intensity, particularly with relation to labor intensity, of a company's cost of production. As depicted here, the totals indicate that in 1971 the average industrial investment in net plant (after deduction of accumulated depreciation) was $14,150 per employee, whereas the average utility had an investment of $122,400 per employee.

Ratio E, Net Plant per Dollar of Total Assets: Again, this ratio depicts the fact that the preponderance of utilities' investment is in plant and equipment, with relatively insignificant amounts of working capital and other assets and investments. The 45 percent of total assets in net plant for the industrials does not mean that 55 percent of their total assets are in working capital. Industrials, while undoubtedly having greater investment in working capital than the utilities, also are likely to have greater investments in other areas. For instance, investment in unconsolidated subsidiaries may well account for a portion of the difference.

Ratio F, Depreciation Cost per Dollar of Revenue: Depreciation makes up four cents of the average sales dollar for the industrials, as against twelve cents for the utilities. While the utilities' depreciation cost content of the sales dollar is thus about three times that of the industrials, one might expect it to be even greater. The utilities' ratio of gross plant to sales (Ratio B) was five times that of the industrials. The data do not permit exact determination of the difference, but a portion is explained by the next ratio, Ratio G, which indicates that utilities' assets are depreciated over longer lives than those of industrials. Another portion may be due to the high depletion rates taken by certain industries, particularly in the petroleum and mining areas.

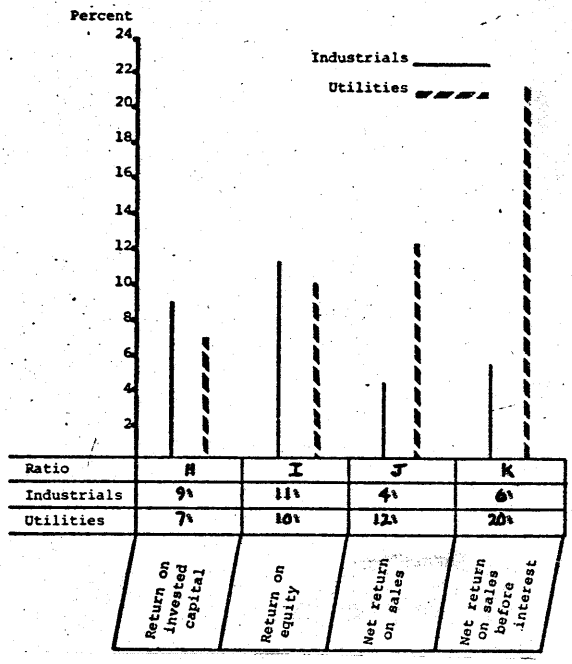
Ratio G, Depreciation Cost per Dollar of Gross Plant: This ratio indicates the proportion of gross plant being written off by current year's depreciation charges: 5 percent for the industrials and 3 percent for the utilities. Perhaps a more meaningful aspect of the ratio can be secured by taking its inverse, which would (under straight-line depreciation procedures) indicate the average life of the assets being depreciated. This would give an average length of life of industrial assets of 1/.05, or 20 years, and 1/.03, or 33-1/3 years for the utilities. In the detailed computer runs, the electric utilities' assets are shown to have the longest lives, equivalent to an average of 50 years. While this seems high for an average, it is not believed to be completely "out of the ballpark." For instance, *Business Week*[11] quotes Consolidated Edison's average depreciation rate at 2.4 percent, which gives an average life of 40 years and states that the company depreciates one-sixth of its assets over periods ranging from 80 to 100 years. Unfortunately, lack of consistency in depreciation procedures makes precise conclusions regarding asset lives somewhat tenuous. However, it would appear that most firms probably use straight-line depreciation for book purposes, even though they may use accelerated depreciation for tax purposes. To the extent that this is true, the interpretation given to the data above has justification.

Figure 2, Measures of Financial Performance

Ratio H, Return on Invested Capital: Here, as one would expect, due to the somewhat lower risk usually attributed to utility securities, the return on invested capital of the utilities is somewhat lower than in the case of the industrials. Also, as one would expect, their rate of return, although modest, is very stable.

Figure 2

MEASURES OF FINANCIAL PERFORMANCE
Industrial vs. Utilities in 1971
Source: Compustat Tapes



Ratio	H	I	J	K
Industrials	9%	11%	4%	6%
Utilities	7%	10%	12%	20%
	Return on invested capital	Return on equity	Net return on sales	Net return on sales before interest

Ratio I, Return on Equity: The rate of return on equity, shown for both the industrials and the utilities exceeds the rate of return on invested capital, shown in Ratio H. This is as it should be, as the greater risk of the equity holders requires the higher return. However, in view of the high debt content of utilities' total financing (see Ratio M) one might expect the difference to be greater. If the leverage principle were working properly (i.e., if the rate of return on invested capital is sufficiently above the cost of the debt) then the rate of return on equity should be boosted significantly by a debt ratio of this magnitude. One of the apparent difficulties is, however, that the cost of debt, estimated for 1970 for investor-owned electrics at about 5.4 percent[12] and with this cost rising every year as new debt is issued at current rates (in 1970, estimated to be 8.7 percent[13] there is precious little room for the leverage factor to work, if a return on invested capital (Ratio H) is only allowed to be in the neighborhood of 7 percent. This may partially explain why utilities' stocks have been in disfavor in recent years. If new bonds yield 8.7 percent and return on equity is 10 percent, before payment of dividends, this would not seem to be a sufficient premium to offset the related risk.

Ratio J, Net Return on Sales: The higher net return on sales of the utilities vs. the industrials may at first be surprising. However, it is completely consistent when reviewed in the context of the greater capital intensity of the utilities. If it takes four times as much invested capital to produce a dollar of revenue for utilities as it does for the average industrial, it is not surprising that the net return on sales should be much greater, if a reasonable return on invested capital is to be received.

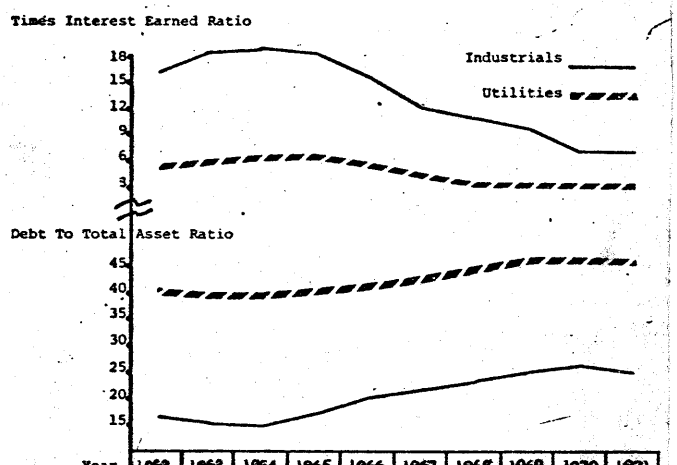
Ratio K, Net Return on Sales before Interest: Some of the same comments apply here as to Ratio J. However, since the return in the numerator of this ratio is before financing charges (net profit after taxes *plus* interest), there should be a more direct relationship between the relative size of the two returns and the relative size of the two ratios given under Ratio A, Invested Capital per Dollar of Revenue. In Ratio A, utilities capital intensity was 2.81/.69, or 4.07 times that of the industrials. In Ratio K, utilities' net return on sales before interest is only .20/.06, or 3.33 times that of the industrials.

Figure 3, Trends in Use of Debt and Coverage of Interest Charges

Ratios L and M: Utilities use a large amount of debt in their capital structure and this amount has been increasing moderately over the past 10 years, from .41 of Total Assets in 1962 to .46 in 1971. During this same period, the Interest Coverage Ratio, defined as earnings before interest and taxes divided by interest charges, has been declining from 5.08 times to 2.93 times. While it is difficult to state categorically exactly what the interest coverage ratio *should be*, Graham and Dodd suggest a multiple of four times, over a period of seven to ten years and a multiple of three times during the poorest year[14]. By these standards, utilities interest coverage is now at the low point. In general, industrials' use of debt has been

Figure 3

TRENDS IN USE OF DEBT AND COVERAGE OF INTEREST CHARGES
Industrials vs. Utilities, 1962-1971
Source: Compustat Tapes

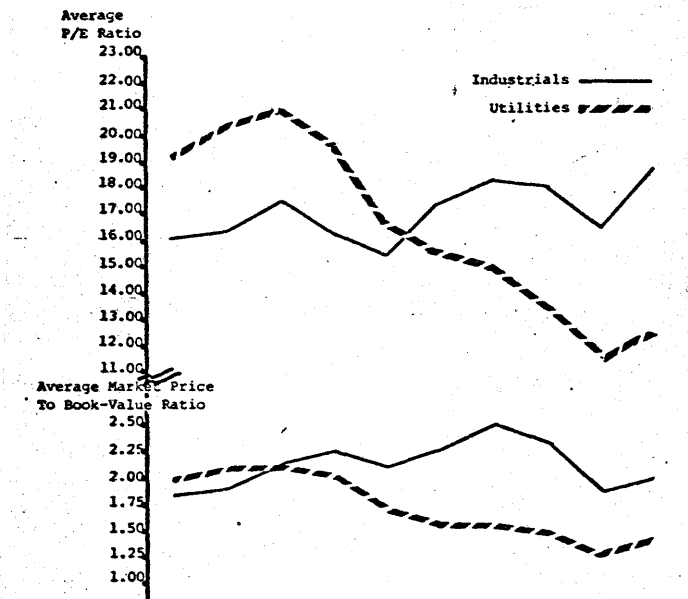


Year	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Ratio L, Times Interest Earned Ratio										
Industrials	17.18	18.11	18.71	18.09	15.01	11.47	10.35	8.59	6.28	6.99
Utilities	5.08	5.14	5.26	5.26	5.17	4.73	4.32	3.82	3.10	2.93
Ratio M, Debt To Total Asset Ratio										
Industrials	.17	.16	.16	.18	.20	.22	.23	.25	.26	.25
Utilities	.41	.40	.40	.40	.41	.42	.44	.46	.48	.46

increasing somewhat faster and their interest coverage, likewise, has been decreasing faster than utilities' during this period. However, even at the end of the period, industrials' average debt ratio is only .25 and their interest coverage ratio is 6.99. The latter is very close to the seven times criterion suggested by Graham and Dodd[15] as an average and well above the five times suggested for the poorest year. These factors may have a bearing on the decline of investors' acceptance of utilities' securities in the marketplace in the past several years, as indicated in Figure 4.

Figure 4

MEASURES OF INVESTORS' ACCEPTANCE
Industrials vs. Utilities 1962-1971
Source: Compustat Tapes



	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Ratio N, Average Price Earning Ratio										
Industrials	16.31	16.68	17.03	16.59	15.23	17.70	18.42	18.09	16.94	18.24
Utilities	19.81	20.83	20.93	19.89	16.14	15.59	15.15	13.65	11.93	12.11
Ratio Q, Average Market Price to Book Value										
Industrials	1.82	1.95	2.15	2.25	2.07	2.20	2.40	2.25	1.83	2.05
Utilities	1.97	2.18	2.15	2.08	1.78	1.66	1.56	1.43	1.22	1.34

Figure 4, Measures of Investors' Acceptance

Ratio N, Average Price/Earnings Ratio: In the early part of the decade, utilities' stocks were favored over industrials, insofar as Price/Earnings ratios are concerned. In 1962, a dollar of earnings in industrials supported $16.31 of stock price; whereas, a dollar of earnings in utilities supported $19.81 of stock price, or 1.21 times as much in terms of market value. This advantage of utilities obtained until 1965, then started to diminish and fell rapidly thereafter. By 1971, the reverse situation was true. A dollar of earnings in industrials now supported $18.24 of stock price; whereas, a dollar of earnings of utilities supported only $12.11 of stock price. Now industrials' earnings supported 1.51 times as much of market value. These data are similar to those developed in other studies[16] For a group of stocks which used to be among the most stable in the marketplace, this is indeed a serious setback. Since the primary objective of financial management is to maximize the value of the firm, this gives some idea of how, under present conditions, utilities' management is failing in this objective, vis a vis the past and with respect to other industries. For an industry faced with burgeoning expansion and financing problems, this is an indication of the serious situation that lies ahead.

Ratio O, Average Market Price to Book Value: This ratio is another significant index of the favor with which the investing public regards the prospects of equity securities. If the ratio is several times that of book value, investors are optimistic about future expected returns. If the ratio approaches unity, investors feel that the value of a company's stock is governed more by the value of its assets than by its expected future earning power. If the stock sells for less than book value, the respective stocks are indeed in disfavor. Placing much reliance on individual yearly variations is probably dangerous. However, the trend over the ten-year period displayed here appears to be clear and consistent with other studies involving similar comparisons[17]. For instance, from 1,962 to 1,965 stocks of the average utilities sold about double their book value, as did the industrials. By 1971, the average utilities sold for only one and one-third times book value and the average industrials had again recovered to double book value, from the recent market slump.

The trend of this ratio gives cause for concern for another reason: since utilities need to raise large amounts of new funds and since they already have high debt ratios, significant new funds must come from the equity markets. When new shares must be sold at prices below book value, the book value of existing shares is diluted. Such prospects have a depressing influence on the price of utilities' equity securities; thus, more shares have to be sold and the more shares then outstanding dilute earnings per share, which, in turn, results in still lower prices.

Conclusions

This study has examined a number of financial ratios designed to cast some light on the inherent differences of utilities vs. industrials. It has indicated partial explanations for some of the economic problems facing the utilities today:

- utilities are more capital intensive than other industries;
- depreciation is a proportionately greater part of the cost and revenue of utilities;
- utilities' assets are longer lived than industrials';
- in spite of a higher return on sales, or revenues, the higher capital intensity of utilities results in a lower return on invested capital;
- although utilities are highly leveraged, their return on equity is lower than that of the average (lower-leveraged) industrial;
- utilities' coverage of interest charges on their growing debt capital has been declining and is presently low, by traditional standards;
- recent poor performance of utilities' stocks in the marketplace is indicated by relatively depressed ratios of market value to book value and average price/earnings ratios;
- these factors, among others, all contribute to increasing problems of utilities in raising required new funds in the financial markets.

There are, of course, other reasons which contribute to utilities' difficulties, such as past complacency of management, lagging research and development, increased public awareness of pollution, higher levels of interest rates and rate structures which encourage excessive demand from the largest users. There are some indications that some of these problems are beginning to receive additional attention.

There seems to be little evidence, however, that proper recognition is being given to the inherent capital-intensive structure of the industry and the related problems in times of rising price levels. As long as inflation persists and utilities are required to price their product on the basis of historical cost of assets used up in production, their product will continue to be priced too low, thereby encouraging excessive demand, which, in turn, contributes to abnormal expansion in the industry. Internal funds generated will not be sufficient to replace existing assets and this, combined with expansion requirements, causes prohibitive amounts of new capital to be raised in the financial markets, which, in turn, are demanding a greater yield on these securities because of these very problems.

In a following article, the author will suggest consideration of a new approach to this problem, which, although initially raising utilities' rates, should eventually result in lower rates to customers and in reduced requirements for new funds from the capital markets.

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