THE REGULATION OF PUBLIC UTILITIES

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among the public utility industries and between the regulated and unregulated sectors of the economy. As is demonstrated in the following chapters, regulation is now, and always will be, a difficult process. It is only with better understanding and increased knowledge of economic, political and social factors that regulation can be an efficient substitute for competition.

Task of Rate Regulation

Before discussing the theory of public utility regulation in detail, it is desirable to outline the overall task of rate regulation. The method of establishing rates constitutes one of the most fundamental differences between public utilities and the remainder of our private enterprise system. In the nonregulated sector, rates are largely determined by the action of competitive forces — market supply and demand. In the regulated sector, because of the absence or the control of these competitive forces, rates are generally determined by a regulatory commission acting under broad powers conferred on it by the legislature, subject, of course, to judicial review.

Each aspect of rate regulation is treated separately in the next few chapters, but in reality they overlap in many instances. Thus, annual depreciation must be included in operating costs and accrued depreciation subtracted from the value of a utility's tangible and reproducible property; service and safety standards have an important relation to the rates that a utility must charge its customers. For these and other similar reasons, the various problems of regulation are closely interwoven.

The Revenue-Requirement Standard

The basic standard of rate regulation is the revenue-requirement standard, often referred to as the rate base-rate of return standard. Simply stated, a regulated firm must be permitted to set rates that will both cover operating costs and provide an opportunity to earn a reasonable rate of return on the property devoted to the business. This return must enable the utility to maintain its financial credit as well as to attract whatever capital may be required in the future for replacements, expansion and technological innovation, and it must be comparable to that earned by other businesses with corresponding risks.

There are two aspects of rate regulation: (1) the rate level or determination of a utility's general level of rates and (2) the rate structure or determination of specific rates and the relationships between rates. In the words of the Supreme Court:

> The establishment of a rate for a regulated industry often involves two steps of different character, one of which may appropriately precede the other. The first is the adjustment of a general revenue level to the demands of a fair return. The second is the adjustment of a rate schedule conforming to that level, so as to eliminate discriminations and unfairness from its details.[15]

Rate Level. The first aspect of rate regulation, the determination of a utility's total revenue requirement, can be expressed as a formula:

$$R = O + (V - D)r$$

where:
- R is the total revenue required
- O is the operating costs
- V is the gross value of the tangible and intangible property
- D is the accrued depreciation of the tangible and reproducible property
- r is the allowed rate of return.

The formula indicates that determining the total revenue required (generally for a twelve-month period) involves three major steps. First, allowable operating costs must be ascertained. These include all types of operating expenses (wages, salaries, fuel, maintenance, advertising, research and charitable contributions) plus annual charges for depreciation and operating taxes. Operating costs represent the largest percentage of a utility's total revenue requirement. Many of these costs are determined by normal competitive factors (wages, salaries, fuel and maintenance) or by various levels of government (taxes). Others are determined by the individual firms (expenditures on advertising, research and development, and charitable contributions; purchases from affiliated subsidiaries) or by the regulatory commissions (annual depreciation rates). A public utility legally may spend any amount it chooses for such purposes, but a commission may not allow all expenditures made for rate-making purposes. When an expenditure is disallowed, in effect, it is charged to a utility's stockholders rather than to its customers.[16]

Second, the net or depreciated value of the tangible and intangible property, or net investment in the property, of the enterprise must be determined. This net value or investment ($V - D$) is referred to as the "rate base"; the process of determining its value as "valuation." Referring again to legal phraseology, a public utility is entitled to the opportunity to earn a "fair rate of return" on this net value or investment; that is, on the rate base. The determination of the rate base has been the source of major controversies between public utilities and the commissions ever since the early days of regulation.

Tangible property represents the value of, or investment in, plant and equipment "used and useful" in providing a particular utility's services. Methods of arriving at the value of a company's property differ. In recent years, with an increasing price level, utilities have argued in favor of repro-

duction cost valuations or the value of plant and equipment expressed in current dollars, while commissions generally have favored original cost valuations or the cost of plant and equipment when purchased or built. Regardless of the measure used, accrued depreciation must be subtracted so as to reflect the depreciated cost or value of the property. Land is usually separated from other tangible property. It is commonly valued either at its original cost or at the value of adjacent property, although qualified appraisals are sometimes accepted by the commissions. No depreciation is subtracted since land tends to appreciate in value over time.

In addition to used and useful tangible property, the rate base includes an allowance for working capital and, depending on the circumstances, amounts for water rights and leaseholds. In former years, the utilities also argued that several intangibles — especially franchise value, going concern value and good will — should be considered in rate making, but current commission practices exclude these items. Considerable controversy, however, surrounds the proper inclusion or exclusion of plant under construction, an item that is of major significance to expanding utilities. The issue: Should construction work in progress (CWIP) be included in the rate base and a current return earned, or should it be excluded from the rate base and the allowance for funds used during construction (AFUDC) capitalized?

The foregoing discussion assumes that the rate base is determined from the left-hand or asset side of the balance sheet, which represents the depreciated original cost of assets used and useful in the enterprise as well as an allowance for working capital. The rate base also may be determined from the right-hand side of the balance sheet, which constitutes the capital employed in the business. This second method is known as the invested-capital or prudent-investment rate base, and was long advocated by Justice Brandeis. "The thing devoted by the investor to the public use," he argued in the *Southwestern Bell* case, "is not specific property, tangible and intangible, but capital embarked in the enterprise."[17] Regulatory statutes permit some commissions to use either method, while limiting other commissions to only one.

Third, a fair rate of return must be determined. This rate is usually expressed as a percentage of the depreciated value of a utility's property. Thus, a rate base of $250 million combined with a 12 percent fair rate of return will result in an annual allowance of $30 million as the fair return component of the firm's revenue requirement. (To this figure must be added the allowable operating expenses, depreciation and taxes to determine the firm's rate level.)

Whatever rate of return is allowed, it should perform two functions. It should be fair to investors so as to avoid the confiscation of their property. It should also preserve the credit standing of the utility to enable it to attract new capital to maintain, improve and expand its services in response to consumer demand. Public utilities must compete for investment funds in the capital market with nonregulated businesses. Moreover, they are not guaranteed a fair

rate of return; they are entitled to a fair return only if it can be earned. As expressed by the Supreme Court:

> It may be safely generalized that the due process clause never has been held by this Court to require a commission to fix rates on the present reproduction value . . . or on the historical valuation of property whose history and current financial statements showed the value no longer to exist. . . . The due process clause has been applied to prevent governmental destruction of existing economic values. It has not and cannot be applied to insure values that have been lost by the operation of economic forces.[18]

Rate Structure. The second aspect of rate regulation, the determination of a utility's rate structure, involves the establishment of rates (prices) to be charged consumers. The problem is complex. For many public utilities, nonallocable (common or joint) costs represent a significant percentage of total costs. All public utilities have various degrees of monopoly power in the market areas they serve, and all have unused capacity some of the time. For these reasons, rate structures are differentiated: Both supply (cost of service) and demand (value of service) considerations enter into their development. Utilities, for example, sell the same service to different classes of buyers with the classes largely determined by differences in demand elasticities. They do not charge each class the same rate. Often, differences in rates can be justified by differences in costs. Sometimes they cannot, and discrimination occurs.

In the absence of regulation, price discrimination may be favorable to the supplying companies and to some buyers, but unfavorable to the vast majority of consumers. As has already been pointed out, there is a potential for a firm with monopoly power to charge more where demand is relatively inelastic and alternatives are lacking, and less where demand is relatively elastic and alternatives are available. Moreover, special prices or rebates may be given to those in the strongest bargaining position. Yet, under conditions of decreasing costs, price discrimination may be socially desirable. The seller who discriminates might well enjoy higher sales, lower costs and larger profits, while the seller who is forbidden to discriminate might have smaller sales, higher costs and smaller profits or even losses. Consumers, too, may benefit from discrimination: Lower prices usually result in a greater demand for — and, hence, consumption of — the utility's services. For many years the commissions and the courts supervised the utilities' rate structures to prevent undue and unjust discrimination and to ensure that the benefits of discrimination were realized.

In more recent years, increasing utility rates and competition have added a new dimension to the rate structure problem. Indeed, rate design has become the most important single issue in rate-making (at least in terms of

Chapter 8

THE RATE BASE

Original cost and the practice of using it as the base for rate of return measurements are not mere regulatory artifacts. Putting the distinction between original cost and historical cost... to one side for the moment, books of account are kept, financial statements prepared, and rates of return calculated on original cost throughout the economy. Hence the traditional regulatory emphasis on original cost is in large measure a mere reflection of long-standing business and financial practice. Of course, that practice has been much criticized of late. In an age of inflation it looks unreal.

—Federal Energy Regulatory Commission

Determination of the rate base — the value of a utility's property used and useful in the public service minus accrued depreciation — is one of the most important and most difficult problems confronting both the commissions and the utilities. No other conflict in the history of regulation has received so much attention or been the subject of so much litigation. There has always been agreement that the price for the service of a public utility should be high enough to cover operating expenses, depreciation and taxes, and also allow a fair return on the fair value of the capital invested in the business. Consumers expect to pay "just and reasonable" prices for the services they demand; investors expect to receive a "fair" return on the capital they invest. How should the commissions establish the value of a utility's property?

The major controversy has been over the determination of the depreciated value of tangible and reproducible property and is discussed in the first four sections of this chapter. The fifth section concerns other elements of value, while construction work in progress is considered in the final section.

Elements versus Measures of Value

At the outset, it is useful to distinguish between the elements of value or the things to be valued and the measures of value or the ways in which they are valued.[1]

Elements of Value. The elements of value refer to the tangible and intangible assets of a utility that together comprise the rate base. The elements may be listed under four headings. Of these the first element is tangibles, which include "used and useful" land, buildings and equipment (plant). The decision as to what property is "used and useful" is normally left to management, although certain items claimed by utilities may be questioned and excluded from the rate base by the commissions. As listed by Welch, these items are:

> (1) Duplicate and unnecessary property; (2) obsolete and inadequate property; (3) property to be abandoned; (4) abandoned and superseded property; (5) overdeveloped property and facilities for future needs; (6) real estate: buildings, leaseholds, and water rights; (7) incomplete and contemplated construction; (8) property used for nonutility purposes; (9) property of other utility departments (as in the case of a combination gas and electric utility company); (10) property not owned; (11) property donations — voluntary or involuntary; (12) deposits and moneys advanced by customers.[2]

The second group, other elements of value, includes working capital, property held for future use and intangibles. Customer contributions and tax deferrals, which comprise the third group, are frequently deducted from the rate base, since they do not represent investor-supplied capital. The fourth, construction work in progress, has become one of the most controversial issues in rate making. A typical electric utility rate base is illustrated in Table 8-1.

Measures of Value. Once the items of property to be included in the rate base have been determined, their value must be established. The measures of value refer to the various methods of computation used in determining the total value of a utility's investment.

A word of caution: In discussing the rate base valuation problem, it must be recognized that "fair value" is not value in the economic sense. Regulatory commissions are not finding the value of property; they are making it. In the case of nonregulated companies, value is the result of market processes. The value of a company's property is determined by the profitability of the

TABLE 8-1

Electric Utility Rate Base[a]

Total Utility Plant In Service	$569,544,820
Total Accumulated Depreciation	$105,464,587
TOTAL NET PLANT	$466,080,253
Eliminate Amounts Recorded On Books In Excess Of Original Cost — Mystic Lake	$ 105,194
LESS: Customer Contributed Capital	
Accumulated Deferred Income Taxes	
Amortization of Plant Acquisition Adjustment	$ 105,194
Accelerated Depreciation	1,1816,954
Liberalized Depreciation	29,775,539
Accumulated Deferred Investment Tax Credits (Pre-1971)	1,340,566
Customer Advances for Construction	1,120,638
TOTAL CUSTOMER CONTRIBUTED CAPITAL	$ 34,158,891
PLUS: Working Capital	
Gross Cash Requirements	$ 6,979,821
Credit for Accrued Taxes	(5,457,809)
Fuel	1,544,915
Materials & Supplies	5,862,088
Net Kerr Rentals	3,393,786
TOTAL WORKING CAPITAL	$ 12,322,801
COMPANY ADJUSTED TOTAL ELECTRIC UTILITY RATE BASE	$442,360,561
PLUS: Commission Adjustment for Excess Accumulated Deferred Taxes[b]	$ 345,750
COMMISSION ADOPTED TOTAL ELECTRIC UTILITY RATE BASE	$442,796,311

[a]The rate base was calculated on a thirteen-month average test period, ended September 30, 1979, adjusted for known changes.

[b]To adjust the accumulated deferred tax account for the reduction in the corporate income tax rate from 48 to 46 percent.

Source: *In re Montana Power Co.*, Order No. 4714a (Mont. 1980), 20.

business, and represents the capitalized sum of the earnings above all operating costs at the current rate of interest or rate of return. In the case of public utilities, this cannot be done, since the earnings depend on the rates established by the regulatory commissions. If rates are set high, value will be high; if low rates are set, value will be low. Circular reasoning is thus involved if fair value for ratemaking purposes is thought of in the economic sense—rates cannot be based on a value that is dependent on the rates. This distinction, long overlooked, was finally recognized by the Supreme Court in 1944:

> The fixing of prices, like other applications of the police power, may reduce the value of the property which is being regulated. But the fact that the value is reduced does not mean that the regulation is invalid. . . . It does, however, indicate that "fair value" is the end product of the process of rate making, not the starting point as the Circuit Court of Appeals held. The heart of the matter is that rates cannot be made to depend upon "fair value" when the value of the going enterprise depends on earnings under whatever rates may be anticipated.[3]

For purposes of rate making, therefore, value depends on the measures of value used by the companies and commissions.

Throughout commission and court decisions, several measures of tangible and reproducible property value, some subsequently rejected, have been discussed and employed. While these measures are discussed at length in the following sections, they can be summarized as follows. (The measures marked with an asterisk have been generally rejected as proper measures of value.)

1. Measures of Construction Cost Value

   a. *Actual, "First" Original, or Original cost.* The amount actually paid for installing the original plant and equipment, plus additions, when first devoted to public service.

   b. *Book or Investment Cost.* The amount actually paid for installing the present plant and equipment, plus additions, as shown in the investment accounts on the utility's books.

   c. *Historical Cost or Prudent Investment.* The original cost minus any fraudulent, unwise or extravagant expenditures.

   d. **Capitalization Cost.* The capital invested in the business as measured by the outstanding bonds, stock and other securities.

2. Measures of Reproduction Cost Value

   e. *Current or Reproduction Cost; Price Level Accounting.* The cost of plant and equipment, plus additions, estimated at price levels prevailing at the date of valuation.

   f. **Split Inventory Value.* The original cost (reproduction cost) of plant and equipment installed before a specific date, and the reproduction cost (original cost) of property installed thereafter.

   g. **Taxation Value.* The value of property as assessed for taxation purposes.

   h. **Market Value.* The capitalized value of a utility (that is, its probable earnings capacity).

   i. **Exchange or Purchase Value.* The value of a utility as determined by the price another party is willing to pay for the property.

There is a third measure of value, which depends upon the two discussed just above: fair value. *Fair value* is a figure somewhere between original cost and reproduction cost, arrived at by the exercise of "enlightened judgment" or by a specific formula.

Property Valuation: Legal Concepts

Prior to the famous case of *Smyth v. Ames* in 1898,[4] determining the rate base was a problem for commissions and legislatures. In deciding an 1877 case, the Supreme Court had taken the position that rate making was a legislative rather than a judicial function. As explained by the Court:

> Rights of property which have been created by the common law cannot be taken away without due process; but the law itself . . . may be changed at the will, or even at the whim, of the legislature, unless prevented by constitutional limitations. . . . To limit the rate of charge for services rendered in a public employment . . . is only changing a regulation which existed before. . . .
>
> We know that this is a power which may be abused; but that is no argument against its existence. For protection against abuses by legislatures the people must resort to the polls, not to the courts.[5]

In 1886, the Court reversed its position, recognizing that "this power to regulate is not a power to destroy, and limitation is not the equivalent of

confiscation."[6] Rates fixed under legislative authority, therefore, were subject to judicial review and might be set aside if they were found to deprive investors of their property without due process of law. And a few years later, for the first time, the Court held that a rate-fixing statute of Texas confiscated the property of a railroad company.[7] But the Court established no standards by which to judge the reasonableness of commission valuations until the *Smyth* decision.

"Fair Value" Doctrine

The state of Nebraska in 1893 passed a law that established a Board of Transportation. Among other things, the board was given the authority to determine the rates charged for hauling freight. One of its first orders, setting maximum rates, was challenged by the railroads on the basis that the rates were confiscatory. The roads contended that much of their property had been constructed during and after the Civil War when prices were high and that they were entitled to a return on their original cost. The state, represented by William Jennings Bryan, based its measure of reasonable earnings on the lower reproduction cost. The property valuation problem thus came to the front.

The Supreme Court held that the rates were confiscatory by any measure. This finding was not, however, the importance of the decision, since the Court went on, in a dictum not essential to its decision, to state the measures of value by which confiscation could be judged. This dictum later became the legal basis of the "fair value" doctrine. Said Justice Harlan:

> The corporation may not be required to use its property for the benefit of the public without receiving just compensation for the services rendered by it. How such compensation may be ascertained, and what are the necessary elements in such an inquiry, will always be an embarrassing question. . . .
>
> We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation . . . must be the fair value of the property being used by it for the convenience of the public. And in order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration, and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property. What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is

Economics of Price Discrimination

When a firm sells the same service at rates that are not proportional to costs, discrimination results. Stated another way, discrimination occurs when rates are based upon differences in demand rather than differences in costs. Consequently, some buyers will pay more than the cost of the particular service; others will pay less. It must be noted, however, that discrimination is not unlimited. Since sellers cannot force customers to pay more than they believe the service is worth, the upper ceiling is the value of service. A price set above this limit would result in reduced sales. The lower limit is the seller's marginal (sometimes referred to as out-of-pocket) costs. Any sales made at a price below this limit would result in losses, since these costs can be avoided by not producing the output. When fixed costs are high, as in most of the utility industries, these limits are wide, thereby leaving considerable latitude for discrimination.

Unavoidable versus Intentional Discrimination

Discrimination is partially unavoidable. The cost of providing a particular service is difficult, if not impossible, to determine accurately. Some variable costs, such as labor and fuel, are easily identified with a unit of output. Other costs, however, are commonly or jointly incurred in rendering different types of service. Rather than varying directly with output, they decline in importance as output increases. These costs include interest, depreciation, investment in plant and equipment, and administrative overhead. When investment is large, such costs represent a significant percentage of total costs. When the same plant or equipment is used to provide several types of service, there is no one correct way to allocate these costs among the different units of service. Any method of apportionment is subject to dispute.[8] Even if firms tried to base their rates upon costs, therefore, a substantial element of judgment is involved.

Discrimination is also intentional. As previously shown, when one rate is charged for a service, a company may not be able to utilize its capacity fully. Only by discrimination may idle capacity be eliminated. Furthermore, discrimination is often socially desirable. If it allows a company to expand its sales and utilize its facilities more fully, average costs are reduced as fixed costs are spread over more units of output and the firm's profits are increased. Fuller utilization, in turn, may result in lower prices for *all* customers and in wider use of the utility's services. Some services might be offered that would not be available under uniform rates or only available at substantially higher rates; interstate toll calls over low-density routes often are subsidized by revenues from high-density routes. Regional development also may be encouraged; low electric rates encouraged its use and attracted

industry to the Tennessee Valley Authority area. These advantages, however, are unlikely to be realized unless rates are controlled. As Sharfman has pointed out, there is an inherent danger in discrimination:

> The "value of service" principle, as a basis for rate-making, provides at best a vague and indeterminate formula, rather easily construed as justifying any system of rates found expedient by the carrier. Taking the words in their most obvious sense, no rate can exceed the value of service and still continue to be paid by the shipper.[9]

Conditions for Discrimination

Rate discrimination is not possible unless the market can be separated into distinct sectors so that (1) customers who are charged the higher rate cannot buy in the low-rate sector and (2) those buying at the lower rate cannot resell in the high-rate sector. For industries that sell transferable products, this delineation is usually not possible.[10] However, for public utilities that sell services, such a division of the market is possible. Moreover, they are able to control the use of their services, since they generally deliver them to the customer as they are consumed. If a telephone company charges a business customer more than it charges a residential user, the business subscriber cannot obtain the lower rate by connecting his telephone with the residential subscriber's lines. Customers of utilities cannot shift between the established sectors. This condition further implies that the discriminating firm is either free from competition or that competition is controlled. If two firms supplied the same market, their rivalry for business would force rates down. Two other conditions for discrimination also must exist.[11] The elasticities of demand in the established sectors of the market must be considerably different. That is, if the elasticities are equal or similar, so, too, will be the marginal revenue curves, and discrimination would serve no purpose. Finally, the cost of separating the market into sectors must not be too large. Rate discrimination involves some extra expense. Different bills, for example, usually must be printed for each type of customer, and bookkeeping becomes more complex. For discrimination to be profitable, the increase in revenues must be greater than the additional expenses incurred.

Case for Discrimination

Discrimination may be advantageous for two reasons. First, it may result in a fuller utilization of a firm's plant and equipment, and a wider consumption of its service. Second, it may lead to lower prices for all customers. The first was illustrated above, where adoption of price discrimination permitted output to rise from 400 units to 2,000 units. The second can be seen in Table 10-3. Here, the prices, sales and costs are the same as those in the previous

tables, but now it is assumed that a regulatory commission controls the firm's rate structure. It was suggested earlier that the rate structure shown in Table 10-2 involves "undue" discrimination because of the presence of excess profits. If discrimination were not allowed, therefore, the commission would force the seller to produce 500 units, which would sell for $7.00 each, as shown in Table 10-1. At this price, there would be no excess profits.

TABLE 10-3

Enterprise Practicing Price Discrimination under Regulation*

Price	Sales	Sales in Each Class	Revenue from Each Class	Total Revenue	Total Cost	Profit/Loss
$5.00	1,000	1,000	$5,000	$ 5,000	$ 5,400	– $ 400
4.00	1,400	400	1,600	6,600	6,700	– 100
3.00	2,000	600	1,800	8,400	8,200	+ 200
2.00	2,800	800	1,600	10,000	10,000	0
1.00	3,800	1,000	1,000	11,000	13,000	– 2,000

*This rate structure is only one of several possible structures that might be established by a company and accepted by a commission.

By allowing discrimination, the commission could establish the rate schedule shown in Table 10-3. A fair return is earned from a scale of prices that begins at $2.00 and rises to $5.00, while the volume of output is raised to 2,800 units. It should be noted that every price is well below the $7.00 that would have to be charged if discrimination were not allowed. This schedule is made possible since by serving the low-rate customers who cannot afford the service at a higher rate, the firm's fixed costs are spread over more units. As a result of the adoption of such a schedule, no customers are harmed. On the contrary, all of them have been helped: the $5.00 customers have saved $2.00 per unit, while the $4.00, $3.00 and $2.00 rates are required to obtain customers who otherwise could not afford the service.

Such discrimination cannot be justified, however, unless (1) there are high fixed costs and chronic unused capacity, so that costs per unit are reduced as the fixed costs are spread over a larger volume of output; (2) the lower rates are needed to attract new business; (3) all rates cover at least variable costs and make some contribution to fixed (overhead) costs; and (4) regulation is undertaken to keep total earnings reasonable and to keep discrimination within bounds. If these conditions exist, discrimination is desirable, since it leads either to an increased use of the facilities or to a

lower rate for the customers discriminated against.[12] At the same time, it is important to remember that each rate must be set with the thought that all rates together should return to the utility sufficient revenue to cover its total costs of service, including the rate of return allowed by the commission. This statement does not imply that such revenue is guaranteed; rather it simply means that this end should be kept in view.

The Case against Discrimination and Embedded Costs

Under conditions of decreasing costs, and assuming a goal of expanding service to a maximum number of consumers, few would challenge the desirability of discrimination.[13] But such discrimination does not promote economic efficiency, particularly under conditions of increasing costs, since consumers are given improper price signals. Correct price signals — and the achievement of economic efficiency — require marginal cost pricing,[14] and herein lies the controversy concerning rate design.

Utility rate structures, as they were developed over the years, represented a complex and confusing mixture of cost of service and value of service considerations, with the promotion of use as the dominant objective. To the extent that rate structures were cost-justified, they were based upon historical embedded (average or fully distributed) costs. In the words of the Colorado commission:

> For example, a utility will establish an actual test year for determining revenue requirements and utilize the historical costs for purposes of functionalizing and allocating the costs to various classes of customers for purposes of establishing rates. In that fashion, both the revenue requirements and the rates ultimately determined are based upon the average costs for the historical test year.[15]

In many instances, however, discrimination was not justified. Further, rate structures included countless internal subsidies: off-peak users subsidized on-peak users, industrial and commercial customers subsidized residential customers (electric and gas) and long-distance (toll) calls subsidized local exchange service (telephone), to cite only a few examples. Many customers, in short, paid a rate that did not reflect "the marginal social opportunity cost of supply."[16] Those who paid less were encouraged to demand more service; those who paid more were encouraged to demand less service.

By the early 1970s, recognition was growing that such rate structures were incompatible with the new economic environment. Promotion was no longer rational, since new capacity resulted in higher average costs. And competition was forcing some rates toward marginal costs, since internal subsidies require monopoly conditions.[17] Not only were customers being given improper price signals, but utilities found that during inflation, rates

based upon past costs and sales resulted in constant revenue deficiencies. For these and other reasons, the emphasis began to shift to marginal cost pricing.

Marginal Cost Pricing: Theory and Practice

The economic literature has long provided the theoretical framework of marginal cost pricing; that is, the pricing of all goods and services at marginal cost.[18] Until recently, however, little attention has been devoted to the problem of translating abstract theory to practical application, particularly with respect to public utilities,[19] although the marginal cost pricing principle has been widely employed in France and England.[20] But with the exposure of public utilities to competitive market forces, rising costs and more elastic demand conditions, marginal cost pricing principles have received increased attention in the literature and in regulatory proceedings.

Theory and Qualifications

Under the equilibrium conditions of pure competition, as explained in Chapter 2, price, which represents what consumers are willing to pay for the last unit of a good or service, is equal to the cost of producing that last unit; that is, marginal cost. As a result, the consumers' valuation of the last unit and the cost of producing the last unit are equal. This equilibrium results in a socially optimum volume of output and a minimum cost of producing the volume. The theory, however, is subject to two qualifications:

> The first qualifying consideration is the cost of administering such a pricing system: obviously, economic efficiency requires that we move toward marginal cost pricing only so long as the additional cost of developing and administering a closer approximation to it is exceeded by the incremental benefit. Notice that even in this decision marginal costs remain the controlling criterion. The second qualification is the principle of second-best: in deciding to what extent and whether to price at marginal cost in a particular market, it is essential to take into account the presence of imperfections elsewhere in the system, in particular the extent and direction in which prices in other markets may diverge from that standard. Both of these qualifications counsel taking into account such other considerations as the possible desirability of avoiding excessive fluctuation of rates over time.[21]

The first qualification is self-evident; the second requires brief consideration. It has been shown that unless prices are equal to marginal costs in *all* industries, an optimum allocation of resources (in the Paretian sense) cannot be achieved.[22] The "problem of the second best" is both a disturbing