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PROFILES IN ELECTRICITY ISSUES:

Declining Block Rates

Summary:

The basic criticism of declining block rates – that they are "promotional" rates which favor the large consumer – is not founded on fact. The opposite may be true, with small consumers benefiting from such rates.

Recent critics of electricity rates often misunderstand rates and how they relate price to cost. It is in the interest of all consumers that there be a better understanding of the basis for the declining block.

In this profile, declining block rates are carefully analyzed, and the reader is provided a specific example of how a typical residential declining block rate is derived.

ELCON concluded that declining block rates are rational and do approximately track costs for small consumers with similar characteristics who are billed on a kilowatt-hour basis. If they are replaced, it should be by a better rate design, not just a different one.

Declining Block Rates

Declining block rates have received criticism in many rate reform circles as the rate structure representing all that is wrong with current electricity pricing. They have incorrectly been described as "promotional," "rewarding the large user for wasting energy," "giving volume discounts," and "not being cost justified." The more cautious critics say that declining block rates appear to have these qualities.

Conclusions being drawn about declining block rates reflect a general misunderstanding of the structure of rates and how rates relate price to cost. The purpose of this paper is to provide a better understanding of the basis for declining block rates -- not to prove the necessity for continuing their use.

The Cost of Providing Electric Service

Rates should be designed to recover the cost of providing service and to reflect the manner in which those costs occur. Before a rate structure can be understood, something must be known about costs.

The costs of providing electric service can be separated into three categories: capacity-related costs, energy-related costs and customer-related costs. These categories can be defined as follows:

- Capacity Costs -- Those costs associated with facilities necessary to respond to each customer's kilowatt demand on the system, including a reserve margin necessary to maintain an acceptable level of service reliability.

- Energy Costs -- Those costs which are incurred in the production of the kilowatt-hours used by a system's customers (primarily fuel).

- Customer Costs -- Those costs incurred in servicing customer accounts, including a portion of distribution costs, hookup, meter reading, bill preparation and customer accounting.

Within each of these categories, certain costs are referred to as being fixed and others as being variable. Fixed costs are those that, in total, do not vary with output.[1] An example of fixed costs is the carrying cost of physical plant, including generators, transmission lines and the distribution system. The dollars invested and thus the carrying costs do not change whether 1 kilowatt-hour or 1 million kilowatt-hours are produced.

Variable costs are those that change in total as output changes. The total variable costs increase as output increases and decrease as output decreases.[2] The primary variable cost in electricity production is fuel.

It can be seen that for the most part, capacity and customer costs are fixed and energy costs are variable. These concepts are basic to understanding the design and application of a declining block rate structure.

The Rate Structure

Any rate structure used to recover the costs of providing service should reflect the fact that some costs are fixed and some are variable. This is exactly what the declining block rate does. For the residential customer the typical electric meter measures only the units of energy used and rate structures, such as the declining block rate, must recover costs on a per unit of consumption (kWh) basis. It follows that on this basis, the variable costs will be the same per unit and therefore the total variable cost will increase directly as consumption increases. On the other hand, the fixed costs, which remain the same regardless of consumption, will decrease on a per unit basis as consumption increases, because the same total is recovered over more units of consumption. When both types of costs are combined, it is the decline in fixed costs per unit as consumption rises that gives the characteristic declining block rate structure.

1 Over long periods of time, all costs can vary because old equipment is replaced or new equipment is added. But, the fixed costs which a utility is allowed by law to recover represent actual investment at that time.

2 Hydroelectric generation is a special case. Its variable costs are close to zero and therefore do not significantly change total variable costs as output changes.

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A declining block rate structure is applicable for any customer classification -- residential, commercial, or industrial. The principles are the same, but practical considerations have resulted in variations of the actual structure used for each class. For most residential customers only energy (kWh) is measured. Therefore, the residential rate structure reflects all the characteristics of a declining per kWh cost -- all fixed costs recovered over a varying consumption. For the commercial and industrial customer more sophisticated and expensive metering equipment is used. The relatively greater amount of energy received at a single location has been the justification for the additional metering expense. The additional equipment can provide separate information about energy, demand and even the time of use. Separate demand and energy information is used to develop separate rates for demand-related and energy-related costs. When demand-related costs are not billed on the basis of energy consumption, the energy part of the rate is not affected by decreasing per kWh costs associated with the demand component. The rate of decline will depend on how much of the demand-related costs (if any) are billed on a per kWh basis and on whether the customer-related costs are billed separately or on a per kWh basis.

A Graphic Example

For simplicity, the declining block structure will be explained using a residential rate since, as stated, it includes all of the declining rate characteristics.

A typical residential declining block rate for monthly electric service serves as an example of how this rate structure works.

Assume the following rate for monthly service:

The first 40 kWh or less	$2.40/month
Next 50 kWh	5¢/kWh
Next 110 kWh	4¢/kWh
All over 200 kWh	3¢/kWh

The following graph demonstrates how the sample rate attempts to recover capacity and customer costs while recovering energy costs on each kWh electricity consumed.

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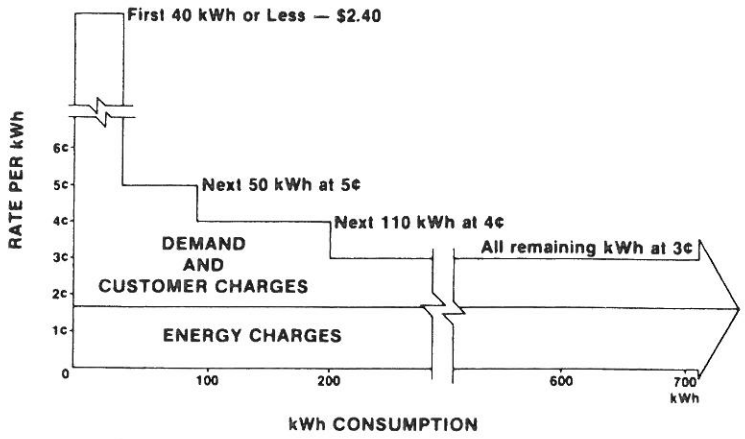
HOW DECLINING BLOCK RATES WORK



The declining block structure does have drawbacks. Since it is recovering average annual costs of providing service, the rate structure only produces the correct revenue (i.e., revenue equal to cost) for average customers.

In this example, energy costs are evenly recovered in all rate blocks while capacity and customer costs are spread across rate blocks in declining steps. This particular rate structure was designed on an average consumption of 600 kilowatt-hours per month, at an average demand level and average load factor. The rate was structured so that this customer would pay the cost to serve him. Customers using less generally do not pay their full share of the cost of service because capacity and customer costs are not recovered until consumption increases. The resulting revenue deficiency is normally recovered from customers using more than 600 kilowatt-hours. In other words, the lower-than-average-use customer usually does not pay his share of the fixed cost of serving him while the higher-than-average-use customer generally is overcharged, paying more fixed cost than is required to serve him.

The following graph represents the typical relationship between the average cost to serve and the revenue recovered using a declining block rate structure. It points out that the revenue exactly equals average cost only for a single consumption level, with some over-recovery at higher consumption levels and some under-recovery at lower consumption levels.

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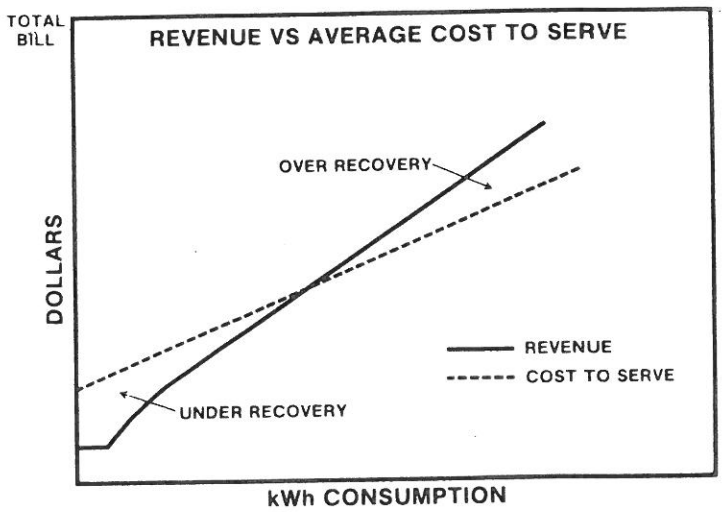

The one-part declining block structure is deficient in that it does not recognize the effect of different load factors on costs. The rate structure assumes a singular relationship (presumably the class average) between demand and energy. Customers with a low load factor -- those requiring a greater capacity for a given consumption level -- benefit by this arrangement. Their share of capacity costs are not recovered within their level of consumption.

Conversely, the high-load factor customers -- those requiring less capacity for a given consumption level -- pay more than their fair share of capacity costs, thereby subsidizing the low-load factor customer.

The inequities of a declining block rate structure are substantially rectified by the two or three-part rate schedules which are prevalent in serving large commercial and industrial customers. These schedules charge for actual customer peak demand (capacity) separate from energy consumption. The customer charge may still be recovered to some degree through block rates although the minimum bill feature can eliminate this deficiency.

Rebutting the Critics

The evidence is quite clear that the basic criticism of declining block rates -- promotional rates which reward the large consumer -- is without foundation. The opposite is often true. For relatively small consumers with similar consumption characteristics, declining block rates track costs in a rational and generally acceptable manner. Of course, a better fit between costs and rates could be obtained with two or three-part rates; but this would require additional metering equipment in most cases.

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There is one further criticism of declining block rates that is also without merit. The criticism is that declining block rates were at one time justified by economies of scale in electricity production but now the economies of scale have disappeared, so declining block rates are no longer valid. Both the premise and the conclusion of this criticism are incorrect.

- DECLINING BLOCK RATES DO NOT DEPEND ON ECONOMIES OF SCALE

  The declining block rate structure reflects the decreasing cost as output increases from a fixed capacity system. If additions to the system are made at increasing costs, this will be reflected by an increased level of rates. The rate structure would still reflect decreasing unit costs for that system at its expanded but fixed capacity.

- ECONOMIES OF SCALE STILL EXIST

  "Economies of scale" is a long-run phenomenon as used in economic theory. It exists when the unit cost of production decreases as the size of the firm increases. Among the major factors contributing to economies of scale in the electric industry is the size economies of generating plants. For example, the unit cost of production from a 600 MW plant is less than the unit cost of production from a 100 MW unit. This was and still is true when the units are compared at a common monetary base, i.e., adjusted for inflation. The existence of economies of scale in a firm or industry is unaffected and, therefore, not determined by the presence of inflation.

Conclusion

Declining block rates are rational and do approximately track costs for smaller consumers with similar characteristics who are billed only on a kilowatt-hour basis. A two-part (demand and energy) or three-part (demand, energy, and customer) rate structure could eliminate most inadequacies. But these methods entail higher metering costs and are even more difficult for consumers to understand. The total benefits of changing to more costly and complex metering techniques and rate structures should be shown to outweigh the total additional costs before being adopted. Declining block rates are but one way of charging for electric service. If they are replaced, it should be by something better, not just something different.