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FINANCES OF THE STATE ELECTRICITY BOARDS AND TARIFF POLICY

By

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The Five Year Plans have continued giving greater emphasis to the need of power development in the country. The investments in power sector in successive plans have increased from Rs 260 crores in the First Plan to Rs.7,294 crores in the Fifth Plan. During the five years of the Sixth Plan, the power sector is expected to invest over Rs 16,050 crores and this is further going to be increased in the coming years. The pertinent question would, therefore, be how best the funding needs of the power sector could be met on a long term basis. This paper examines the ways and means of funding the needs of the power sector.

For State Electricity Boards (SEBs), the possible sources of finance are the budgetary sources of the State and Central Government, loans from the financial institutions and the internally generated funds which are retained in the Board.

As far as the government budgetary sources are concerned, the Planning Commission has already indicated that the various state governments might not be able to adequately support the power development programmes. Under the present system, funds for the power programme, the bulk of which is in the state sector, have to be found from the

pool of resources available for the State's Annual Plans. In spite of the priority to be accorded to the power sector in allocation of funds when drawing up the Annual Plans, it is expected that it will become increasingly difficult for states to make the necessary allocations to individual projects on account of constraints of resources. SEBs will increasingly have to rely on their own for additional resources to implement future plans.

For new investments and developmental work, one would expect SEBs to get funds from the financial institutions, or borrow directly from the capital markets. Financial intermediaries lend only to those units whom they find capable of returning the interest and the amount loaned on due dates. In other words, if the Boards are to borrow funds from the financial institutions, they have to prove their viability in the short run and profitability in the long run. Same is true of borrowing funds from the capital markets. Secondly, if the Boards are run profitably, it would also help in generating a sizeable internal resources to finance part of their development activities. This is also being emphasised by the Electricity (Supply) Amendment Act, 1978. Earlier, the Electricity (Supply) Act of 1948 had laid down that as far as practicable, the Board should not carry on their operations at a loss and should adjust their charges (tariffs) accordingly from time to time. The

Amendment Act of 1978 had made it obligatory for the Boards to earn a net surplus to provide for timely repayment of loans and also to finance part of their annual capital requirements. The Central Electricity Authority (CEA) in its communique dated 3rd August 1978 directed the state governments that around 20 to 25 per cent of the Annual Plan programme be financed from internal resources. Undoubtedly, viability of the SEBs has become the primary consideration of all recent conferences and seminars at the governmental as well as non-governmental level held to consider the problems and prospects of the power sector.

Present State of Affairs

Concern for the SEBs has been expressed at various forums. A number of committees and working groups have studied the financial working of the Boards and nearly all of them observed that the Boards are not run efficiently, and that they are financially sick. Venkataraman Committee in 1964 suggested that inclusive of excise duty, Boards should earn at least 11 per cent on its capital base. This recommendation of 11 per cent is made assuming interest payment of 6 per cent on the Board's outstanding loans. But even after more than a decade, the actual performance of almost all the Boards has been dismal. The Boards have been accumulating heavy losses over the years. Seventh Finance Commission estimated that accumulated interest

liability on state governments' loans at the end of 1977-78 is about Rs 873.92 crores (Interestingly, all the Boards have accrued interest liability), and five Boards (Bihar, Himachal Pradesh, Meghalaya, Tamil Nadu and Uttar Pradesh) have unadjusted depreciation amounting to Rs.21.09 crores. The reasons for the present state of affairs are that while the revenue liabilities of the Boards have increased substantially from year to year because of increase in operating and maintenance costs, tariff revisions have not kept pace with the increased costs. Boards borrow to finance these losses which in turn increase the interest costs.

We have seen that if power sector has to expand, it has to be made profitable. Profitability can be ensured either by reducing costs and/or by making suitable adjustments in tariff level and its structure. As far as reducing the costs is concerned, a number of suggestions have been made by various committees. The measures suggested are reduction of system losses, better fuel management, effective financial and inventory management, better utilization of capacity, timely recovery of dues, minimising bad debts, reduction in administration overheads, etc. Further, attempts should be made to lay down operational norms for each electricity Board. Comparative performance data of various Boards should be compiled which would indicate to each Board how efficiency can be improved and where costs can be minimised.

In this paper,I shall not discuss various management and budgetary control systems which might help to monitor the cost and increase efficiency of the SEBs. I shall confine only to the pricing aspect of the financial management.

Determination of Tariffs

In setting the tariffs, two distinct steps are involved :

a) Setting an adequate level of tariffs in the aggregate, and

b) Developing an appropriate structure of tariffs

The level of tariffs determines the degree to which total revenue would cover all reasonable operating expenses and provide a fair return on invested capital which would be adequate to attract the new capital required. The structure of tariffs determines the way in which total costs, including return on invested capital, are apportioned among the various classes of customers.

In setting tariff levels, two issues to be resolved are :

a) What is the Boar's total revenue requirement considering its operating and maintenance expenses, adequate provision for depreciation, interest payment on its loans, and a reasonable rate of return on its equity (if, there is any)?

b) What is the Boards' incremental costs situation in providing electricity supply?

Reasonable return on investment is necessary if the Board has to provide satisfactory services, meet its financial obligations as and when they become due, and attract the new capital needed to support future construction. A study of incremental costs is necessary if the Board has to remain viable in the long run and allocate the resources used in an optimum manner considering the competing needs of other sectors in the economy.

The other aspect in setting the tariffs would be its impact on demand which we would consider along with the socio-economic priorities of the country when we discuss the structure aspect of the tariff.

Total Revenue Requirement

The total revenue requirement is the sum of

a) necessary operating and maintenance expense,
b) annual depreciation,
c) taxes, of any, and
d) reasonable return on capital invested in current supply of the electricity.

In setting the level, a reasonable estimate of operating and maintenance cost should be made. Based on certain acceptable norms of fuel consumption, labour and plant efficiency, standard costs of supplying the electricity should be used in estimating the level. In all fairness, inefficiency and mismanagement on the part of the Board should not be charged to customers.

Annual depreciation is a charge for using the fixed assets during the year. This is an allocation of the cost of capital equipment over its useful life in a systematic and rational manner. Controversy generally arises whether depreciation charged against revenue in a given period should be such that it does not simply recover the historical cost of the capital equipment, but in some sense or the other, also provides for its replacement. We will take up this issue later.

In determining the total revenue requirement one must also ascertain the appropriate value of the capital invested in supplying the electricity. This base is the depreciated value of the tangible and intangible property 'used and useful' in current supply of the electricity. The return should be calculated on assets in beneficial use, and the average value for the year should be taken for computation and not the year-end figures.* One can easily visualise that the capital work-in-progress which has not been put into use should not be included in such a base. The controversy regarding using historical or current values of such property-in-use would be dealt shortly in the following paragraphs.

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*The World Bank has suggested capital as the net value of the assets in use, less consumer contributions, plus 1/6 of the operation and maintenance expenditure (excluding depreciation).

Finally, a fair rate of return would be based on the cost of capital raised to finance the property base. The rate of return must reflect interest payment on the borrowed funds.

Inflation and Total Revenue Requirement

The total revenue requirement is generally computed based on historical cost data. It is suggested that during an inflationary period, this requirement should be calculated using replacement cost data in order to reflect the possible opportunity for price increase recovering current costs, otherwise management may not be able to collect enough revenue to maintain its physical capacity of production. In determining the total revenue requirement it may be desirable to adjust the depreciation charge on the replacement cost of the facilities used. However, one should take note of the fact that under current accounting practices, the accountants try to meet the depreciation shortfall by speeding up the normal process of writing off the historical costs. Some do it by making the amortization period as short as possible, while others modify the method of spreading the cost over life of the assets, charging higher depreciation in early part of the life of an asset. If one was to use replacement costs, one needs to use systematic and rational method of charging depreciation so as to avoid double incidence. The useful life of the asset and

and the manner in which the cost is spread need to be objectively and rationally determined.

The other component of the total revenue requirement, i.e. a reasonable return on capital invested, also needs to be reconsidered. The capital invested would be computed by valuing each part of its installed capacity at present day prices, and thus return would be calculated on an enlarged capital base in times of rising prices.

Some people claim that in marginal cost pricing system, the present day cost of supplying the electricity gets reflected, and thus simulates the effects of inflation on cost of production. Moreover, from economists point of view, marginal cost pricing results in a socially optimum allocation of resources, i.e., a situation in which each resource is being put to its best use.

Marginal Cost Pricing

The stated arguments in favour of marginal cost pricing are that, it allocates resources efficiently, approximates the present day values of the facilities, and provides an appropriate signal to consumers about the real cost of energy so as to increase or curtail the usage.

World Bank's "Study of Electricity Tariffs in Andhra Pradesh" was the first official document which advocated marginal cost pricing for determination of tariff for an

electricity Board in India. Without going into the rational of advocating marginal cost pricing principle, the report narrates step by step the method of calculating marginal capacity and marginal energy cost. On reading the report carefully, one concludes that their aim in recommending such an approach seems to ensure 'optimal allocation of resources' in the economy, and secondly to augment the resources to help finance future expansion. This would help SEBs in mobilising financial resource on a sufficient scale, and to relieve pressures on the public revenue to subsidise the electricity supply industry.

Further,it is suggested that long run marginal cost in preference to short-run marginal cost should be the basis for tariff formulation. In the short run, it is highly probable that industry would operate under 'excess' or 'short' capacity situation due to in ivisibilities of investments. In case of 'excess capacity situation', it would operate under decreasing cost conditions in which unit cost falls over the relevant range of the cost curve. In such situations, marginal cost is less than the average cost, and the pricing based on marginal cost would result in operating deficits. In contrast, when a Board is operating under increasing cost conditions, pricing electricity at marginalcost would result in excess profits. To avoid the operating deficits under decreasing cost conditions and the excess profit under

increasing cost conditions, it is suggested that pricing for electricity should be done on the basis of long run marginal costs.

In my opinion, the concept of marginal cost pricing would be preferred if the objectives of the tariff regulators are, a) to allocate resources optimally among the competing needs of the economy, b) to use price mechanism to mobilise resources in sufficient scale to finance power sector expansion and thus relieve pressure on the public revenue. It would be for the policy makers to define the objectives of tariff regulation, especially in a monopoly situation like ours. However, there is a caution here, that as long as other competitive forms of energy, such as coal, diesel, petrol, natural gas, and even human energy are not priced by using long run incremental cost principles, there is no basis for judging whether incremental costs pricing of electricity would achieve the desired results of optimum use of resources in the power sector, let alone the whole economy. Secondly, the forecasting period involved in the application of incremental cost pricing is generally much longer, and the uncertainties involved are too many. One may question the reliability of forecasted data. Thirdly, it will permit the Boards to earn more than its revenue requirements. One has to ask whether it is justifiable and equitable in a monopolistic situation like ours. However,

suggestion has been made that this can be taken care of by setting rates below the true long run marginal costs by a sufficient amount to eliminate the "excess" revenue, but such reduction should be concentrated in those markets where increasing electricity consumption is socially desirable.

Tariff Structure

A suitable tariff structure must ensure :

1. Simplicity, understandability and public acceptability
2. Feasibility of application for the purposes of measurement, billing, and collection of dues.
3. Effectiveness in yielding required total return.
4. Stability in structure but not necessarily in levels over a considerable period of time (it should guarantee a certain degree of stability in the price differentials embodied in the tariff system, errors of structure are extremely difficult to correct).
5. Help in restoring the load curve over time so that demand can be met at lower capacity cost.
6. Efficiency in approximating the true costs-to-serve, thus guiding the consumers towards optimum use of power, both in terms of total usage and in terms of distributing consumption between peak and off-peak period.

In a developing country like India, in addition to the above, the design of the tariff structure should be such that :

1. It encourages socially desirable consumption and discourages non-productive consumption.
2. It promotes the widespread use of electricity which would lead to more industrialisation.

3. It becomes instrumental, wherever significant and effective, for more desirable allocation of resources.

In tariff setting, the most desirable thing would be to have close correspondence between electricity rates and cost-to-serve. But for variety of reasons it is not practicable. Quite often, socio-economic objectives and lately pure political considerations have overridden the cost-to-serve principle. We will examine cost-to-serve for different classes of customers and later on discuss the tariff structure in the light of our socio-economic objectives.

Cost-to-Serve

Cost-to-serve is dependent on two major factors, viz., the quantity of energy (KWH) consumed and the rate(KW) at which it is consumed. Broadly speaking, the former determines the amount of fuel consumed and the latter the size of the plant required to meet the demand.

Energy costs are those which vary with the quantity of kilo-watt-hours produced. They are largely made up of the cost of fuel, fuel handling, and labour. The capacity costs (i.e., the demand related costs) are the costs of facilities created to be prepared to meet the electricity demand. They primarily consists of interest on investment, depreciation expense, and the maintenance and operating

expenses which do not vary with the quantity of service supplied in KWH. We may also include in the capacity costs the proportion of the fuel expense incurred to maintain readiness to serve and which do not produce energy as it is being used in banked boilers.

The capacity costs have three segments, each relating to generation, transmission, and distribution. The large industrial customers who accept service directly from the relatively high voltage transmission lines represent a far different cost burden to the Board than the residential customers whose use generally varies widely from time to time. The latter requires the use of expensive step down transformers and an elaborate low voltage system. To meet large customers' need we do not need elaborate system of transmission and distribution. Thus capacity costs to serve a residential customer is not same as that of supplying to a large customer. It may not be out of context to mention here that to supply electricity to remote areas would involve large distribution system which would mean a much higher capacity cost-to-serve.

Methods of Allocating Capacity Costs

To allocate the capacity cost among various consumer groups, one has to look into the voltage in which energy is supplied, its load peaking and coincidence factors,

length and time in which such coincidence in the peak demand hour occurs, and the amount of losses and wastage in transmission to serve these groups. A high load factor is conducive to low average costs per KWH since a relatively high KWH output can beobtained from a relatively small investment in capacity. Similarly a low coincidence factor (high diversity factor) also results in low average cost per KWH. Similarly, if transmission losses are relatively high in supplying to a specific group of customers, the capacity needed to make such supply would be relatively larger.

Generally, the fixed capacity cost is allocated on the basis of each customer's maximum demand regardless of when this demand occurs. Since the maximum demand of customers will fall at different periods and not necessarily at the time of system's peak demand, the sum total of the maximum demands of the customers would be more than the system maximum demand and thus the total recovery based on individual's maximum demand would be larger than the system's total fixed charge. Further,the method ignores the differences in the cost of serving on-peak and off-peak customers. This can be amended if structure is so designed that the entire capacity costs are allocated in proportion to the kilowatt demand of each class of customers at the time of peak load. Such allocation should not be limited to the generation capacity cost only, it is possible that various parts of

the distribution system may have its peak at different time and, th refore, their capac ty costs would be allocated according to their own peak. This method is known as 'Peak Responsibility Method'. In its 'pure' form, this method does not allocate any capacity costs to 'off-peak' customers, although even 'off-peak' service requires some capacity. A modified version of peak responsibility method is 'intercepts' method of charging fixed cost according to the time of supply during the day.

Under this method, consumers are charged according to the load curve of the system at different hours. In a typical load curve there is a base demand level which is prevalent during all the hours. The curve rises as additional demand is made during busy hours, reaching a peak point in certain hours when demand on the system is highest. For the base level consumpt on, the facilities are fully utilised all the time, and therefore, base capacity cost is divided equally among customers. For busy hours, additional capacity cost is allocated among those customers who are responsible for acquiring additional capacity. Maximum capacity cost would be borne by those customers who are consuming in peak hours. The obvious practical difficulty in following such a method would be to estimate the typical load curves for different consumer groups.

The cost-to-serve (both capacity as well as energy costs) gets substantially influenced by the transmission losses. The difference between energy generated and the energy billed varies significantly among different consumer groups. The percentage line loss in serving EHT consumers is much less compared to supplying the electricity to distant areas and small users. The capacity required to serve the same amount of electricity to the distant areas and small users would be much larger ocompared to the large and EHT users. Consequently, the cost-to-serve significantly differs for different consumer groups.

The other element in cost-to-serve is customer related costs. Customer related costs include meter reading, billing, collecting, and accounting expenses. These costs varies directly with the number of customers served, and is generally charged as fixed amount per period for each customer.

In designing a tariff structure, in addition to cost-to-serve, there are other considerations which are also important. Significant ones are as follows.

Socio-Economic Considerations

Electricity demand growth is considered very desirable from the community's point of view and its wide-spread use leads to industrialisation and rise in general

well-being. Electricity availability builds up the necessary infrastructure which in its turn forces the social and economic growth. For balanced socio-economic growth, cross sectional as well as cross-regional subsidies may be desirable from social welfare point of view. Considerations may relate to the type of use, characteristic of the user, and perhaps their location. The question to be asked is what are the legitimate and appropriate claims which these desirable but unprivileged priority sectors might have on supply of the electricity?

No one can dispute the fact that the SEBs have responsibility to serve such groups at concessional rates, but what is forgotten most often is the costs of such responsibility and who should bear them. The SEBs do not endeavour to recover such costs from other sectors to whom the benefits accrued overwhelmingly outweigh the charges made. To make SEBs financially viable, it is essential that total required revenue is collected, and that the cross subsidisation is understood to mean that some sectors have to pay little higher to subsidise the other sectors. One may also argue that the government has a responsibility of socio-economic growth of underdeveloped areas and the concessions given to preferred sector must come from the budgetary sources of the State and Central Governments. In any case, the Boards should not be the losers for supplying electricity to the

priority sector at cheaper rate, and thus endangering their own financial stability.

Demand Elasticities

Lastly, one should also take into account the consumer's response to electricity prices. No doubt, the price elasticity of electricity is very low mainly due to electricity costs being very small proportion in the total costs. However, over a long period, demand of electricity might be expected to be more elastic. Certain uses of electricity are open to competition from other sources (i.e., mechanical and other forms of power). Different customer groups are going to react differently on price change because all do not have the same price elasticity. A customer group which is using electricity for personal consumption purposes like lighting, heating, etc., the price elasticity is considerably low. They derive high personal utility compared to the sacrifice made by way of electricity charges. A huge consumer surplus accrue to this class of customers, and any price increase is easily absorbed without any decline in consumption.* But when electricity is used as an input to produce other economic goods, reaction to price increase would be more quick based on purely economic considerations. It may be interesting to estimate price elasticities for different consumer groups over a long period of time and accordingly design a suitable tariff structure.

*One may,however, note here that it may deprive a poor consumer of the use of electricity if his electricity bill becomes sufficiently high in his total family budget.

Conclusion

To summarise, I must state that financial situation of the SEBs has been very critical mainly because of their operational inefficiencies on the cost side and faulty tariff policies on the revenue side. Based on normal operational performance, standard cost should be determined for each Board and after providing for adequate return on its investment in current supply of the electricity, the total revenue requirements must be determined. Further, total revenue requirement must take into account the present day cost-to-serve and thus provide for constant replacement and growth of electricity industry.

A suitable tariff structure should be designed to collect the total required revenues. The cross-subsidies, however, would promote socially and economically desirable growth of the electricity consumption. Drastic changes are needed in the policies and management of the electricity Boards. In a monopolistic supply situation, operational inefficiencies need not be hidden and in the name of socio-economic development tariff structure need not be artificial. There should be no political interference in tariff formulation if the Boards are to remain viable.

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