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Cost-effectiveness of alternative investment strategies for the power sector in India: A retrospective account of the period 1997–2002

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Abstract

This paper focuses on the profitability of investments in the power sector in India seen from a micro-economic viewpoint followed by macro-extrapolation. We will compare the profitability of various investment strategies that serve as an alternative to the simple expansion of the generating capacity. In a system where maintenance has long been neglected, these measures also turn out to be cheaper than capacity addition and should be given preference in a period of scarcity of funds. Improvement in the use of plants and reduction of technical and non-technical losses are profitable, but these measures are not implemented enough under the present public system in India.

We will then briefly link up these findings with some of our earlier works to show that these inefficiencies arise because State Electricity Boards have long relied on technical and administrative procedures that were designed during a period of expansion and not on efficiently decentralised and information-based management as should be the case in the present mature phase.

Keywords: Electricity; Investment; Profitability; Network rehabilitation

1. Presentation

Several studies deal with the investments required by the Indian power sector to bridge the present gap in demand and supply. Most of them are based on a business-as-usual scenario and just keep extrapolating the current trends, without giving much thought to efficiency improvement. Projections of future demand, for instance in Mohan (1997) and Shukla (2000), show large upcoming equipment needs, regardless of the scenario under consideration. The business-as-usual hypotheses show that India lacks money for its power system development. This approach is in line with the official position on reforms. Although it is fully aware of the inefficient operation of SEBs, the Government of India (1998a, 1998b) still contends that 'the most serious problem facing the power sector is the paucity of investment funds'. It argues (Government of India, 1998b, 2004) that additional resources for upgrading the system would need private sector participation in the areas of generation, transmission and distribution. Significantly, the need for reforms seems to emanate from these concerns and it is recognised that structural reforms in the industry are very necessary to attract private capital (Government of India, 2004; Ruet, 2002, 2005a). This issue is therefore central in the Indian debate on

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power reforms. However, these macro-studies are based on more or less conservative hypotheses, at least as far as the managerial efficiency of State Electricity Boards (SEBs) is concerned (Ruet, 2003).

Another set of studies, essentially led by the World Bank (1996, 1997, 1999) for reforms in the states of Orissa, Haryana and Andhra Pradesh, have attempted to quantify the need for structural reforms in operation and management and restructuring of generation. They suggest interesting options for going beyond the preset notion of increasing public expenditure for expanding the generation capacity and sift through the numerous possibilities for the technical-cum-managerial reorganization of the power sector.

We wish to complement these studies, in three ways:

- firstly, they never bring out clearly the economic profits that can be derived from these particular measures, for instance, in terms of internal profitability; we propose to do so through calculations based on several hypotheses and proxies for some variables,
- secondly, the extrapolation of these results to an all-India level without limiting them to state-wise analysis gives an idea of the scope for such reforms,
- thirdly, experiments on better maintenance and rehabilitation of assets have been attempted over the last five years by some public utilities. We will not go into the details of these experiments, but will indicate how they could be incorporated in an attempt to fine-tune the evaluation of the investment needed to reform the power sector in India.

We have examined in detail investment profitability in the light of different technical and commercial choices. We have used as a reference the figures for 1996–97 as well as 2001–02 in order to show the trend over a period of five years. The year 2001–02 has been chosen for reasons of harmonisation in figure availability (the last year for which all figures are available). We have looked at the short-term profitability without making assumptions about future growth or about the long-term marginal development cost. Data are presented in Section 2. Section 3 presents the various technical options available, for which we propose a calculation methodology to address fixed and variable costs and annual returns of several technical strategies at given tariffs. The possibilities we will examine are PLF (Plant Load Factor) improvement and reduction of technical losses. For purposes of reference, we will also compute the cost and income of a commercial policy that tackles non-technical losses. Several costs and incomes depend on the level of tariffs. Hence we will investigate the impact of tariff increase (based on present costs) on the outcome of each strategy. These issues are dealt with separately in Section 4. Then, we will compare all these strategies with classical thermal capacity addition in Section 5. Of course, in each case the corresponding investment on the power distribution network (necessary to evacuate power) is also taken into account, as well as the incidence on operational costs. In the section on techno-economic discussions, we will discuss the profitability of various strategies in both tariff contexts and analyse the margins for the actual tariff. We will show that even under the current subsidised tariffs – on account of which SEBs argue that they lack money for investment and operation – several clearly profitable strategies are possible, though they are not implemented by SEBs. We will conclude (Section 6) by showing how the internal organisation of SEBs precludes them taking profitable decisions.

2. Main data

It is important to point out that the costs that have been computed are those incurred by the SEBs, and their financers in last resort, the state governments (this amounts to direct costs). We have not focused on the state's indirect revenue generated from taxes, nor have we paid attention to additional growth for consumers or any macro-economic ousting effect on other sectors. World Bank studies (1996, 1997, 1999) focusing on Orissa, Haryana and Andhra Pradesh show that global economic profitability depends on the financial viability of the SEB in the case of such reforms. Our intention is to show that from the SEBs' viewpoint such actions are profitable and add evidence to the fact that SEBs in India are not taking economically sound decisions, even (all the more!) considering their cash-constrained situation.

In order to compare different strategies, we will look at them in isolation. However, since the various strategies do not present the same scope and margins in terms of equivalent-GW of capacity to be added, we will also focus on sets of combined strategies. We have directed our attention to power cuts arising from lack of energy, which exemplify the sector's failure in the eyes of the general public. We have focused on strategies to bridge the energy gap, which is the annual gap between demand and supply.

As per the Planning Commission (2002), the energy gap is 7.5% of the demand (it was 11.5% in 1997). Interviews with NTPC officials have revealed that the estimated cost of developing thermal plants is 4 crores[2]/MW, pretty stable over the period. As underlined by the Planning

[2] A crore is an Indian unit representing 10 million. So Rs. 1 crore Rs. = Rs. 10^7; 1 $ = Rs. 42, at the 1997 rate of exchange and Rs. 45 at the rate in 2004; so Rs. 1 crore = 2.4×10^5 $. The 'paisa' is to the rupee what the cent is to the dollar. So 100 Paise = 1 rupee. We will keep the value of Rs. 4 crore/MW constant over the period, which is correct in current prices and, therefore, in constant prices with low inflation. The ratio is nearly the same in dollars with a parity that is at the same level as in 1997.