

## Will meeting electricity shortages lead to economic development?

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**Power required for economic development** The environmental and cultural costs of nuclear, thermal and hydro power are often admitted. Question raised then is this: "Yes, these costs are there. But we need to supply electricity to our villages that are facing power cuts of up to 16 hours or more. We also need cheap electricity for our industries in this era of global competition. Therefore, we have to bear some of these costs in order to push economic development."

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It is argued in this short note that a tradeoff is involved here between short- and long term economic growth. Under-pricing of electricity for economic growth provides short term economic growth but hits at long term economic growth. The crucial question is whether we are willing to risk the long term existence of our civilization for short run gains of economic growth.

**Pricing and economic growth** The correct or 'efficient' price and quantity of a good is determined by equilibrium of supply and demand. Production higher- or lower than this level leads to inefficiency. We are trying to develop a market for trade in electricity in the country to attain this efficiency.

The market is driven by private costs only. The private costs incurred by the producer do not capture the total cost of production. Some costs are not accounted by the producer. For example, a cigarette producer does not pay for the higher incidence of cancer due to smoking. This cost of health is called an 'externality'. The Government intervenes and imposes taxes etc. to bring the private costs in line with the total costs. Taxes equal to the social costs must be imposed so that the quantity and price in the market reflects the true total costs incurred by the society and not only the costs incurred by the private supplier. Thus, the Government imposes high taxes on cigarettes, requires printing of a statutory warning and also orders the producers not to advertise this harmful product.

Section 61(c) of the Electricity Act, 2003 states: that "tariff to be determined (such that it) would encourage competition, efficiency, economical use of the resources, good performance and optimum investments." The efficiency, economical use of the resources and optimum investments are to be reckoned on total costs and not private costs because the objective of the government is public welfare, not private profit.

**Importance of long term economic costs** The importance of externalities is explained by a historical

precedent. Our ancestors of the Indus Valley Civilization produced bricks, beads, wines, etc. for exports. They had to compete with producers in other countries. They cut the forests for fuel wood in order to keep the cost of production low. They failed to account for the externalities of increased sediment flow into the rivers, biodiversity, etc. In the result, the forests were cut, the rivers got filled with sediments, the level of river water increased, the cities got flooded and the entire

civilization collapsed. They harvested short term gains from cheap fuel wood by ignoring externalities. This gain was undone by the long term loss imposed by these same externalities.

It is necessary, therefore, to account for the true total costs of electricity if we want sustainable economic growth.

**Equilibrium of private supply and demand** The task before us is to determine the correct requirement of electricity; and then produce that much power—neither more nor less.

First let us examine how the market works. The market takes into account only private costs that are incurred by the producer. The demand and supply of electricity on the basis of private costs is shown at 'Commercial Equilibrium' in Fig 1 below. The private producers are willing to supply increasing quantities of power as the price increases. The consumers will consume less quantity of electricity as the price increases. Equilibrium is reached at price  $P_2$  and quantity  $Q_2$ . This quantity of power sold at this price will eliminate all shortages in the market and lead to highest short-term growth rate.

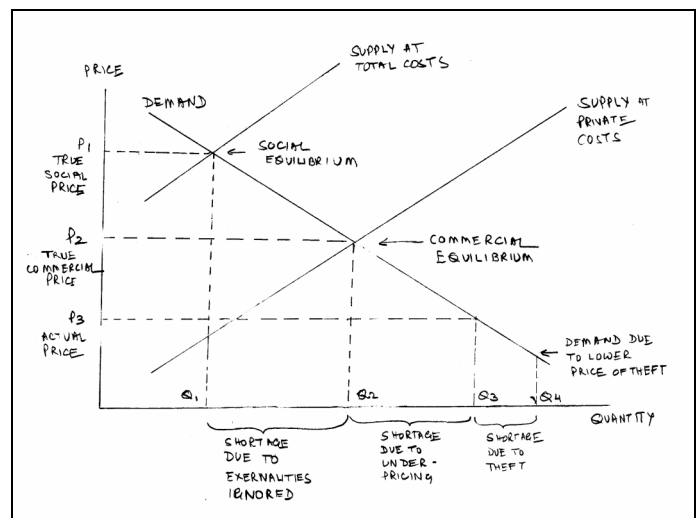


Fig: Equilibrium of supply and demand

The present political arrangement, however, does not allow electricity to be priced at  $P_2$ . The actual price charged from the consumer is lower, say  $P_3$ . In consequence, the demand for power is more, say  $Q_3$ . This leads to creation of shortage. The demand at this price is  $Q_3$  but supply is only  $Q_2$ . In turn, the State Electricity Boards have to buy electricity at higher price and they incur huge losses. It will be obvious that producing electricity at the level of  $Q_3$  is inefficient. We are using more electricity than is best for economic growth.

The situation is made worse by the pervasive theft. The price paid by the thief-user is a fraction of the already low official price of say Rs 2 per KWh. The cost to the thief-user may be only Rs 0.50 per KWh being the amount he has to pay to the lineman etc. Thus the demand of power is further increased to  $Q_4$ . Accordingly the shortage is increased.

**Equilibrium of total supply and demand** The social costs of generation of power are ignored thus far. We can include these costs by drawing another supply curve by including social costs.

Each of the sources of power has some externalities or social costs. Nuclear power has problem of storage of nuclear waste, risk of accidents and dependence on uranium imports. Thermal has the problem of carbon emissions, displacement during mining of coal etc. Hydro has problems of displacement, destruction of river, deterioration of water quality, methane emissions, submergence of forests, loss of biodiversity, reservoir induced seismicity, increased landslides, creation of virulent strains of malaria in reservoirs and loss of aesthetic and cultural values of free-flowing waters. A new supply curve of electricity is drawn after taking these various costs into account.

The social equilibrium of supply and demand of electricity is now attained at level  $Q_1$ . Long term economic growth is attained only if we produce electricity at this level and sell to the consumer at price of  $P_1$ . The 'shortage'—or the demand in excess of the social optimum is now increased to  $Q_4 - Q_1$ .

**CEA's approach of meeting 'shortages'** The 17<sup>th</sup> Electric Power Survey published by the Central Electricity Authority sets the aim of meeting and eliminating all shortage of power by 2012. This assumes that the demand of power as it exists today is 'true' or 'genuine' and has to be met for the purpose of economic growth. This is clearly not the case. The long term economic growth requires production of electricity to the level of  $Q_1$  only. Production in excess of this is not

efficient. Production of electricity to meet all current demand at the level  $Q_4$  will hit at our long term economic growth just as it did for our ancestors of the Indus Valley. Political compulsions may not permit pricing of electricity at  $P_1$ , however. In this situation, the correct policy would be to actually produce power only at the level of  $Q_1$  and allocate it between the rural and urban consumers and agriculture and industry administratively. In other words, the inefficiency must be limited to allocation between different users but not allowed to extend to the long term

economic growth. Production above  $Q_1$  will hit at long term economic growth even if it delivers short run economic growth.

**Responsibility cast by Electricity Act 2003** The responsibility to determine the social equilibrium of electricity (and not commercial equilibrium) is cast upon the CEA in various ways by the Electricity Act,

2003:

1 The Preamble says it is an Act (for the) "promotion of efficient and environmentally benign policies." Similarly Section 23 requires the authorities to regulate supply, distribution and consumption of electricity "for maintaining the efficient supply, securing the equitable distribution of electricity and promoting competition." The pivot of efficiency here is national economy, not producer's profits, hence efficiency has to be assessed as per social equilibrium. CEA must determine the total electricity to be produced after taking into account the externalities. The focus on 'equitable distribution' is a clear statement that objective of the Act is social welfare and not producing companies' profit.

2 Section 61(c) says that tariff should be determined such that would "encourage competition, efficiency, economical use of the resources, good performance and optimum investments." Here efficiency and economical use of resources have to be assessed on the basis of social costs. Further, 'optimum investments' means that investment above a certain level will turn counterproductive. This optimum level would be determined by the total costs incurred by the society.

3 Section 61(d) requires the authorities to safeguard "consumers' interest and at the same time, recovery of the cost of electricity in a reasonable manner." This stipulation is made necessary because electricity is not priced in the market at its true cost. Therefore, authorities have to intervene to bring the under-priced regime as close to the social equilibrium as possible.

4 Section 73 (a) requires the CEA to "Formulate short-term and perspective plans for development of the electricity system and co-ordinate the activities of the

planning agencies for the optimal utilization of resources to subserve the interests of the national economy and to provide reliable and affordable electricity for all consumers." The explicit mention of 'short-term' and 'perspective' plans indicates that the lawmakers were aware of the necessity to make a perspective plan and then develop a short-term plan to reach us to the long-term destination. The explicit mention of 'national economy' again indicates that all costs incurred by the society in the production of electricity should be taken into account.

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**Special treatment to Hydro Power** Section 8(1) of the Electricity Act provides special status to hydro-power. The CEA is required to examine that the proposed river-works will lead to the "best ultimate development of the river or its tributaries for power generation, consistent with the requirements of drinking water, irrigation, navigation, flood-control, or other public purposes."

The statement that hydro power should be generated in a way that is consistent with other public purposes puts a special responsibility upon the CEA to examine the various environmental aspects which are 'other public purposes'. Maintenance of water quality, control of methane emissions, submergence of forests, loss of biodiversity, increase in reservoir induced seismicity, increase in landslides, creation of virulent strains of malaria in reservoirs and loss of aesthetic and cultural values of free-flowing waters are all public purposes that the CEA is explicitly mandated to take into account.

**The cycle of long-term destruction** The present policy of the CEA of meeting existing shortages involves a regressive cycle of long term economic destruction. The steps are as follows:

- 1 Present demand is taken as final demand. The under-pricing of power that is leading to the generation of this huge demand is ignored. The long-term economic costs via externalities and destruction of environment are ignored.
- 2 Production of electricity is sought to be increased to meet this demand.
- 3 Yet more long-term economic costs are imposed on the society through this increased production of electricity.

In this way ignoring social costs becomes a gateway to the imposition of yet more long-term social costs leading to a regressive cycle.

**Answer to shortages** This short paper had started from the question how to supply electricity to our villages that

are facing power cuts of up to 16 hours or more; and to provide cheap electricity to face competition from other countries. The answer to this is at two levels.

1 Level 1: The ideal solution is to produce electricity equal to  $Q_1$  and provide to consumer at price  $P_1$ . The demand will become less and long-term economic development will also be secured.

2 Level 2: The second-level solution is to produce electricity equal to  $Q_1$  so that long term economic development is secured. Then administratively allocate the power between competing users as best as possible. This will lead to sub-optimal economic growth but still ensure long term economic sustainability.

The underlying idea is that long term economic growth and sustainability stands at a higher pedestal than short-term economic growth. If we are not willing to price electricity at its correct social price then inefficiency is inevitable. The choice then is between (1) producing more electricity, ignoring social costs and risking the existence of our civilization; and (2) accepting lower short term growth rates due to administrative inefficiencies in allocation of power. This means that we should live with shortages to ensure survival of our civilization.

**Counterargument 1: Impact on the poor**

Counterargument is that the policy of pricing power at price  $P_1$  will impose huge burden on the poor who do not have the capacity to pay.

The solution is to enhance the capacity of the poor to pay higher price of power by putting in place economic policies that generate employment and that increase price of agricultural produce suitably.

The impediment in implementing this scheme is the middle class which will have to pay higher price of electricity, higher wages to the maid and higher prices of food.

**Counterargument 2: Global competitiveness**

Counterargument is that Indian industries will have to pay true price of electricity at  $P_1$  while our global competitors will be paying lower price at  $P_3$ . This will price our goods out of the global market.

The solution is to impose higher import taxes and to provide export subsidy. This will maintain high price of electricity and other goods within the domestic market while enabling our producers to compete globally. Our long term economic growth will be secured while the short term economic growth will be somewhat reduced because we will loose access to cheap foreign goods made from low-priced electricity. We must focus on long term economic growth first and short-term economic growth later.