Towards a new paradigm for power sector reform in India

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The purpose of this discussion note is to describe briefly the paradigms[1] that have guided the power sector of India, starting with the pre-1991 classical electricity utility paradigm which gave way to the current World Bank-led paradigm for power sector reform. Sankar's new innovative proposal for addressing the problem of the power sector in India suggests the possibility that a shift may take place to a new paradigm. The contours of this emerging paradigm are the subject of this note.

1. The classical integrated utility paradigm [Dubash and Chella Rajan, 2000; D'Sa, et al., 1999]

The pre-Independence power sector in India was largely operated by private companies or local authorities, which supplied 80 % of the electricity required by cities/towns and industries. Apart from a few hydroelectric and thermal power projects, the generation was mostly from stand-alone generation sets. There were two factors that transformed that situation: (1) the growing demand for electricity from industry; and (2) the inability of small-scale systems without a grid to cope with this demand.

After Independence in 1947, the capital requirements for electrical capacity expansion could not be met by the private sector, which therefore turned to the government to invest in power plants as an important infrastructural service. The 1948 Electricity Supply Act stipulated that all generation, transmission and distribution facilities should be within the state's purview. This led to the establishment of government-controlled public-sector electricity boards with vertically integrated (or bundled) power sectors consisting of generation followed by transmission and distribution to consumers. The government also sponsored programmes of rural electrification that were equated with electrification of villages through extension of the grid. In the states where agriculture was mainly rainfed, there was also a drive for the electrification of irrigation pumpsets (IPSs). In response to a temporary shortage of meters, a view was taken in Karnataka that the costs of metering IPSs outweighed the corresponding benefits, and therefore meters need not be installed on IPSs. Instead, a flat charge on a horsepower basis was levied on the IPSs. This unfortunate decision to de-meter IPSs spread like wildfire, with disastrous consequences such as estimating agricultural consumption rather than measuring it, and hiding theft under this unknown quantity. With the electricity boards being used as vehicles for political patronage, the tariffs for some consumer categories were heavily subsidised. Also, industrial and commercial consumers cross-subsidised other consumer categories in an environment of administered prices.

Several transforming factors made this state-owned integrated utility paradigm unsustainable. Demand grew faster than supply, resulting in significant shortages (particularly during the hours of peak demand). These shortages had a negative impact on the quality of power, which deteriorated, with frequent spells of load-shedding, low voltage and low frequency. There was also a growing budgetary deficit, requiring increasing financial inputs from the government.

2. The post-1991 power sector reform paradigm

The turning-point came in 1991 with a macroeconomic crisis involving an adverse balance-of-payments situation, a mounting debt burden and a serious budgetary deficit. As a result, the Government of India yielded to World Bank pressures for liberalisation, privatisation and globalisation.

The first phase of the post-1991 power sector reform was based on the independent power producers (IPPs) strategy. Though India was exceptional among developing countries in having built up a large and sound generation equipment industry, its Bharat Heavy Electricals Limited was sidelined and bypassed. The doors were opened for foreign direct investment (FDI) in the power sector. There was an initial euphoria, with 189 offers from IPPs for 75,000 MW involving an investment of Rs 2,760 billion. MOUs were signed for 95 projects that would yield 48,137 MW. There was international competitive bidding for only 32 projects for 20,697 MW. Eight fast-track projects were identified and supported with sovereign counter-guarantees. There were opportunities galore for junketing and corruption. Foreign investors were offered attractive terms that they would never have dreamt of in their own countries. Underlying this "generosity" was the mistaken belief that it was a seller's market when actually it was a buyer's market because electricity demand had saturated in the industrialised countries. In this whole process, the World Bank was by and large a spectator. After all the controversy over the Dabhol/Enron project [Reddy and D'Sa, 1995; Mehta, 2000], consumers came to know the exorbitantly high cost of Dabhol power. Despite all the fanfare over IPPs, very few projects actually came

to the stage of generation. It became clear that the IPP strategy was a failure.

This failure of the IPP strategy led to the second phase of the post-1991 power sector reform driven by World Bank (WB) conditionalities. The WB model, as should be expected of bankers, had a blinkered obsession with the goal of financial health for the power sector to the exclusion of social issues such as the expansion of access. To achieve this goal, the WB top-down recipe consisted of restructuring of the power sector, involving corporatisation, unbundling of the vertically integrated utilities, elimination of subsidies, tariff rationalisation, establishment of electricity regulatory commissions (ERCs) and privatisation. In contrast, a diagnosis of the ills of Karnataka's power sector led to a bottom-up approach to the reform of its power sector involving (1) corporatisation of the utility, (2) liberation from government, (3) an independent regulatory body and (4) transparent democratic functioning [Reddy, 2001].

The WB model was implemented in Orissa. In October 2001, the Government of Orissa brought out the Kanungo Committee report on the Orissa power sector reform. According to the report [Reddy, 2002b], the most notable result of the reforms was an increase of tariffs. The transmission and distribution (T&D) losses have not been brought down, and theft has not been eliminated. The costs have not been contained. Performance has not improved. The private distribution companies have not shown superior management skills, and they have not been more successful than their predecessor public sector organisations in collecting revenues. They have defaulted in their payments to the grid. Far more serious is the fact that rural electrification has been the worst casualty of reform. The verdict seems clear – the reform of the Orissa power sector is a debacle, and its privatisation a failure.

In Karnataka, the third and current phase of the post-1991 power sector reform consists of the proposal of "distribution margins", which are a back-door method of government subsidising the distribution companies (formed by the restructuring) for losses in the collection of electricity charges. Quite apart from the fact that these subsidies are little different from the subsidies that used to be given to loss-making electricity boards, they are unsustainable.

Several transforming factors are now in operation. The new generation imported-fuel peaking plants[2] are relatively much more expensive than indigenously manufactured base-load plants running on Indian coal. Consequently, the average cost of power is increasing and is likely to keep on increasing. And the burden of increasing average cost is imposed on all the consumer categories, including the poorest with low marginal demand. Industry is also feeling the pinch of rising costs and unreliable quality and is turning to captive generation sets (CGSs) running on diesel or fuel oil and opting out of the grid. The information technology sector is depending on expensive CGSs because grid electricity is far too unreliable. Urban middle-class domestic consumers and the owners of IPSs are rebelling against tariff increases even after the ERCs go through an elaborate process of tariff fixation. Faced with a backlash from powerful vote-banks, the government is finding it difficult to push through the tariff increases recommended by the ERCs. Thus, the tariff increases recommended by the WB (on the basis of cost of service and subsidy elimination) are becoming politically unviable. On the generation side, capacity expansion is not taking place at the required rate and the FDI in the power sector has dried up. The IPP strategy has ended in failure. The quality of service is deteriorating. Thus, the power sector is becoming a serious constraint on industry, agriculture and services.

Also, public benefits (in particular access expansion and environmental protection via end-use efficiency and renewable sources) are being eroded under the impact of reforms. So, the current reform that is being implemented excludes public benefits and it is hoped that this shortcoming can be fixed with Band-Aid solutions including regulations.

3. Sankar's "People's Plan for Power" [Sankar, 2002a; 2002b; Reddy, 2002a]

The current situation regarding power sector reforms is an example of the well-known management problem – should a defective machine be repaired? Or should it be scrapped and replaced with a new and efficient machine? In the context of power reforms in India, should the defective World Bank-imposed model be repaired with, for example, regulations? Or should it be replaced with an alternative pattern of reform?

Sankar has recommended in a recent paper [2002a] and in this issue [2002b] the redesigning of reforms to focus on the expansion of accessibility through an increase in the availability of affordable power. Instead of being preoccupied, like a banker, solely with the finances of the power sector, the objective should be to start with the people and their electricity needs (i.e., to have an end-use/user orientation). This is tantamount to scrapping the World Bank model of power sector reform under implementation via conditionalities in different versions in the various states of India.

It is proposed that satisfying the power needs of the consumers should be the central purpose of reforms. In particular, the design of power sector reforms should start with the power needs of poor households (not forgetting the unconnected households) and of irrigation pumpsets. The target should be to electrify all unconnected households and to energise all pumpsets (up to the limits of the groundwater potential).

It is proposed that the power sector should be partitioned into three power sectors:

- Power Sector A consisting of those domestic connections of the poor and agricultural pumpsets that consume less than certain specified entitlements, and in addition, socially relevant needs such as water supply and street-lighting;
- Power Sector B for the above-entitlement domestic connections and agricultural pumpsets and all the other existing commercial and industrial consumers; and

- Power Sector C for emerging large demands.

It is further proposed that separate generation systems be assigned for each sector as follows.

- The depreciated plants (hydel and some thermal for the balance) should be dedicated to Power Sector A with its below-entitlement domestic connections and agricultural pumpsets and socially relevant needs such as water supply and street-lighting.
- The remaining generation plants should be assigned to meet the requirements of Power Sector B with the above-entitlement agricultural pumpsets and domestic connections and of other existing consumers (small industry, commercial establishments and large industry).
- The yet-to-be built/just completed plants as well as captive generation sets and cogeneration systems should compete in Power Sector C to meet the emerging large demands, which are free to choose their supply options. If there are existing establishments that want more power than current demands, they can also move into Power Sector C. In fact, Power Sector C is meant to capture the well-known benefits of a competitive market for electricity generation, to create a competitive environment for new investment on generation and prevent "distorted/perverse approaches to future investments in power generation and delivery" [Clark, 2002]. Obviously, therefore, competition must be ensured as the key to lowering the costs of new generation.

Thus, it is proposed that the hitherto vertically integrated power sector be separated into three vertically integrated generation-distribution power sectors sharing a common transmission system. The notional separation is not physical; it is from an accounting and administrative point of view. Most importantly, the power sector for the domestic power needs of the poor and agricultural pumpsets is insulated from the power sectors for the other existing customers and from the emerging demand of the affluent consumer categories.

The dedication of generation plants to different consumer categories has important cost implications. The below-entitlement domestic and agricultural pumpset end-users/uses have to meet the lowest average generation cost. The above-entitlement agricultural pumpsets and domestic connections and other existing consumers have to meet the next highest average cost. The emerging large demand has the highest, and rising, cost of power from new plants, in fact, the marginal cost or what power from the next generation plant would cost. The affluent customers are encouraged to meet their requirements from private sector plants and/or captive generation sets and/or cogeneration with assurances of wheeling facilities.

Thus, the below-entitlement domestic and agricultural pumpset consumers are insulated from the rising costs (compared to the costs of generation from old depreciated plants) of the new plants. This cost unbundling is a major advantage in comparison with the pooled generation system in which the average costs in India keep rising as costly state-of-the-art plants come into the system[3].

It is proposed that the intra-village electrification of all households would take place through franchises similar to the concession approach highlighted in the World Energy Assessment [UNDP, 2000]. The franchise/concession has to be kept small, for example a village, to ensure dedicated supply and close attention to consumer needs. Its success, however, may depend on an "obligation to serve" being stipulated by law. Apart from grid supply to the franchise/concession, it is necessary to encourage decentralised local sources [Reddy, 1999] (for example biomass-based systems such as biogas and producer gas), particularly for villages that are not yet grid-connected. Such decentralised local sources are particularly important when the unelectrified villages are beyond the break-even distance from the grid, in which case centrally-generated and grid-distributed electricity would be more expensive[4] than distributed generation, which is undergoing technological improvement and cost reduction [Reddy, 1999; Patterson, 1999][5]. And even in the case of grid-connected villages, decentralised rural generation, if more cost-effective, can be established whilst retaining the grid as a back-up and earning credit for the saved grid electricity. This would enhance the strengthening of local self-reliance and empowerment as a crucial component of sustainable development.

In the case of the partitioned Power Sectors A and B that are envisaged to operate with existing generation plants, integrated resource planning (IRP) would help to arrive at a least-cost mix of generation and saving options, with the saved power being sold to higher-tariff paying consumers. Thus, IRP can identify the role of demand-side management in general, and efficiency improvements in particular. In the case of Power Sector C, IRP can identify the least-cost mix of generation, captive generation, cogeneration and saving options to meet demand.

An important political gain from the proposed plan would be universal home electrification, which can be claimed as the fulfilment of Gandhi's dream that electricity would be a boon to every home. Incidentally, all political parties and electricity boards seem to have ignored this dream. These bodies have mistakenly assumed that village electrification means home electrification even though it is well known [Reddy, 1985] that a large fraction of the homes in electrified villages are unelectrified. In contrast, the African National Congress in South Africa highlighted "Electricity for all!" as a goal for its power sector.

Sankar's proposal hinges on agricultural pumpset owners agreeing to their consumption being metered and purchased in return for the assurance that their below-entitlement reliable cheap power will come from dedicated depreciated hydel sources for which there is no escalation cost and no fuel cost, and for which the tariff will be fixed for 10 years. If agricultural pumpset owners are won over, the principal opponents to current power sector reforms can become supporters. Clearly, "political consensus will

have to be evolved on this crucial issue" [Prayas, 2002].

The prima-facie calculations also show that the government's subsidy bill goes down to zero in much less than a decade (cf. [Sankar, 2002b]). In effect, therefore, the proposal corresponds to a win-win situation for all consumer categories.

4. A new paradigm for power sector reform in India

Sankar's "People's Plan for Power" is not merely a tweaking[6] of the current reform paradigm. It implies a fundamentally different paradigm for power sector reform in India. Attention will now be turned to sketching the salient features of this new paradigm.

4.1. Reform for sustainable development

The new paradigm for power sector reform starts with the view that reform is not an end in itself. It must not even be driven by the sole objective of financial health of the power sector, as is the case with the current WB-inspired paradigm. Power sector reform should be an instrument for advancing sustainable development – a process of economic growth directed towards equity, environmental soundness and endogenous self-reliance.

4.2. Vital role for state intervention

If sustainable development is to be advanced, the state cannot abdicate its role and leave power sector reform entirely to the market. "It depends entirely on whether there are explicit government policies, strategies, programmes, financing and regulatory instruments to deliver public benefits. If these are absent, the electricity industry is unlikely to deliver" [Eberhard, 2002] benefits such as access expansion.

4.3. Satisfaction of the electricity needs of end-uses/end-users

In the case of the power sector, a sustainable development orientation means above all the satisfaction of the electricity needs of end-uses/end-users. It is useful here to recall the debates of the 1970s on development, when the hopes that the benefits of economic growth would trickle down to the masses gave way to plans for the direct satisfaction of basic needs, starting with the needs of the neediest. Similarly, the focus now should be on access, with the direct targeting of the electricity needs of end-users, starting with the needs of the neediest end-users, rather than depending on electricity trickling down to all end-users, including those not yet connected. It is worth recalling in this context that the electricity needs in a country such as India are different from those in the industrialised countries where electricity access was hardly a concern when they started reforms [Clark, 2002].

4.4. Multiple integrated generation-transmission-distribution systems

The following unique characteristics of electricity are of crucial importance. (1) For all practical purposes, electricity "cannot" be stored economically except to a limited extent through pumped storage and compressed air storage. (2) Hence, continuous supply-demand matching is required, failing which the resulting frequency deviations from the standard are deleterious to equipment. (3) Demand varies hourly, daily and seasonally, with the peaks in demand being well above the "average" demand. (4) Hence, there should be an adequate reserve margin to cope with sudden spurts in demand. (5) Electricity has become so essential that demand is relatively price-inelastic, in the sense that it is not very sensitive to price changes. (6) As shown clearly by the 2001 California experience, electricity is very easy to manipulate, in the sense that a supplier can easily turn the supply on or off and engage in price-gouging. Hence, electricity cannot be left to the mercy of an unregulated market. Some regulators have turned a blind eye to market malpractices that are tacitly condoned by the political establishment. Some vigilant regulatory bodies have been ignored. It is tempting to ignore the California experience by citing other examples of reforms "that have delivered improved efficiencies and lower costs" [Eberhard, 2002], but the crucial question is whether these "successful reforms" have been carried out under conditions of power shortage, failing which they are irrelevant.

In order to handle the abovementioned unique characteristics of electricity, it is worth exploiting the advantages of vertically integrated systems of generation, transmission and distribution. Thus, the new paradigm envisages that the Power Sectors A, B and C are vertically integrated utilities sharing a common transmission system.

4.5. Segmentation of consumer market

According to marketing fundamentals [Lancaster and Withey, 1994], it must be recognised that consumers have different needs. Hence, the marketer/supplier must break the market down by identifying these different needs as well as the consumer groups corresponding to these different needs. In other words, the market must be segmented into clusters of consumers. In this segmentation, it is crucial that the yet-unconnected (potential) consumers are included as an important segment.

The disaggregation of consumers into different categories is not a new proposal; it was in fact an integral feature of the pre-reform integrated electricity boards with their different tariffs for different consumer categories. The WB reform approach, however, would like to eliminate these differences and only consider the cost-of-service to different consumers.

4.6. Price discrimination

The segmentation of consumer markets in the case of the supply of electricity has a number of special features. Not only can the consumer categories (markets) be separated but also they can be kept separate at a low cost by meters. Also, since electricity for all practical purposes cannot be stored, and it can only be received and transmitted through wires connected to the consumer, these consumers cannot re-supply/re-sell it over distances to other consumer categories. In addition, the demand patterns of the different consumer categories are significantly different. This difference is not only with regard to the time variation of the demand during the day but also with regard to the responses to price changes, i.e., the so-called price

elasticities of demand.

These characteristics are the basis for price discrimination [Nicholson, 1978; Baumol and Blinder, 1979], the practice whereby a seller with a monopoly position in different markets sets different prices for the same good/service. In the case of electricity, price discrimination refers to a utility selling electricity to different consumer categories at different prices.

With regard to the actual prices, the decision rule is that the more inelastic the demand, i.e., the less the demand is responsive to price changes, the higher should be the price/tariff. Customers with a relatively more elastic or price-sensitive demand are charged less[7]. By and large, industry and commercial establishments are relatively less sensitive to price increases[8] than poor households, which can afford electricity only if it is sold at a relatively low price[9]. Quite apart from elasticity considerations, taking into account the social benefits of universal electrification, it is advantageous to make electricity affordable to poor households. Setting a lower tariff for this consumer category can fulfil this objective[10]. Price discrimination is facilitated by the fact that, in the case of electricity, it is easy for the utility to prevent customers who are charged a low price from reselling what they buy to customers who are charged a high price. In addition, consumers (buyers) cannot shift from one market to another without the concurrence and approval of the utility. If the utility enjoys a monopoly situation in which prices decrease with increase in demand (i.e., a downward-sloping demand curve [Gwartney and Stroup, 1993]) for its electricity, price discrimination can also lead to greater increases in revenues compared to uniform pricing for all consumer categories. Thus, the result of differential pricing can be profitable and beneficial to all the parties involved in electricity transactions – the utility (seller), the richer and poorer consumer categories.

4.7. Subsidies

The concept of price discrimination can be extended to include cross-subsidies and subsidies, which need not be ruled out *per se.* Across-the-board opposition from the World Bank to cross-subsidies and subsidies to any category of consumers stems from the belief that "getting the prices right" is the only/best way of inducing consumers to use electricity efficiently [Reddy, 2000]. It is believed that consumers will respond to price increases by reducing their consumption and/or improving efficiency. Unfortunately, the demand may be inelastic, in which case the consumption of electricity may not decrease even when its price increases. In such a situation, it may be far more effective to lower demand by promoting the installation of energy-conserving end-use equipment, in which case the resulting efficiency improvements are *non*-price-induced. For example, a reduction of electricity consumption for water-heating may be achieved far more effectively through dissemination of solar water heaters than through electricity tariff increases. Thus, improving the efficiency of end-use equipment may be a better option than expecting the behaviour of consumers to change in response to price increases. Such improvements may have to be facilitated with loans for efficient equipment, or leasing of such equipment, or provision of more efficient fuels. Since these options achieve the same purpose as subsidies (viz., reducing the expenditure burden), they should be preferred. The guideline is that, to help specific sections of the population, it may be better to subsidise efficient end-use equipment than subsidise energy inputs (electricity or fuels). If, however, subsidies are used as a policy instrument, they must be time-bound with sunset clauses and they must be justified on the basis that they are definitely promoting technological advances and organisational learning. Above all, subsidies must not be a permanent crutch inhibiting the advancement of the technology[11].

4.8. Dedication of generation plants to specific consumer segments

The prospects of an integrated utility profiting from price discrimination in a segmented consumer market can be enhanced by the fact that invariably the generation plants in the utilities are of various vintages. In particular, there are old depreciated plants with much lower generation costs than the newer plants[3].

By dedicating the cheapest generation plants (with the lowest marginal cost) to consumer categories with lower tariffs, even these categories can yield profits, or at least meet a significant fraction of costs. Thus, unlike in the pre-reform and reformed systems where there is a pooled generation system supplying all the consumers, it is proposed that in the new paradigm, clusters of generation plants be dedicated to specific consumer segments[12]. In effect, this would correspond to a segmentation of the generation system with a common transmission grid for the whole system to ensure non-discriminatory open access to the grid.

Through this segmentation, the poorer consumer categories can enjoy stable prices insulated from the rising average costs. Also, marginal costs can be experienced only by the emerging large demands of the relatively affluent consumer categories [13]. In effect, what is being proposed is a "demander pays principle" ("demander" = one who/which demands) – analogous to the "polluter pays principle" in environmental management – so that those who exert small demands for power pay less than those who generate large demands. Through this approach, tariff increases may become far more politically viable than in the current fractious atmosphere.

4.9. Assured stable prices as quid pro quo for installation of meters

"The assurance of long-term tariff stability and predictability for the most vulnerable sections" (the poorest customers and irrigation pumpsets) can be the *quid pro quo* for the installation of meters for currently unmetered consumer categories that resist meterisation. Universal meterisation would thereafter go a long way towards facilitating the reduction of theft and of commercial transmission and distribution losses. In addition, "metering (like price

signals) provides incentives not to waste" [Dutt, 2002][14].

4.10. Emphasis on renewable sources of electricity

The encouragement via the village franchises/concessions of decentralised local sources as an alternative/supplement to grid supply defines an integral role for renewable sources in the supply system. Notwithstanding the support for solar, small hydel and wind generation and biomass-based systems (such as biogas and producer gas), there is insufficient funding and research and development effort to go beyond the mind-set of centralised generation followed by grid transmission and its expansion. Part of the problem is that these decentralised local sources come under different decision-making and administrative agencies with minuscule budgets compared to the ministries for centralised generation. Imposing an obligation to serve rural households may force Power Sector A to make rational choices between grid expansion and off-grid solutions that require a different approach [Patterson, 1999].

4.11. Emphasis on demand-side management and efficiency improvements

If integrated resource planning is an intrinsic feature of the operation of the partitioned power sectors, an inevitable result will be the identification of the scope, and incorporation, of demand-side management in general, and efficiency improvements in particular. From this identification should follow the enabling policies and market incentives for efficiency improvements even in the case of consumers with assured stable low tariffs.

4.12. Internalisation of the externality of public benefits

Studies [Dubash, 2002] of the impact of the current pattern of reforms show that public benefits such as access expansion and environmental protection tend to be eroded. One of the problems is that public benefits are externalities that do not find a legitimate place in the balance-sheets of market-driven utilities or their offshoots. Against this background, attempts are being made to retrofit public benefits. Instead, however, of getting the reforms wrong and then embarking on a repair job[15], a far more rational and effective approach would be to internalise the public benefits such as access expansion and environmental protection (involving efficiency improvements and renewable sources). It is this internalisation of the externality of these public benefits inherently assured and backed by the state and its regulatory agencies[16] that is an integral feature of the new paradigm for power sector reform.

5. Comparison of paradigms

A comparison of the pre-reform paradigm, the current reform paradigm and the proposed paradigm for power sector reform is summarised in Table 1. In drawing up this comparison, attention has been focused on the approach and pattern of thinking without being diverted by whether or not the current situation and practices correspond exactly to the paradigm.

6. Conclusion

The new paradigm has several attractive features such as its focus on the energy needs of end-users/end-uses, the insulation of poor households and irrigation pumpsets from rising average costs, assured stable prices as *quid pro quo* for universal installation of meters, internalisation and inherent protection of public benefits, and above all the promotion of sustainable development. Notwithstanding these features, what has been discussed in this paper is only a paradigm. Though the right approach/framework is a necessary condition, it is obviously not sufficient. For the paradigm to become a reality, attention must be devoted to the details of implementation[17]. In fact, an implementation package is necessary with all the necessary economics, finance, technology, human resources, enabling policies, institutional arrangements. Fortunately, many of these implementation issues and quantitative calculations for Karnataka have been presented in the paper by Sankar [2002b] in this issue of the journal. ■

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Notes

1. At any period in history, according to Thomas Kuhn, there is a ruling paradigm (or pattern of thinking or framework) within the constraints of which most thinking takes place. When its effectiveness diminishes and it begins to break down, a paradigm shift takes place and a new paradigm comes into being.
2. In the industrialised countries, these very same short gestation (~200 MW) gas turbine plants were much cheaper than the ~1,000 MW long-gestation nuclear plants which became "stranded assets".
3. In the industrialised countries, the short-gestation new (~200 MW) gas turbine plants proved to be much cheaper than the long-gestation old (~1,000 MW) thermal and nuclear plants. This technological improvement resulted in the costs of generation declining.
4. The thumb-rule in India is that transmission and distribution together cost as much as generation.
5. Walt Patterson has argued that technological change means that distributed generation will become an affordable, locally available infrastructure service. Eberhard holds a pessimistic view: "However, we are still many years away from that scenario. Renewable energy sources, including many traditional and local generating options, as well as new distributed generation such as fuel cells and micro-turbines, remain uncompetitive or unaffordable in the short to medium term for the poor in developing countries." The fact is that costs are declining for all decentralised generation technologies and decisions must be made on a case-by-case basis taking into account benefits other than cost, such as empowerment of local communities.
6. Tweaking: improvement by making fine adjustments.
7. This is why for example subscriptions for journals are less for individuals than for libraries.
8. Up to a price above which the alternative of captive generation is cheaper.
9. Failing which they have shown a tendency to switch to kerosene for lighting.
10. Prayas [2002] has pointed out the similarity to "the Chinese 'two-track system' wherein the low-cost historical power was allocated equitably and high-cost power from new plants was to be used by consumers having increasing consumption".
11. For instance, the consensus among solar water heater manufacturers in India is that the subsidies of the Ministry of Non-conventional Energy Sources hindered the development of solar water heaters and in particular came in the way of cost reduction. Fortunately, these subsidies have been withdrawn.
12. Eberhard's concern whether "there are enough low-cost generating units to meet low-income demand, both present and future" has to be answered, not at the level of the paradigm, but through actual numbers for specific states/utilities, as Sankar [2002b] has attempted.
13. Commenting on the draft of this paper, Dutt [2002], says, "I believe that the question of how much each user pays is unrelated to where the electricity comes from. I am of course speaking from the other extreme power sector operating conditions (Argentina): total unbundling, wholesale spot and term markets, etc. Contracts are made between buyers and sellers in the wholesale term market at prices that are mutually agreed. Dispatch is made centrally, where there is no way of knowing which electricity was received by the buyer. On the retail side, users pay tariffs which are decided by regulatory agencies. Prices vary according to customer class and province, and again bear no relationship to the costs of generation.

Table 1. Comparison of pre-reform, current reform and proposed reform paradigms

	Pre-reform paradigm	Current WB-inspired paradigm	Proposed new paradigm
1. Power sector	Infrastructural service	Driver of economic growth	Instrument of sustainable development
2. Principal objective of reforms		To achieve a financially sound power sector	To satisfy energy needs of end-users/end-uses
3. Generation, transmission and distribution (G, T & D)	Vertically integrated utility	Unbundling of vertically integrated utility into separate G, T & D units	Partitioning into vertically integrated Power Sectors A, B & C
4. Transmission	Common transmission system for whole system	Independent transmission company	Common transmission system for whole system
5. Consumer market	Different consumer categories	Single consumer market	Segmentation of consumer market
6. Generation system	Integrated generation system	Integrated generation system	Segmentation of generation plants
7. Allocation of generation system	Pooled generation system	Pooled generation system	Different generation plants dedicated to different consumer segments
8. Prices	Administered prices	Cost-of-service prices	Price discrimination
9. Cross-subsidies	Cross-subsidies	Removal of cross-subsidies	Cross-subsidies not excluded
10. Subsidies	Subsidies	Removal of subsidies	If subsidies are necessary, they should be time-bound with sunset clause and/or preferably be for end-use equipment
11. Impact of generation costs		Rising average costs that affect all consumer categories	Poor households & IPSs are insulated from rising average costs
12. Tariffs	Administered tariffs	Increasing tariffs	Assured stable prices with agreed tariff increases
13. Universal installation of meters	De-metering in 1980s	Opposed by powerful consumer categories	*Quid pro quo* for assured stable prices
14. Commercial T&D losses (theft)	Started growing after de-metering	Reduction difficult without meters	Facilitated by universal installation of meters
15. Political viability of tariff increases		Ignored in WB conditionalities	Crucial factor in price discrimination
16. Public benefits (access expansion, environmental protection, etc.)	Government programmes of public benefits	Erosion of public benefits	Public benefits inherently ensured
17. Public benefits	Implemented by government	Public benefits are externalities that must be retrofitted	Public benefits are internalised

"Thus, I believe that operationally there is no problem in charging different users arbitrarily different prices for electricity. If this is not a problem in an unbundled free-for-all sector like Argentina, it would be a piece of cake in vertically integrated utilities. There are even countries where certain users pay more for Green Electricity. This does not mean that their electricity comes from renewable sources. What it does mean is that the sum total of green electricity purchased is the same as the green electricity generated (plus T&D losses)."

14. Dutt also added, "[Metering] may not be enough, if price elasticity is low. Or it may be contrary to development: if people react to higher price electricity by reducing energy services", e.g., when households revert from electric lighting to kerosene lamps.
15. A colleague from the Energy and Development Research Centre, Cape Town, put it pithily: "Is it worth wagging the tail of the dog when it is the wrong dog!"
16. Prayas has commented thus: "Another key issue would be to prevent regulatory sabotage. Even in the new paradigm, the role of Regulatory Commissions would be crucial to address emerging issues (distributed generation, regulating imperfect markets and competition related issues as well issues relating to quality of supply, service for poor and rural sections)."
17. As they say, "The devil is in the detail."

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