SAUGATA BHATTACHARYA
Axis Bank Limited

URJIT R. PATEL
Reliance Industries Limited

The Power Sector in India: An Inquiry into the Efficacy of the Reform Process*

Introduction

The infrastructure deficit in India is immense and in some sectors growing. Over the years, the provision of essential but uneconomical services seems to have been driven by non-commercial principles resulting not just in the ineffectiveness of the objectives of universal service coverage of the original programs, but also assuming a heavy fiscal burden on the government. This is especially true of the power sector.

India is power stressed. The increasing vibrancy and flexibility of the rest of the Indian economy is not matched by the power sector. Experience and casual empiricism is vindicated by analysis that suggests that electricity supply by government monopolies is the most important (infrastructure) constraint on overall economic growth, and is significant in growth regressions and investigations of foreign direct investment (FDI) determinants (Virmani, 2005). Based on a firm-level survey, it is estimated that for manufacturing firms the cost of private electricity is 24 percent higher than that of utility supply; 69 percent of firms have their own generators; and output lost due to power outages is 9 percent (World Bank, 2002). A recent phenomenon has been a sharp deterioration of energy adequacy, both at base and peaking periods. Given the record of meager additions to the generation capacity over the 10th Plan period (2002–03 to 2006–07), projections of energy requirements in the future, *prima facie*, would seem to make the task of closing the gap between demand and supply appear almost insurmountable.

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The sector is dominated by government-owned behemoths at both the national and state levels; 88 percent of utility-based power is produced by government generators (state government generating plants account for close to 60 percent of total installed utility capacity in the country), and transmission is almost entirely within the public sector. The cash-generating distribution segment—where responsibility for supply, billing, and collection lies—is almost completely under the ambit and ownership of respective state governments [through State Electricity Boards (SEBs) or state government distribution companies (discoms)].[1] Private distribution is limited to the states of Delhi, and some parts of Orissa, West Bengal, Maharashtra, Gujarat, and Uttar Pradesh (UP). In the seventh year of the millennium, astoundingly, some power utilities still follow single-entry book-keeping practices. Despite the sorry state of affairs, the inadequacy (until recently) of the commercial aspects of the sector that has "seized the attention" of decision makers is particularly bewildering. The clear and present problems in the distribution segment notwithstanding, the tone of official discussions remains skewed towards generation capacity. Every year, for instance, the Economic Survey devotes the majority of column space on the power segment to generation, transmission, and arcane technical minutiae like "super critical technologies," while relegating distribution and supply to a secondary position.

Having said this, it is not that there has been lack of application of mind on the issues, or, paucity of strategies for addressing problems. Task forces, working groups, and committees constituted by both the Central and state governments have, for the most part, proffered well-argued policy alternatives over the last decade.[2] Specifically, the Central Government's policies in early 2000s attempted to systemically galvanize state governments to tackle mounting losses in the sector. The one-time settlement (OTS) scheme of SEB dues to Central Government-owned public sector units recommended by the Expert Group on Settlement of SEB Dues (Government of India, 2001), linked the capital restructuring of SEBs to a set of incentives and penalties. To ensure that the OTS remained precisely that, measures to accelerate state level reforms by rapidly restoring and then sustaining the financial viability of the power sector were considered important by the Empowered Group of (State) Ministers. Arising out of the OTS Scheme, the Accelerated Power

1. These are *de facto* an extension of the respective state government.

2. The Report of the High Level Committee on Escrow Cover to IPPs prepared in February 2000 at the behest of the Government of Karnataka was probably the first official undiluted statement of the centrality of the distribution segment in restoring the sector's health.

Sector Development and Reform Programme (APDRP) [recommended by the Expert Committee on State-Specific Reforms (Government of India, 2002a)], has also become a landmark intervention. The Central Government, in addition, made an admirable effort to prod the states toward meaningful reform to infuse the sector with competition and efficiency by legislating the Electricity Act 2003 (EA), first introduced in Parliament in 2000. In the aftermath of the Central Government initiatives after 2000–01, various states have gone about their individual trajectories in terms of the operational steps to increase revenues and reduce losses. Some have been more assertive and changed the market structure of the sector.

Have the measures had the desired effect? It has now been several years since various (systemic) institutional initiatives were introduced to reform the state-dominated sector, hence (arguably) this is an apposite juncture to weigh their effectiveness. The perception of improvement in the sector five years into the reform process has received a jolt in recent months, with widespread shortages of power being reported from many industrialized states. The bulk of the (already inadequate) additions to generation capacity have been in the public sector. Independent power producers (IPPs) have been attempting to achieve financial closure for their generation capacity plans, but continuing doubts about financial viability ensure that due diligence and related activity drags on. The evidence of the decrepitude and shortages are most startlingly demonstrated by the power cuts that have begun to creep into the island city of Mumbai like a malignant growth, to use a simile of cancer. Long having been "islanded" from the Maharashtra State Electricity Board's distribution system, with standby charges levied on private suppliers of power to the city, there are now increasing doubts about this exclusivity.[3]

The paper shows, *inter alia*, that the reform actions have not, by and large, resulted in the improvements in cash flows and revenues that would have given potential investors comfort about the ability of utilities (which are the buyers of the IPPs' generation) to meet their debt service obligations. But this is only one part of the story; more fundamentally, has there been a change in the intrinsic functioning of SEBs over the period of reforms that is likely to induce profitability and keep the sector consistently remunerative? At a deeper level, the main objective of the multiple policy interventions had been to impart a "commercial orientation" to discoms (and SEBs). The

3. The dominant private electricity supplier to Mumbai city (Tata Power Company) annually makes a payment to the state-owned supplier to back-stop any shortfall that may occur due to unforeseen incidents (it is akin to buying "insurance").

importance of this concept had been officially identified by the Report of Distribution Policy Committee (Government of India, 2002b):

> Traditionally, the supply of electricity has been viewed as a public service and the overall operations of the SEBs has been characterised by a lack of commercial orientation. One reason for this is that since inception, SEBs have been focusing towards the objectives of government providing electricity to larger sections of society and to agriculture at low rates. The second but more important reason for the lack of commercial orientation has been the absence of incentives for improving efficiency (Section 3.2.1).

The policy reforms sought to ensure that the discoms utilized the transfers from the Center to the states in a financially productive manner and, moreover, capitalized on the leeway in terms of improved market structures and regulatory efficiencies to make the financial improvement sustainable and lasting.

To our knowledge, no exploration of the panel data of SEBs/discoms on the outcomes, and key economic and financial parameters that indicate the effect of reform steps has hitherto been available in the public domain; toward this, inter-utility comparative analysis of high-level financial/commercial indicators is attempted. An important pivot of this objective is to quantify the unstructured concept of "commercial orientation," and to develop a summary statistic on which utilities/states may be compared. In the process of this construction, the paper, *inter alia*, endeavors to decipher broad patterns in the components of commercial operations of the power sector, while tracking changes after the near breakdown in 2000–01. Throughout, the paper attempts to sensitize the reader to the immense fiscal and financial challenges, and the institutional complexities involved in the reform process.

It is important to also delineate what this paper does not attempt. It does not deconstruct the microstructure of the reform process. The economic and financial logic for establishing appropriate market structures, restructuring of liabilities, tariff principles, process flows, and regulatory oversight have been charted, largely through detailed case studies, by multi-laterals, international development agencies, Indian academic institutions, consulting agencies and others; they have analyzed these actions for certain key states at the inception of reform and designed road maps, identifying the exact steps needed to transition toward financial viability.[4]

4. See *inter alia*, IDFC (2001), Patel (2004a; 2004b), World Bank (2007) and references therein.

A literature has built up that explains the arcane technical minutiae of operational and financial elements of the power sector (NTPC, 2006; Government of India, 2006). These relate *inter alia* to administrative measures (for example, human resource management, including details like the designation of circle-in-charge as CEO, re-labeling of Junior Engineer as feeder manager, establishment of special courts for energy theft, and so on), technical parameters (whether a 33 kV line results in lower transmission losses than an 11 kV line, the rate of transformer burnout, the advantages of electronic supply meters, IT enabling with data logging, and so on), and commercial issues (energy audits, metering, and so on).

Another strand has explored the details of financial engineering that must accompany the restructuring of the power supply system; these include the restructuring and treatment of existing liabilities, including unfunded one such as pensions, unbundling and power purchase systems, including decisions on whether the purchase should be via the transmission company in a single buyer model (see Tadimalla, 2000; 2001 for an extensive analysis of these processes). A third stream has looked at regulatory issues, including the impact on tariffs and accounting principles accompanying the restructuring (see TERI, 2007 for a recent treatment).

All of this is beyond the scope of the paper, both from the viewpoints of feasibility and desirability. The former is almost self-explanatory; the power sector is one of the most operationally complex with characteristics that vary even in contiguous areas and the reform experience has been richly varied. The desirability of looking beyond these details relates to the evaluation of the effectiveness of the various steps to enhance revenues and reduce losses, among other indicators. This emphasis is important since it is the outcome of the multiple actions taken by utilities and regulators that ultimately determines the status of the financial viability of the sector, not the actions *per se*.

As for the methodology used in investigating the effect of the drivers on performance outcomes, the paper does not dwell on statistical relationships between various outcome indicators and causal reform processes. There are two reasons. Foremost, there is just not sufficient data to effectively estimate and infer causal relationships in an environment where institutional eccentricities are predominant and structural instability is high. Second, gaps remain in power flow audits in most states, arising from uneven and inadequate metering, which does not provide a complete picture of consumption patterns and loss levels. A caveat is in order: there are diverse official sources for data on the Indian power sector, and we do not attempt reconciliation

in this paper.[5] Suffice it to observe that all sources manage to convey the magnitude of the challenges; for example, the payments crisis at the onset of this decade was plain regardless of the specific measure, or, source.

The plan for the rest of the paper is as follows. In the next section, against the backdrop of the institutional framework of the power sector, initiatives designed to nudge the sector toward efficiency and financial discipline (especially on the distribution side) are discussed, focusing on the OTS scheme, the APDRP, and the EA. The third section reviews trends in the macro-economic evolution of the sector and explores changes in key (aggregate) financial performance variables of the sector. In the fourth section, after examining the dissimilarity in financial performance across states, we explore these variations across utilities in terms of commercial orientation; a summary measure—Index of Revenue Orientation (IRO)—is constructed that captures a critical (commercial) aspect of the sector. The fifth section has our conclusions.

Institutional Background and Reform Initiatives

India has the fifth largest installed capacity for electricity—about 140 GW—in the world, but shortages plague the country as the power system has not kept pace with economic performance.[6] One pattern that emerges is deterioration of energy adequacy (both at base and peaking periods) that is sharpening seemingly on a month-to-month basis. During the period April 2006–February 2007 the country recorded a base shortage of 14.2 percent[7] in comparison to 2005–06, which itself showed signs of deterioration from the previous year, though not as markedly (in 1999–2000, the national energy and peaking shortages were 6.2 percent and 12.4 percent, respectively).

The difficulties of state government-owned utilities lie at the heart of the problems of the power sector. The financial position of SEBs deteriorated rapidly over the decade of the 1990s and culminated in the payment crisis of 2000–01 when, according to the Economic Survey (2001–02), commercial

5. Agencies that publish data include Ministry of Power, Ministry of Finance, Planning Commission, Central Electricity Authority, Regional Load Dispatch Centers, Power Finance Corporation, and Reserve Bank of India.

6. Nationally, power generation increased by 8.4 percent per annum in the 1980s (when average annual GDP growth was 5.8 percent), 6.7 percent in the 1990s (annual GDP growth was same as the previous decade), and there was further deceleration to a mere 4.7 percent per year in the first half of this decade (average annual economic growth of 6 percent).

7. See Indian Electricity Scenario, Ministry of Power (available at powermin.nic.in).

losses reached Rs. 254 bn. Large and persistent losses—on account of both technical reasons related to transmission and distribution, and theft, non-billing, incorrect billing, and inefficiency in collection—have adversely affected operations and the ability of utilities to reliably supply electricity to consumers.

Institutional Structure of the Electricity Sector in India

In order to appreciate the complexity of implementing reform and restructuring in the electricity sector, the reader needs an overview of its institutional structure, which is dispersed across multiple organizations both at national and state levels [a summary is in Box 1; also see Panagariya (2008) for a comprehensive introduction to the issues]. The Central Government has important responsibility for electricity policy, long-term planning, technical analysis, and project approvals through the Ministry of Power, Planning Commission, and Central Electricity Authority. Under the Constitution of India, the electricity sector is a "concurrent" subject; jurisdictionally, therefore, on matters of both policy and regulation, the sector is divided—but clearly demarcated—between the Union and the state governments. [It is because of the "concurrent" nature of responsibility in the electricity sector that one level of

BOX 1. Institutional Framework of the Electricity Sector in India

<table>
<tr><th>Function</th><th>Central level</th><th colspan="3">State level</th></tr>
<tr><td>POLICY</td><td>Ministry of Power
Central Electricity Authority</td><td colspan="3">Department of Energy</td></tr>
<tr><td>REGULATION</td><td>Central Electricity Regulatory Commission (National Grid Code; inter-state transmission and sale of power, incl. tariff)</td><td colspan="3">State Electricity Regulatory Commission (intra-state transmission and sale of power, incl. distribution tariff for final consumer)</td></tr>
<tr><td>GENERATION</td><td>Central Sector Undertakings (Thermal, Hydro and Nuclear)</td><td rowspan="3">State Electricity Boards (SEBs)</td><td>Govt.- owned Generating Companies</td><td>Private Generators (IPPs)</td></tr>
<tr><td>TRANSMISSION</td><td>Central Transmission Utility (Power Grid Corporation of India Ltd.)</td><td colspan="2">State Transmission Utilities (Govt.- owned Transmission Companies)</td></tr>
<tr><td>DISTRIBUTION</td><td></td><td>Govt.- owned Distribution Companies</td><td>Private Distribution Companies</td></tr>
<tr><td colspan="5">Source: Computed by authors.</td></tr>
</table>

government cannot (in practice) really force the other to take specific action.][8] The sector is dominated by large state monopolies at both Central and state levels, with the cash-generating (and customer interface) distribution segment completely under the ambit of state governments.

The Indian Electricity Act, 1910 provided the original framework for the electric supply industry. It empowered the state governments to issue licenses authorizing the licensee to supply electricity in specified areas and spelt out the legal framework for laying down wires and other work. It also specified the rules governing the relationship between licensee and consumers. This Act allowed private agents in both generation and distribution. In 1948, the Electricity Supply Act brought all new generation, transmission, and distribution facilities within the state's purview. It directed the creation of a Central Electricity Authority to develop a sound and uniform national power policy. It also authorized the creation by each state of its own vertically integrated SEB. This model continued until virtually the end of the 1990s, when individual states initiated measures to unbundle their respective electricity boards into separate entities for generation, transmission, and distribution.

Thereafter, a series of legislations has guided the reform, restructuring, and regulation of electricity industry in India. At the national level, the first was the Electricity Regulatory Commissions Act, 1998, which was later repealed and replaced with the EA, incorporating most of the provisions of the former. However, it is noteworthy that Orissa and Andhra Pradesh had initiated far-reaching reforms comprising unbundling, corporatization (including privatization by the former), and constituting regulatory commissions prior to both the 1998 and 2003 Central Government acts. The EA laid the foundations of a structure that substantially sought to make competition and commercial principles the driving impetus for decision-making. It provides *inter alia* that Regulatory Commissions shall adopt tariffs if they are determined through transparent process of bidding, in accordance with the guidelines issued by the Central Government through the Electricity Tariff Policy, notified in January 2006, with the aim of moving away from cost- and norm-based approach for tariff determination to competitive tariff fixation, including by public sector generating companies after a transition period of five years. The Central Government still guides the overall development of the sector through the National Electricity Policy notified in 2005 which, *inter alia*, stipulates that "all efforts would need to be made to bring

8. In other words, if a state government does not implement what is specified under an Act, there is not much that the Central Government can do "operationally"; for example, thus far, a major state like Tamil Nadu has not unbundled the state-owned electricity board.

the power industry at a stage in which competition will determine the price rather than any cost plus exercise."

Initiatives after the Payments Crisis of 2000–01

The year 2000–01 may well be considered a watershed year for the power sector in India. The Central Government by this time had been sufficiently exercised in the malaise afflicting the sector; outstanding dues owed by state government power utilities to Central Government-owned public sector units such as National Thermal Power Corporation, National Hydro Power Corporation, Coal India Limited, Indian Railways, and Power Grid Corporation of India Limited had reached Rs. 415 bn (as percent of 2000–01 GDP, 1.8 percent).[9] Given the inherent limitations on account of the division of responsibilities between the states and the Center, and also that the sector is almost wholly government-owned, the Central Government could deploy only indirect instruments to influence changes in the (revenue generating) distribution segment, which is under the ambit of states. That there was also method to this can, perhaps, be appreciated by the following mapping of objectives to the specific initiative:

1. The OTS scheme—restructure liabilities that had accumulated on account of SEBs' persistent failure to make regular payments, and to settle surcharges and interest imposed as penalty; in other words, a financial workout to moderate burden on SEBs but at the cost of a harder budget constraint on state governments (as owners of SEBs).
2. The APDRP—to nudge states to address long-standing problems related to the cash-generating segment of the sector.
3. The EA—to help coalesce thinking on the structure of the electricity sector by providing a framework for legislative changes at the state level for undertaking reforms.[10] Although all aspects—distribution,

9. Of the total outstanding amount on February 28, 2001, Rs. 257 bn was principal and Rs. 157 bn was on account of surcharge and accumulated interest on delayed payments (Government of India, 2001). By the time of the cut-off date of September 30, 2001, this figure had increased to Rs. 419 bn (Ministry of Power, 2002–03).

10. State governments did not require formal legislative action at the Center to initiate reforms. As mentioned earlier, Orissa established a regulatory commission and privatized the power sector as early as 1996 (under the purview of the Orissa Electricity Reform Act approved in November 1995), without any Central Government legislation. In fact, Orissa's approach to regulation spread to other states and was adopted by the Central Government in the form of an Electricity Regulatory Commissions Act 1998. The Andhra Pradesh Reform Act 1998 was similar to the Orissa Act regarding regulatory structure and functioning.

tariff setting, and market structure—of the problem end of the electricity business are under the ambit of state governments, the EA (passed with broad support) nevertheless was important for introducing political suasion at Center–state forums[11] and Planning Commission dialogue with states in the context of plan allocations.[12]

SEB DUES RESTRUCTURING SCHEME. The Conference of State Chief Ministers and Power Ministers held in March 2001 noted that the large accumulated dues owed by SEBs, in turn, adversely affected the finances and investment plans of central public sector units (CPSUs). An expert group established to recommend a resolution of outstanding dues to the CPSUs submitted its report in May 2001 (Government of India, 2001). The key features of the scheme (which came to be known as the OTS) included securitization of the accumulated dues through 15-year tax-free bonds—with a five-year moratorium on repayments—issued by respective state governments through the Reserve Bank of India (RBI) at a tax-free interest rate of 8.5 percent per annum. A 60 percent waiver of the surcharge on outstanding dues was granted as an incentive for states to accede to the securitization scheme. In addition, to harden the budget constraint, a quasi-binding restriction on SEBs designed to recover defaults (exceeding ninety days) to Central Government-owned utilities and suppliers through adjustments from Central Plan Assistance to state governments, was introduced.

Under the scheme, state governments have issued bonds worth Rs. 350 bn (Ministry of Power, 2006).[13] The OTS can be deemed to have worked, against a simple measure (that of timely payments): the mechanism to recover dues through the RBI has, to the best of our knowledge, not been availed.[14] (Has the prospect of being *named and shamed* concentrated the minds of state governments?) In other words, state utilities have regularly paid Central Government-owned suppliers of electricity and coal, and to transmission operators and Indian Railways. However, a comprehensive verdict on the

11. Of which the National Development Council (NDC) is probably the most prominent.

12. Another possibility is that reform minded leadership in state governments could deploy the EA as a lightening rod to goad their (recalcitrant) colleagues to support initiatives.

13. This number increased with each subsequent issue of the Annual Report since 2003–04, when it was Rs. 323 bn.

14. The tripartite agreement has hardened the budget constraint. But its durability is, *per se*, not guaranteed since the potential for individual state governments to indulge in arm twisting exists, especially given the reality of a Central Government that is a coalition reliant on powerful regional parties.

scheme can only be made when amortization of outstanding bonds will have to be honored to the tune of about Rs. 35 bn annually. Given the cash position of state-owned utilities (elaborated in the fourth section), many state governments may end up making repayments from general revenues.

ACCELERATED POWER SECTOR DEVELOPMENT AND REFORM PROGRAMME (APDRP). To ensure that the OTS remained precisely that, measures to accelerate state-level reforms by rapidly restoring and then sustaining the financial viability of the power sector were considered important by the Empowered Group of Ministers. Against this background, the Union Ministry of Power constituted an expert committee to examine (and recommend changes in) the method by which Central Government assistance for the power sector was given to states. Based on the recommendations of the committee (Government of India, 2002a), the Central Government decided to revamp an existing scheme, the Accelerated Power Development Programme (APDP) which had been introduced in February 2000 for providing financial assistance toward renovation and modernization of power plants and also for strengthening and improvement of sub-transmission and distribution network.[15]

The motivation and operational contours for broadening the scope of the APDP and changing it to the APDRP were informed by two interrelated objectives, viz., a reduction of losses and increasing revenue collection.[16] The change from the APDP to the APDRP reflected a change in emphasis from a project/input (engineering) orientation to performance and outcomes; the emphasis was shifted to the commercial aspects of the engineering actions. The tenor of the Central Government assistance changed to a reform program predicated on the realization that an ad hoc and piecemeal approach to loss reduction needed to be replaced with sustaining reforms.[17]

Access by state utilities to assistance under APDRP was made contingent on a state signing off on the OTS Scheme. There were two streams of support under the APDRP—one for investment and the other as an incentive based on reducing operational cash losses. The Union Budget, 2002–03 formally rechristened APDP as APDRP and enhanced the allocation to Rs. 35 bn from Rs. 15 bn in the previous year with the stipulation that "access of the States to

15. The APDP financed 50 percent of the project cost with a grant to loan ratio of 50:50 to the state governments as advance Central Plan Assistance. The balance 50 percent of funds had to be contributed by respective states.

16. In recent years, India has attempted to estimate an omnibus (physical) measure, aggregate technical and commercial (ATC) losses, to gauge what fraction (percentage) of the units of electricity is not paid for (in the third section the concept is formally defined, and the data presented).

17. Details are available at powermin.nic.in under Acts and notifications.

the fund will be on the basis of agreed reform programmes, the centre piece of which would be the narrowing and ultimate elimination of the gap between unit cost of supply and revenue realisation within a specified time frame." The incentive stream provided for a "substantial reward," up to 50 percent of the actual cash loss reduction (without elevating tariffs) as a grant for states that were willing to go beyond "demonstration projects" for the investment component and undertake enterprise-wide reform for performance improvements. 2000–01 was the stipulated base year for calculating the reduction of loss during subsequent years.[18]

As part of the scheme, and some even before, states initiated steps aimed at restructuring the sector through measures relating to private sector entry into power generation, re-organization of SEBs into separate corporations for generation, transmission and distribution, metering feeders, measures for reducing losses, rationalizing tariffs and initiating statutory steps for establishing regulatory commissions. Over the four years 2002–03 to 2005–06, aggregate disbursement (investment and incentive) under the APDRP was Rs. 77 bn. Nineteen states submitted incentive claims to the Ministry amounting to Rs. 108 bn; on scrutiny by independent evaluators, eight states were found eligible, and the aggregate of incentives that has been released is Rs. 15.8 bn.[19]

RESTRUCTURING APDRP. The Ministry of Power in Delhi felt that despite being a major improvement over the APDP, there were residual flaws in the structure of the APDRP. The performance of the APDRP, at least in terms of financial assistance to states, fell short of what had been envisaged (Rs. 200 bn was targeted in the 10th Plan). The thinking was that the program had to be restructured to an outcome-driven program based on monitorable targets against established baselines.

According to the committee established to restructure the APDRP (Government of India, 2006), some aspects transpired time and again as hindrances to the level of performance improvement that had been envisaged in the APDRP. All the agencies interacting with the Committee pointed out certain bottlenecks encountered during implementation of the schemes,

18. Losses are calculated on net of subsidy and tariff compensation given by the state government, both in the base as well as subsequent years. Revenue is considered on net realization basis only (increase in receivables is factored out). Incentive in subsequent years was given on the basis of incremental loss reduction by the utility with calculation of loss at the enterprise level. For the states where SEBs have been restructured, calculation for transmission and distribution utilities are used for assessing reduction in cash loss.

19. In the most recent Union Budget documents released in February 2007, no figures were given for APDRP disbursements in 2006–07.

including unrealistic investment project reports, delay in supply of equipment due to increased demand, heavy quantum of work, increase in price of materials and equipment, poor response to turnkey offers, and employees' resistance to outsourcing (especially on work related to information systems). Other flaws emerged consistently from responses of the utilities, most notably that state governments were tardy in transferring funds that had been released to them by the Center.

It is difficult to ascertain how much of the improvement in the cash position of the sector has been due to Central Government initiatives and how much has been on account of states' desire to restore the sector's health. The payments made on account of APDRP have been modest. Some states have focused on top-level (revenue enhancing) instruments which has taken the form of (i) reduction of losses; (ii) tariff rationalization; and (iii) management of load composition, in particular handling agricultural supply and greater emphasis on supply to industrial and commercial consumers (these are investigated at length in the fourth section). There are also instances (unheard of in the past) of some state power utilities swapping their high cost debt for debt with lower coupon, renegotiating power purchase agreements, and shopping around for cheaper coal.[20] Some state governments have also pitched in by financial restructuring through carving out liabilities of state utilities and assuming responsibility for them.

THE ELECTRICITY ACT 2003.[21] The Act essentially provided a "process map" for a market-based transparent regime through progressive introduction of competition and choice by incorporating impressive panoply of features comprising liberalization of captive generation, introduction of open access in transmission and subsequently in distribution, and the provision for issuing multiple distribution licenses in a given area. A critically important change that the Act sought to encourage was replacing the present single-buyer model to a multi-buyer model. This would lead to a paradigm change in the environment whereby monopoly of the SEBs for buying/selling power would cease, thus leading to a market determined tariff structure. Toward harmonization of regulation, the Act specificates that the principles laid out by the Central Electricity Regulatory Commission (CERC) in generation and transmission should guide State Electricity Regulatory Commissions (SERCs).

20. Over 2002–03 to 2005–06, Gujarat's state-owned power system negotiated savings of Rs. 7.7 bn on costs pertaining to fuel and power procurement (Government of Gujarat, 2006).

21. The Act, *inter alia*, consolidated the Indian Electricity Act 1910, Electricity (Supply) Act 1948, and Electricity Regulatory Commissions Act 1998.

The Act wrote the code for the sector from a national perspective with regard to grid discipline and rationalized dispatch of power.[22] In May of 2007, Parliament also passed legislation that makes stealing of electricity a cognizable offence and authorizes establishment of special courts for prosecution of those indulging in theft of power.

Structural Outcomes

All states, except Arunachal Pradesh and Nagaland, have constituted SERCs. However, SERCs of three states (viz., Goa, Jammu and Kashmir, and Meghalaya) are non-functional, and except for the electricity regulatory commission in Bihar, all SERCs that are functioning have issued tariff orders (appendix table A2 provides a composite summary on implementation of some of the reform measures discussed above). Thirteen states have unbundled their SEBs whereas nine states have sought extension; the mandatory date for unbundling SEBs into generation, transmission, and distribution entities was June 2004.

THE REGULATORY ENVIRONMENT. The role of state electricity regulators has been extensively analyzed [see, for example, Prayas (2003)]. Although the function is critical in the reform process, it is by and large exogenous to the reform efforts of state governments/discoms. Being largely outside the scope of the paper since the metric for evaluating the regulatory function is very different from this paper's analysis, we will limit our observations to an assessment of some of their broad functions [see Bhattacharya and Patel (2003; 2005) for the relevant criteria and associated evaluation of national regulatory agencies].

The effectiveness of regulators has, decidedly, been mixed. They have been able to pry open the books of state power utilities, at least partially, which has led to state governments to explicitly provide subsidies (up to a point) to the utility from the exchequer, if it wants to pursue social objectives.[23] While state regulators in recent years have contributed toward tariff rationalization—altering tariffs for different consumer segments, reflective

22. Transparent application of Availability Based Tariff (ABT) and Unscheduled Interchange (UI) are formal tools in this context. As part of implementation of EA, the government notified a National Electricity Policy in February 2005 and, subsequently, a National Tariff Policy, which *inter alia* facilitated Merit Order Despatch in supply (giving priority to least costly generators).

23. State governments never pay the entire uncovered net cross subsidy balance, in part because they know that utilities include shortfall due to pilferage from the system as subsidy requirement.

of cost of supply and occasionally stipulating (performance oriented) multi-year tariff methodology to enhance predictability—the pace of the initiative is uneven, and much remains to be done.[24] The SEBs have often been unwilling to follow the basic rules of the National Tariff Policy. One of these requires that utilities should file annual revenue requirement to the concerned SERC (filing the revenue requirement initiates the process of tariff revision keeping in mind the viability of distribution utilities). In 2006, only some states filed average revenue requirement petitions on time, and ten states had sent these in after the deadline. Important states such as Maharashtra, Gujarat, and Tamil Nadu did not bother.[25] State governments of diverse hues promise gifting away power to favored consumers—in 2006, Scheduled Castes in Punjab and farmers in Andhra Pradesh—in contravention of the rules for subsidies in the notified tariff policy. Therefore, not surprisingly, it is felt (and not without merit) that some SERCs have been ritually handing out tariff orders often (implicitly) endorsing populist initiatives at the behest of state governments. An interesting political economy aspect of regulation is provided by the comment of an eminent panel on a study on the SERCs: "… many State Governments have been brazen in defying the orders and directives of the [S]ERCs, year after year. Even the basic requirement of submission of full data in support of the tariff increase proposals is not being met by the utilities. This does not augur well for the [S]ERCs…" (Prayas, 2003).[26] The observation underscores the inherent difficulty of regulating government-owned utilities (Tadimalla and Patel, 2005).

The practice of quarterly up-to-date audited accounts is unheard of although this would increase transparency and allow for critical examination of accounting practices followed by SEBs. It will be difficult for state utilities and governments to publicly oppose introduction of 21st century accounting practices. The EA provides flexibility for regulators to force the issue, but practically none have to the extent that the Companies Act enjoins corporations to prepare financial statements.

24. Statutory requirements for hearings, access to information, and recourse in tariff determination have been positive (and useful) attributes of the regulatory framework that states have embraced (Dubash and Rao, 2006). Also see Rao (2007a).

25. Maharashtra eventually did so in April 2007.

26. Recently, a staff member of the Uttar Pradesh ERC has bemoaned the same point: "The power ministry should take note of the fact that most of the government-owned utilities across states have chosen to ignore the mandated legislative structural arrangements despite time-bound provisions in the [Electricity] Act. Non-compliances of regulatory orders galore; delays, disobedience, frequent reviews and appeals are common responses to the orders of the regulatory commissions" (Singh, 2007).

One of the most disappointing aspects of the reform process has been the slow (actually negligible) tangible progress on competition and open access to wires in the sector. This is an area in which significant responsibility may be placed on state electricity regulators, who should have been more proactive in "encouraging" introduction of open access and third party sales to break the monopoly of state-owned utilities. There has been a marked lack of effort to advocate change of current practices and initiate debate.[27] It is noteworthy that consultation and discussion papers by other sector regulators, for example, Telecom Regulatory Authority of India (TRAI), now have a proven track record as change initiators.

OPERATIONAL EFFICIENCY AND SUSTAINABILITY. Even if there is improvement in top-line indicators such as revenue performance and cash profits, will it be sustainable? An important aspect in evaluating the sustainability of commercial improvements is analogous to progress in the operational efficiency of the system. Capacity to withstand competition, reductions in system interruptions, quality of metering, grid discipline, and electricity supply parameters (like voltage fluctuations) are "well-being" indicators of a power system, and improvements (or lack of them) are an important gauge for the underlying health.

MARKET STRUCTURE AND COMPETITION. Market contestability may be considered to be a key factor for inducing efficiencies in electricity operations and reliability. Despite the advancement of many changes in the market structures of the erstwhile monolithic SEBs, there has been virtually no change in the level and nature of competition for customers. While most developed markets, and many emerging ones, have progressed quite rapidly from competition in the wholesale segments to retail competition, there has been virtually no progress in most discoms in India despite an enabling environment in the EA. The quantum of electricity traded is only about 3 percent of the total power sold.

The transition from a single-buyer model to a multi-buyer multi-seller model should result in a competitive power market so as to provide incentives for new investment while providing affordable and quality power to consumers. In January 2006, the Forward Markets Commission (FMC) notified electricity to be included in the list of commodities permitted for futures trading. Unfortunately, the process seems to lack a roadmap toward development of a competitive bulk power market, which should comprise

27. Of course, SEBs are extremely unwilling to allow choice to their "subsidising" customers as they are the major source of income for meeting expenses; loss of cash streams to private electricity suppliers, even with surcharges and open-access charges, would result in a severe cash shortfall.

adoption of a direction sensitive and efficient transmission pricing regime, introduction of intra-state ABT regimes, liberalization of fuel markets, rationalization of retail tariffs, and competitive procurement of renewable energy. The Indian wholesale power market is characterized by long-term bilateral contracts, which will continue to play a dominant role.

An exposition on the design of power markets and dispatch mechanisms is a complicated and technical subject, and beyond the scope of this paper (Deo, 2007). All we can comment on is that the development of this market requires the application of economic principles that incentivize the flow of power from the most efficient generators to the most creditworthy customers. The magnitude of wheeling charges and cross-subsidy surcharges has *de facto* made open access unviable. Maharashtra is probably the only state where the surcharge formula allows for the possibility of open-access sales to be remunerative.

GRID DISCIPLINE. A well-functioning electricity system with balanced flows and seamless responsiveness to demand–supply imbalances is critical for the smooth operation of the grid as a whole.[28] An acceptable international standard of deviations in electricity system frequency from 50 Hz is considered to be .005 percent, anything below 49.5 Hz is bad and below 49.0 Hz is a crisis. In 2006–07, on average, the chronically power-short northern region had a grid frequency below 49 Hz 21 percent of the time. The southern region was the most disciplined.

The kind of grid discipline that is being followed is inimical to the emergence of an actively traded market for power. The CERC has developed mechanisms for making inter-state transfers of power more efficient and commercially oriented. In this regard, the UI mechanism under the ABT regime could continue (albeit with modification) as a proxy for balancing the market to help smooth transition from the existing practice. For instance, given the current prices at which short-term power is being purchased by state and private discoms, the increase in the UI ceiling rate in April 2007 by CERC from Rs. 5.70/unit to Rs. 7.45/unit may not be binding.[29] A rate of Rs. 9.30 was suggested to the CERC, in keeping with the requisite practice of setting the UI rate at slightly higher than the cost of diesel generation (in some instances this is as high as Rs. 10–13/unit).

28. Grid discipline is a very important gauge of the physical integrity of the power system, that is, whether rules are followed. In the Indian context, grid indiscipline is usually on account of overdrawing of power (on account of incipient shortage) from the system which leads to a decline in the frequency of the grid, and occasionally its collapse.

29. The UI rate is a penal rate for drawing unsanctioned power from the grid.

Moreover, the current regime's limitations are likely to be exacerbated with the emergence of a nationally synchronized power grid encompassing all the power regions of the country.

METERING AND ENERGY AUDITS. One of the recommendations common across all committees on the power sector has been an insistence on energy audits, and as a precursor, metering of consumers, in order to be able to identify power flows and losses at the distribution levels. One of the basic problems of estimating the magnitude of losses in the system was the ability of utilities to disguise the extent of these losses by attributing them to (underpaid/unpaid) consumption in agriculture. Appendix table A3 provides a summary of the current status of metering. The striking aspect of these numbers is the completely inadequate metering at the level of distribution transformers; nationally, only 11 percent of these transformers are metered. Even worse is the metering status at the consumer level at end-2006, after years of reform funds for metering and audits; large states in terms of sales of electricity units have metering levels of anywhere between 2 percent and 34 percent. While metering at the 11 Kv level is high, it only provides a rough idea of the approximate location where the supply is being dispersed. The numbers on meters themselves may not be entirely reliable given the lack of information on how many meters are in a working condition, properly calibrated or actually read. [30]

Macroeconomic Assessment

There are several (interrelated) indicators that convey the extant financial health of the power sector at the aggregate level. The principal markers deployed in this paper comprise fiscal indicators, commercial aspects, and cash position.

Fiscal Aspects

Poor financial performance of state government-owned power utilities as well as the fact that SEBs account for the bulk of the states' investments in PSUs, have been major fiscal challenges for state governments. The proximate

30. The evidence on this aspect can, almost inevitably, only be anecdotal. The purchase of low voltage meters (about two years back) by the Maharashtra distribution utility is apocryphal. The "meters" were procured on the basis of lowest-price bidding at about Rs. 200 each, which is ridiculously low by any standards; what, in fact, was purchased were metallic boxes that looked like meters! Regarding transformers the story is that (occasionally) existing units are removed (at night) and sold back to the utility.

reasons have been the state-mandated subsidy to some consumers and the attendant scope (indeed, incentive) for camouflaging outright theft for supply to these categories that a skewed tariff policy has engendered. In macroeconomic terms, the sector, by some measures, is currently perched more or less where it was in 1997–98 (and the position then was not considered to be healthy). Recent strong economic growth and the concomitant buoyant tax revenues have given state governments some elbow room for financially supporting the power sector.

How far the sector had fallen can be appreciated when one notes that despite increase in subsidy payments—2–3 times the 1994–95 level—the burden on SEBs that remained uncovered had almost doubled (as a percent of GDP) by 1999–2000 (table 1), and which almost brought their operations to a virtual halt in 2001. This is because in tandem, the net subsidy to consumers (after taking into account over-charging to industry and the commercial sector), increased sharply over the same period, from 0.8 percent of GDP to 1.5 percent of GDP. After 2001–02 there has been a sharp correction in net subsidy, and, commensurately the uncovered gap, and currently both measures are at about the same level that they were a decade ago (1997–98).

As a percent of GDP, subsidy by the state governments to partly compensate SEBs for below cost sale of electricity to agriculture and domestic sectors have declined in recent years. However, despite a supportive macroeconomic environment, budgetary support, both in absolute terms and as share of state gross fiscal deficit (GFD), has increased in 2006–07. Although this, of itself, is not bad, since the states seem to be taking more responsibility for social objectives, risk of aggravating the fiscal situation as subsidies gradually creep up remains high. For some states, the scope for vulnerability on this score is significant. Consider, for example, subsidy in 2004–05 (last year for which state-wise data is available) as percent of respective GFD for the following states: Haryana (91.3 percent), Punjab (56.6 percent), Karnataka (38.8 percent), Gujarat (23.3 percent), Tamil Nadu (16.6 percent), and Andhra Pradesh (15.9 percent). Other states have some buffer; for instance, the ratio is relatively modest for Orissa (1 percent), Assam (3.4 percent), Uttar Pradesh (5.3 percent), Rajasthan (11.2 percent), and Madhya Pradesh (12.6 percent).[31]

In 2006–07, while (estimated) subsidy from state governments to SEBs was Rs. 138.7 bn, an (estimated) uncovered subsidy of Rs. 212 bn remained, which, as the 2006–07 Economic Survey observes, "offers the large reform

31. A word of caution: a low ratio for some states may be due to under-payment of subsidy, rather than the requisite subsidy bill being low.

TABLE 1. Overall Fiscal Indicators of the Power Sector (in Rs. bn)

	Gross cross-subsidy (as % of GDP in brackets)	*Surplus from subsidizing sectors*	*Net cross-subsidy (as % of GDP in brackets)*	*Subsidy to power sector from state govts. (as % of GDP in brackets)*	*State govt. subsidies as % of State GFD*	*Uncovered cross-subsidy loss*	*Uncovered subsidy as % of GDP*
			(3)			(6)	
	(1)	(2)	(1– 2)	(4)	(5)	(3–4)	(7)
1991–92	74.5 (1.1)	21.7	52.8 (0.8)	20.5 (0.3)	10.8%	32.3	0.5%
1992–93	93.5 (1.2)	33.1	60.4 (0.8)	19.1 (0.3)	9.1%	41.3	0.5%
1993–94	114.5 (1.3)	35.0	79.4 (0.9)	20.7 (0.2)	10.0%	58.8	0.7%
1994–95	133.1 (1.3)	53.1	80.0 (0.8)	18.3 (0.2)	6.6%	61.7	0.6%
1995–96	172.8 (1.4)	66.6	106.2 (0.9)	72.3 (0.6)	23.0%	33.9	0.3%
1996–97	201.5 (1.5)	78.5	123.0 (0.9)	62.8 (0.5)	16.9%	60.1	0.4%
1997–98	245.2 (1.6)	90.6	154.6 (1.0)	72.1 (0.5)	16.3%	82.4	0.5%
1998–99	303.5 (1.7)	68.8	234.7 (1.3)	78.5 (0.4)	10.6%	156.2	0.9%
1999–00	338.1 (1.7)	42.4	295.7 (1.5)	109.4 (0.6)	12.0%	186.3	1.0%
2000–01 (P)	344.3 (1.6)	34.4	309.9 (1.5)	88.2 (0.4)	9.9%	221.7	1.1%
2001–02 (P)	345.9 (1.5)	37.0	308.9 (1.4)	86.8 (0.4)	9.0%	222.1	1.0%
2002–03 (P)	305.7 (1.2)	48.0	257.7 (1.0)	130.0 (0.5)	12.7%	127.8	0.5%
2003–04 (P)	331.5 (1.2)	61.3	270.2 (1.0)	110.8 (0.4)	9.0%	159.4	0.6%
2004–05 (P)	361.9 (1.2)	63.9	298.0 (1.0)	104.8 (0.3)	9.6%	193.2	0.6%
2005–06 (P)	364.0 (1.0)	60.6	303.4 (0.9)	116.1 (0.3)	10.2%	187.3	0.5%
2006–07 (RE)	401.3 (1.0)	50.6	350.7 (0.9)	138.7 (0.3)	12.7%	212.0	0.5%
2007–08 Plan	395.4 (0.9)	88.2	307.3 (0.7)	124.6 (0.3)	10.1%	182.7	0.4%

Source: *Economic Survey* (2006–07), and previous years; *Handbook of Statistics on Indian Economy* (2006).

Notes: GFD is consolidated gross fiscal deficit of state governments; (P) means provisional. RE means revised estimates.

potential for improving not only the electricity sector itself but also the fiscal position of the States." The recovery of cost by the government from the power sector (not a non-excludable commodity) has been low at 13.1 percent, compared to 17.7 percent for irrigation, 11.6 percent for roads, 5 percent for public health, and 1.2 percent for education (RBI, 2006). In addition to subsidies and loans to utilities, governments have also provided substantial guarantees to financial institutions for enabling state utilities to raise requisite resources. With persistently negative rates of return of SEBs (on capital employed), resources forgone continue to be very large.

AGRICULTURAL POWER AND SUBSIDIES. Politicians have used state distribution utilities to deliver populist measures like (almost) free power to agriculture; over the last two decades this has been the primary contributor to the financial weakness of the sector (table 2). The promise of free power has reached epidemic levels with most political parties doing so in practically every election [see Narendranath et al. (2005) on the underlying political explanations].

For the most part, accounting practices of SEBs have continuously disguised non-technical losses (essentially pilferage) as consumption of power by agriculture. Since a large part of the supply to agriculture is unmetered, utilities can under-report the systems' actual distribution losses by ascribing a significant portion of non-technical losses and theft as supply to agriculture. Subsidies expected to benefit poor farmers in fact benefit the large farmers and the pilferers of power, many of whom are not farmers [see Katiyar (2005) on power theft in rural areas]. While this reality is well known, existing estimates are largely based on anecdotal evidence or non-representative samples.

Losses

In consonance with improvement in their finances (at least in cash terms), the overall financial losses of state-owned power utilities have declined from Rs. 293 bn (1.3 percent of GDP) during 2001–02 to Rs. 221 in during 2004–05 (0.7 percent of GDP) (Power Finance Corporation, 2005; 2006). But ATC losses, which include theft, non-billing, incorrect billing, inefficiency in collection, and (technical) transmission and distribution (T&D) losses,[32] are about 36.8 percent nation-wide in 2004–05, the last year for which data is officially available (PFC, 2006).[33, 34]

32. The T&D losses are determined by the physical quality of the T&D infrastructure of a power system (a very good system would have losses on this count in the low single digit).

33. Available data does not give a breakdown of ATC losses between TD and other losses.

34. There are informal indications that ATC loss levels might have fallen in 2005–06, based on a selective survey of tariff filings.

TABLE 2. Power Sector Cross–subsidy Indicators (in Rs. bn)

	Subsidy to agricultural consumers (as % of total gross subsidy in brackets)	*Subsidy to domestic consumers*	*Subsidy on inter-state sales*	*Gross cross-subsidy*	*Gross cross-subsidy as % of state GFD*
	1	*2*	*3*	*4 (1+2+3)*	*5*
1991–92	59.4 (79.7)	13.1	2.0	74.5	39.4%
1992–93	72.1 (77.1)	19.2	2.3	93.5	44.7%
1993–94	88.8 (77.6)	24.2	1.4	114.5	55.6%
1994–95	101.1 (76.0)	29.6	2.3	133.1	48.0%
1995–96	137.9 (79.8)	31.6	3.3	172.8	55.0%
1996–97	156.3 (77.6)	42.3	2.9	201.5	54.1%
1997–98	190.9 (77.9)	51.7	2.6	245.2	55.5%
1998–99	225.4 (74.3)	72.7	5.4	303.5	40.9%
1999–00	241.8 (71.5)	91.7	4.6	338.1	37.0%
2000–01 (P)	240.7 (69.9)	99.7	3.9	344.2	38.5%
2001–02 (P)	240.1 (69.4)	103.5	2.3	345.9	36.0%
2002–03 (P)	218.5 (71.2)	85.3	1.9	306.7	29.9%
2003–04 (P)	233.5 (70.4)	88.9	9.2	331.5	26.6%
2004–05 (P)	252.4 (60.7)	104.3	5.2	361.9	33.1%
2005–06 (P)	244.7 (67.2)	108.4	10.9	364.0	31.9%
2006–07 (RE)	273.3 (68.1)	130.1	–2.12	401.3	36.2%
2007–08 Plan	270.9 (68.5)	118.4	6.1	395.4	32.0%

Source: *Economic Survey* (2006–07), and previous years; *State Finances*, a study of budgets of 2006–07, RBI (2006).

Definition of ATC Losses[35] ATC losses (in percent) are calculated as follows:[36]

$$(1 - \text{ATC Loss}) = (1 - \text{TD Loss}) \times (\text{Collection Efficiency})$$
$$= [(\text{Units billed})/(\text{Units input})] \times [(\text{Rupees realized})/(\text{Rupees billed})]$$

There is another interpretation of this formula. Rearrange the two terms in parentheses on the right hand side as follows:

$$= [(\text{Rupees realized})/(\text{Units input})] \times [(\text{Units billed})/(\text{Rupees billed})]$$

The first term in square brackets is the "Average Realization Rate." The inverse of the second term is the "Average Billing Rate." Therefore,

$$(1 - \text{ATC Loss}) = (\text{Average Realization Rate})/(\text{Average Billing Rate}).$$

The reduction of losses is the proximate determinant of the financial viability of the power sector; in a sense, it is the overarching outcome of various reform measures that have been instituted by states/discoms. And it is here that the progress (or lack of it) has been the most disappointing. The ATC losses have declined from 37.2 percent in 2001–02 to 36.8 percent in 2004–05 (PFC, 2005; 2006) (although it is likely that the data will show an improvement in 2005–06).[37] It is instructive that the Report on State-Specific Reforms (Government of India, 2002a), which initiated the APDRP, had envisaged a reduction of losses from the then (estimated) 60 percent levels to around 15 percent over five years, thereby implying an annual reduction of about 9 percentage points.

35. The definition presented here, which is now widely used, was formulated by Prayas, Pune and Delhi Electricity Regulatory Commission. An ATC loss estimate (which is a physical measure) helps to gauge what fraction (percentage) of the units of electricity is not paid for.

36. The TD in the formula is also, of course, in percent.

37. The *Report on Restructuring of APDRP* (Government of India, 2006), which are the latest available estimates of ATC losses, has 38.9 percent and 33.8 percent for 2001–02 and 2004–05, respectively. Provisional accounts for 2005–06 show that the states of Andhra Pradesh, Goa, and Tamil Nadu have reported ATC losses below 20 percent during the year, and that Punjab and two discoms of Gujarat (Madhya and Uttar) have reported ATC loss of 20–25 percent. Further, utilities in the states of Andhra Pradesh, Goa, Himachal Pradesh, Punjab, Gujarat, Meghalaya, Chhattisgarh, and West Bengal have reported profits. States of Jharkhand, Madhya Pradesh, Haryana, Rajasthan, Uttaranchal, Karnataka, Kerala, and Assam have also reported reduction in their losses during 2005–06.

Aggregate financial data do not convey the whole picture, given that business and the underlying physical supplies are also changing. A look at some of the above trends in per unit of electricity supplied provides an alternative and important perspective (table 3).

All the available data indicate that after a fairly sharp improvement over 2001–02, improvements are stagnating in the last couple of years. In fact, the reported worsening of the rate of return in 2006–07, at a time when the economy is strong and state government finances are solid, bode ill for the underlying performance of the sector. One adverse trend that shows up in table 3 is a marked deterioration in the revenue gap of the agriculture sector although this needs to be looked at with more care, given the problems with metering and weak energy audits of agriculture feeders.

Overall Financial Assessment of State Government Utilities

Most SEBs (and successor entities after unbundling) are unable to earn a rate of return (RoR) of even 3 percent on their net fixed assets after providing for depreciation and interest. [This is one of those quaint features of the Indian electricity sector; the Electricity (Supply) Act 1948 mandates a minimum return on assets.] In fact, despite significant improvements in many financial and commercial parameters over recent years at the aggregate level (these are evidenced in table 4 up to 2004–05), there seems to have been a significant deterioration in the projected RoR in 2006–07; the cause is unexplained.

During 2004–05, although state utilities had incurred (book) losses of Rs. 221 bn (before subsidy), cash losses of the sector (on a revenue- and subsidy-realized basis) have improved dramatically from Rs. 189 bn in 2001–02 to Rs. 34 bn in 2004–05 [and are likely to have lessened even more in 2005–06 (table 4)].[38] Subsidy provided by governments is important; transfers have increased, as state fiscal situations have improved since 2002–03, and this has contributed to incomes of utilities. Subsidy booked but not paid to utilities has declined from Rs. 52 bn in 2001–02 to overpayments of Rs. 7 bn in 2004–05.

The financial liquidity to cover losses of this magnitude is likely to be manageable through working capital loans, deferred payments to their state government owners, some increase in dues to suppliers and, presumably,

38. One of the problems in interpreting financial data of the power sector is the multiplicity of accounting conventions used in different contexts; revenues booked and realized are often used interchangeably. This makes it difficult to compare revenue streams from different sources for different years, especially given the large revisions that are made in the data. Very different pictures of the health of the sector emerge depending on the particular definition of revenue adopted.

TABLE 3. Electricity Tariffs and Costs (in paise/unit)

	ACS (1)	*ARR w/o subsidy (2)*	*ARR–ACS (2–1) (w/o subsidy) (3)*	*ARR–ACS gap (w/o subsidy) (4)*	*ARR for agriculture (5)*	*ARR for industry (6)*	*ARR–ACS gap for agriculture (7)*	*ARR–ACS gap for industry (8)*
1991–92	–	–	–	–24.91	–	–	–	–
1995–96	–	–	–	–28.10	–	–	–	–
1999–00	–	–	–	–70.53	–	–	–	–
2000–01	–	–	–	–65.38	–	–	–	–
2001–02	246	181	–65	–81.34	58.7	410.0	–	–
2002–03	239	196	–43	–48.05	77.5	412.7	–161.5	173.7
2003–04	239	202	–37	–37.00	70.1	387.5	–168.9	148.5
2004–05	250	208	–42	–42.00	73.3	384.2	–176.7	134.2

Sources: Cols. (1), (2), (3), (5), (6), (7), and (8) are from *Report on the Performance of the State Power Utilities*, Power Finance Corporation (PFC) (2005; 2006), which do not carry long time series for each of the data fields. The gap shown in col. 4 is from *State Finances*, a study of budgets of 2006–07, RBI (2006).

Note: ARR stands for average realization rate.

ACS stands for average cost of supply.

TABLE 4. Consolidated Cash Profits/Losses (in Rs. bn)

			2001–02	*2002–03*	*2003–04*	*2004–05*	*CAGR (2004–05 over 2001–02)*
A		Income (without subsidy)–Utilities selling directly to the consumers	809.0	882.4	981.5	1,068.8	9.7%
B		Expenditure (without depreciation and tax) Utilities selling directly to consumers	1,035.4	1,009.5	1,090.5	1,203.9	5.2%
C1	A–B	Profit/Loss without depreciation, subsidy, and tax for DISCOMs	–226.4	–127.1	–109.0	–135.1	–15.8%
C2		Add Gencos and Transcos (Profit without depreciation, subsidy, tax)	24.5	18.2	24.1	30.7	7.8%
	C1+C2	Total Profit/Loss without depreciation, subsidy, and tax	–201.9	–108.9	–84.9	–104.5	–19.7%
D		Tax	0.8	1.6	1.6	2.4	45.0%
E		Depreciation	90.6	100.7	110.2	112.2	7.4%
F	C–E	Profit/Loss (without subsidy and tax)	–292.5	–209.6	–195.0	–216.7	–9.5%
G		Subsidy booked	146.0	136.7	104.3	110.2	–9.0%
H	(F–D + G)	Book Profit/Loss	–147.4	–75.2	–92.3	–111.1	–10.2%
	(H–G)	Profit/loss without subsidy	–293.3	–211.9	–197.2	–221.3	9.0%

I		Subsidy Unpaid (subsidy booked less received)	51.5	13.3	–2.1	–7.4	–42.6%
J		Unrealized revenue	80.9	61.4	42.7	45.0	–17.8%
K	(C–D+G–I–J)	Profit/Loss (without depreciation but on revenue and subsidy realized basis)	–189.2	–48.5	–22.7	–34.4	–43.3%

Source: PFC (2005; 2006). The data covers state power utilities, power departments, and distribution companies that were an outcome of the reform process, in all 29 states as well as the Union Territory of Pondicherry.

Note: CAGR stands for compound annual growth rate.

Memo items:

	2001–02	*2002–03*	*2003–04*	*2004–05*	*2005–06*	*2006–07*
Collection efficiency (%, in income terms)	90	93	96	96	–	–
Units sold (Mn Units)	287,138	309,725	329,647	358,905	–	–
Income (w/o subsidy)/unit sold (in Rs./unit)	2.82	2.85	2.98	2.98	–	–
Rate of Return (%)*	–32.8	–31.6	–28.3	–28.0	–24.8	–27.4

Notes: We have not reported units sold for 2000–01, to preserve continuity; earlier estimates in the *Annual Report of SEBs and EDs* from the Planning Commission vary widely from the PFC (2005; 2006]) estimates thereafter.

*RoR data (provisional/estimated) is from *Economic Survey*, various years.

assistance under the APDRP. The sector manages to (barely) keep its head above water, just about able to meet operational expenses, but being in no position to invest adequately in strengthening the distribution infrastructure or investing in generation capacity.[39] While the financial position has improved, it is noteworthy that the debt service coverage ratio of utilities is hardly likely to inspire confidence among lenders (table 5).

The system—at least on a cash basis—appears to have settled down (albeit at a low level equilibrium), which has contributed to a perception in recent times that the sector is at the cusp of turning the corner, and that this would soon snowball into a full-fledged commercial revitalization and crowd in new investment. The data in tables 4 and 5 is part of the extensive information memorandum of the show-piece initiative [Ultra Mega Power (UMP) Projects] of the Central Government. It is a program of coal-based power stations of 4,000 MW each, which the government hopes can be developed with private sector participation. Open tenders (with lowest tariff as the bidding variable) for executing the UMP projects have been invited for locations across the country and one has been awarded in Gujarat. The private sponsors of UMP utilities would need robust and credible mechanisms to ensure that governments honor their payment commitments under the power purchase agreement (PPA) with multiple states. Public sector financial institutions, it can be argued, may be better placed to assume the counter-party risks of these large projects in which linkages to government-dominated sectors (coal supply, fuel transport, and transmission) are critical for success. The financial shock could be overwhelming; for instance, a back-of-the-envelope calculation

TABLE 5. Distribution of Debt Service Coverage Ratio (DSCR)
(no. of utilities)

DSCR	*2002–03*	*2003–04*	*2004–05*
0–0.50	4	10	7
0.5–1.0	11	9	11
> 1.0	15	20	18
–ve	10	8	17

Source: PFC (2005; 2006).

Note: Among the discoms that have DSCR > 1, there are two each from Andhra Pradesh and Karnataka; ratios of the SEBs of Gujarat, Punjab, and Madhya Pradesh are also larger than one.

39. Of course, the stress in the system is felt in the dilapidated physical assets of the utilities because of inadequate capital expenditure; net fixed assets grew in nominal terms by only 4 percent in 2004–05 from the previous year. Recently, the Prime Minister said that by 2012 (end of the 11th Plan), investment of Rs. 6 tn is required in the power sector (Address to Chief Ministers at Centre–States Meeting on the Power Sector, New Delhi, May 28, 2007).

indicates that discoms would have to essentially, albeit not legally under the PPA, "earmark" distribution circles with revenue collections of Rs. 58 bn to provide "comfort" to *one* UMP (at, say, 75 percent PLF, @ Rs. 2.20/unit)) for meeting procurement costs. To put this in perspective, aggregate income of discoms was about a trillion rupees in 2004–05.

The following is a summary of the positives and negatives that we can discern at the aggregate level:

Positive	*Negative/unchanged*
• Cash flows have improved. • Collection efficiency has improved. • Subsidies from state governments have become more stable, even as fiscal burden (as percent of GDP) on account of the power sector has moderated.	• ATC losses remain stubbornly • Performance indicators seem to have plateaued in 2004–05.

State- and Utility-specific Outcomes

Disaggregating the Financial Turnaround by States/Utilities

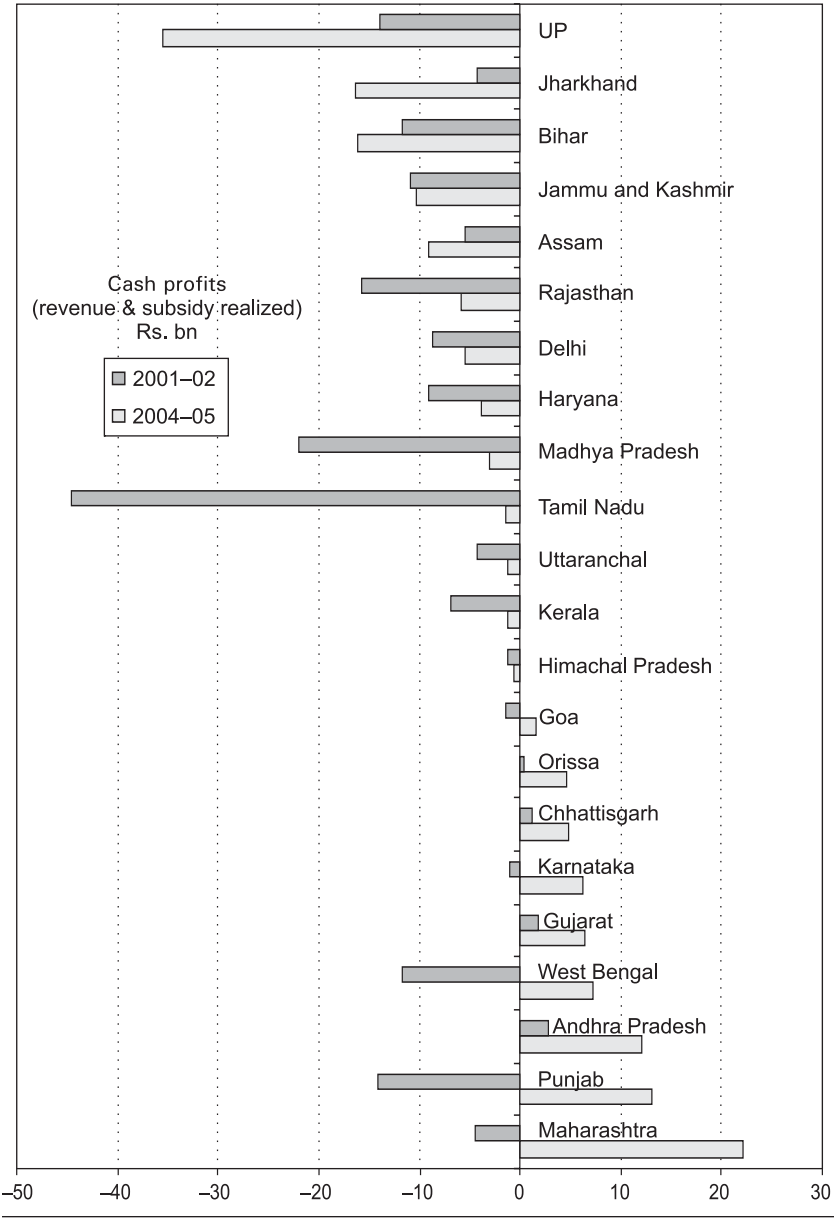
Is the overall pattern at the all-India level that we have reviewed above, repre-sentative of most states? This section examines disaggregated numbers and finds that there is considerable variability between states and distribution utilities (discoms).[40]

The concentration of losses and profits is immediately apparent from the state-wise distribution of cash profits/losses (on a subsidy realized basis) (figure 1).[41] Of the gross cash losses of around Rs. 110 bn in 2004–05 from

40. See data appendix 1 for a discussion on the choice of states and performance metrics in the paper; it also includes nomenclature for discoms in the sample. We will consistently use "utilities" to denote power utilities of individual states. Note that this will include integrated utilities (that is, where SEBs have not been unbundled) *as well as* unbundled distribution utilities (that is, discoms where SEBs have been broken up).

41. We look at cash profits and losses on revenue and subsidy realized basis in section 4; in the interest of fairness to discoms, to the extent that their losses are due to supply to subsidized segments, including agriculture, the onus is on state governments to recompense for what is considered to be essentially a "social (political)" obligation. Later in the same section, however, we consider revenues, profits, and so on, before subsidies, since we are concerned with the commercial aspects of the utilities' performance.

FIGURE 1. Distribution of Cash Profits/Losses by States (in Rs. bn)



Source: PFC (2005; 2006).

Note: The cash profits and losses for states that had unbundled their gencos and transcos in our reference period (2001–02 to 2004–05) include the losses and profits made by these entities, in addition to those by their discoms. This is to enable comparability with those states that had not unbundled.

thirteen states, 80 percent originated in five states (UP, Jharkhand, Jammu and Kashmir, Bihar, and Assam). Gross cash profits of Rs. 78 bn were slightly more dispersed across the nine states generating it, with five states accounting for 78 percent (Maharashtra, Punjab, Andhra Pradesh, West Bengal, and Gujarat).

One of the main inferences from figure 1 is the higher variability in the cash position in recent years. In 2001–02, the cash positions were clustered more closely around a higher average loss (Rs. 8.4 bn), and by 2004–05, the average loss had reduced significantly (Rs. 1.4 bn), but the spread around this lower loss level had widened. The coefficient of variation for states' levels of loss had increased from –1.23 in 2001–02 to –8.23 in 2004–05, due to the standard deviation increasing from 10.4 to 12.0 over this horizon.

Of the improvement that we have seen in the last three years, a few states have contributed a disproportionate share. The most remarkable turnarounds (in terms of loss reduction) were in the states of Tamil Nadu, Maharashtra, Punjab, West Bengal Madhya Pradesh, and Karnataka. Andhra Pradesh, Orissa, Gujarat, and Chhattisgarh significantly improved their profits.[42] Uttar Pradesh, Jharkhand, and Bihar had contributed the most to the higher loss levels in 2004–05.

Even within states, there is large variability among the unbundled discoms. For the individual discoms of unbundled state utilities, the coefficient of variation had increased from –1.11 to –2.33 over this period. Figure 2 shows that very few discoms had made the transition from a cash loss situation to cash profits (prominent among those making the transition were the Bangalore circle of Karnataka, Delhi North, AP North, AP East, Orissa West, and Delhi Rajdhani).[43]

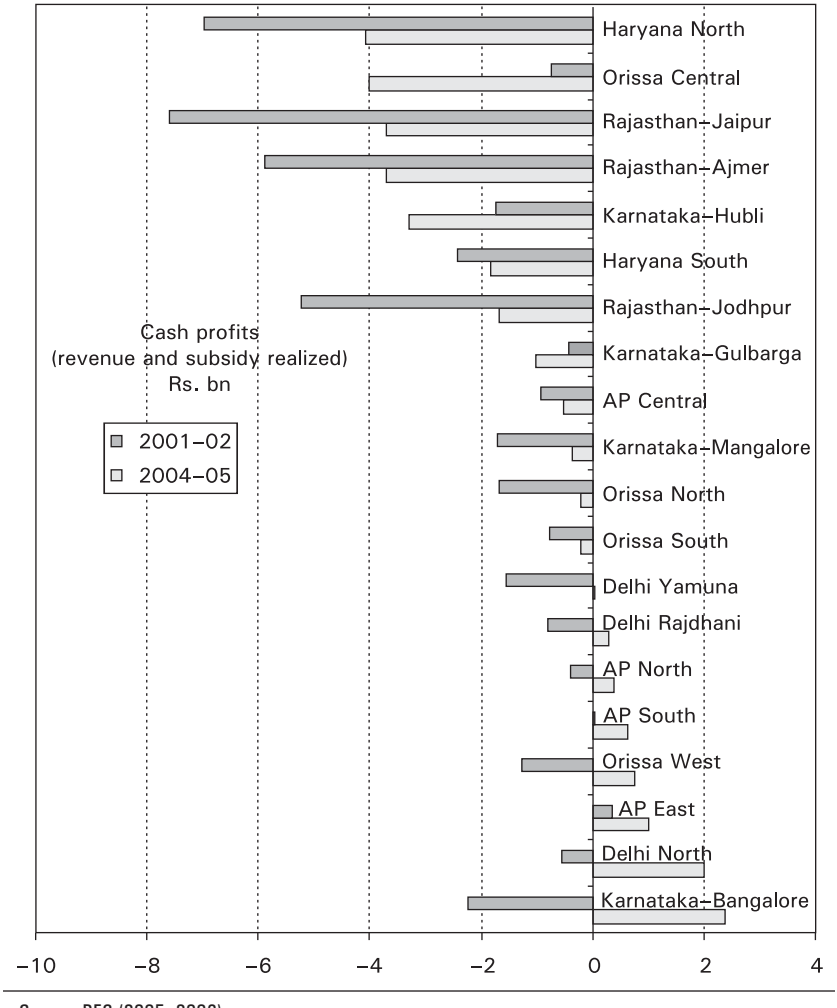
The performance of the six privately-owned discoms (in Delhi and Orissa)[44] was all the more remarkable, as they did not receive (direct) subsidies from their respective governments in 2004–05; despite this, four

42. In fact, Gujarat has earned profit before tax (PBT) after depreciation of Rs. 1.8 bn in 2005–06. The per unit (ACS–ARR) gap has been reduced from a deficit of 66 paise in 2003–04 to a surplus of 5 paise in 2005–06 (Government of Gujarat, 2006).

43. It is notable that *after* depreciation (that is, on a book basis), only three (unbundled) discoms made profits in 2004–05, notably Delhi North, AP East and Karnataka-Bangalore (PFC, 2006). Among the vertically integrated utilities (SEBs, which are not part of figure 2), Punjab, Chhattisgarh, Maharashtra, West Bengal, and Goa made significant profits after depreciation.

44. Central Electricity Supply Company of Orissa (CESCO) (Orissa Central) reverted from private majority to the Government of Orissa [through Grid Corporation of Orissa Limited (GRIDCO) assuming control] in 2002, following the exit of AES Corporation from the joint venture operating the discom.

FIGURE 2. Distribution of Cash Profits/Losses by Discoms (in Rs. bn)



Source: PFC (2005; 2006).

Note: The chart does not include the losses/profits of states with integrated SEBs, since the scale of these numbers would blunt the variations in the other discoms.

of them made profits in 2004–05, which amounted to 41 percent of the profits of the unbundled discoms and 4 percent of total profits.

To lend credence to having qualified under the incentive component of the APDRP, the qualifying discoms generally have been some of the most improved among their peers but, at the same time, have also been dispersed by the metric of cash profits. However, it is not to say that states that did not

qualify under the incentive scheme have not done well, the most striking being Tamil Nadu.

Determinants of Revenue Orientation

Why have some states done well and some so poorly? We would argue that the main motivator of performance is the degree to which individual utilities are commercially oriented.[45] In particular, it comprises measures to enhance revenues (and hence cash flows). The following sections investigate aspects of the focus on revenues in greater detail and attempt to answer why some states have succeeded more than others in devising a turnaround.

There are three broad aspects that determine revenue orientation. The first is reduction of ATC losses, which, in turn, comprises several sub-areas, including metering and collection efficiency. The second is management of overall load composition, with greater emphasis on supply of power to industrial and commercial entities. The third is tariff rationalization. Are overall tariffs moving towards the cost of supply? Are industry, domestic, and agriculture tariffs converging toward cost?

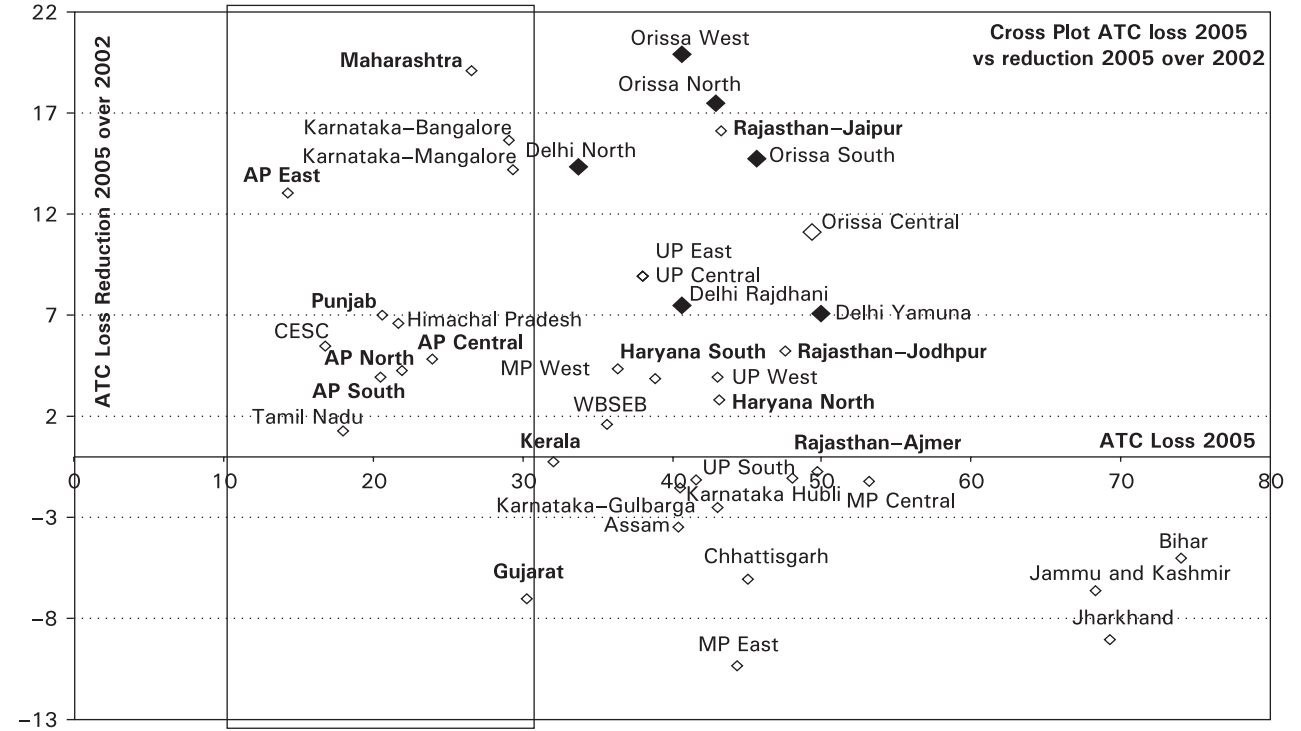
ATC Losses

As with most outcome indicators in the power sector, there is a wide dispersion in the ATC loss levels and reduction (figure 3). The figure is a cross plot of utilities with ATC losses in 2004–05 and loss reduction (from 2001–02 to 2004–05). Although the distribution of utilities at various loss levels seems more or less random, the high loss ones (that is, those with losses above 50 percent) seem to have predominantly deteriorated. Among the others, though, a dominant majority have reduced their losses.

TARIFF RATIONALIZATION. One of the important contributors to India's relatively low rankings in most competitiveness indices is the high cost of power to industrial and commercial enterprises, which is an outcome of the fiscal necessity to offset the subsidy on account of sales to agriculture and domestic customers. Since these latter accounts for over half of total units sold, the cross-subsidy loading on to the subsidizing segments is significant. Tariff rationalization entails moving tariffs toward cost, mostly by reducing

45. The market microstructure and political economy aspects of commercial orientation have been the subject of much discussion elsewhere. The following quote in a recent article by a former chairman of the CERC is instructive: "Government owns all transmission and distribution, and the bulk of the country's generation. They are run by government servants with no *commercial* experience, adding to inefficiencies, poor maintenance, tolerance of indiscipline and theft by employees" (Rao, 2007b, authors' emphasis).

FIGURE 3. Cross Plot of Level of ATC Loss and Loss Reduction during 2001–02 to 2004–05



Note: Diamond legends in black are discoms which have been privatized. The legend names in bold are those states/utilities that have qualified for the APDRP incentive scheme.

the gap between subsidized and subsidizing segments. At the same time, managing demand growth in subsidized segments and increasing supply to paying customers also moves the average revenue toward average cost.

Utilities with a large gap were far more likely to have deteriorated over the four reference years (figure 4); this relationship seems to be among the strongest that we have found. On the other hand, those with the lowest gap in 2004–05 have managed a loss reduction on average. The threshold ACS–ARR gap below which the change seems to become random across utilities is about 60 paise/unit. Among the measures that we deploy, this is about the only one with a cost component. Power procurement costs, that is, the cost of purchasing power from external entities account from anywhere between 30 and 70 percent of total expenditures of utilities. Management of these costs, of course, is important and a few utilities have taken initiatives to negotiate better deals on PPAs.

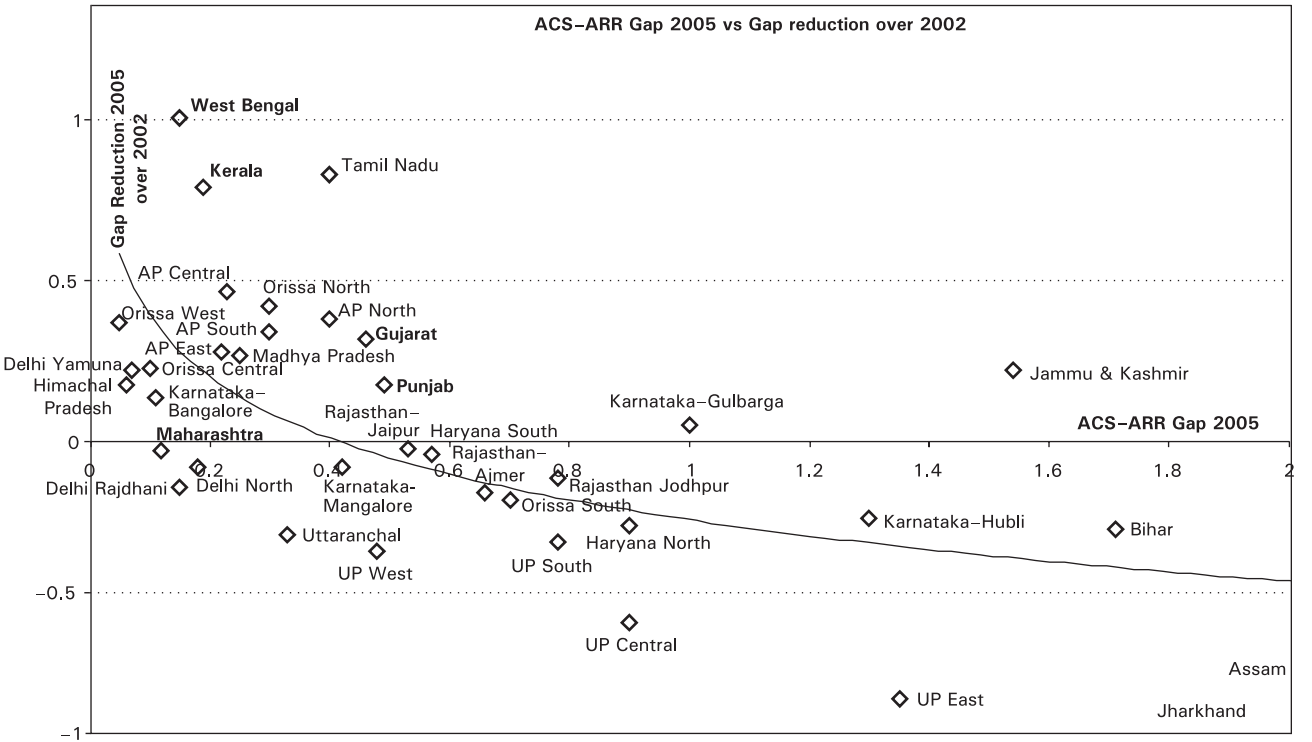
DEMAND COMPOSITION MANAGEMENT. Those states that have managed to shift their incremental load composition toward industries and commercial enterprises will have tended *ceteris paribus* to have better cash flows and would therefore be more financially viable. It is important to note that the potential of some states to increase their industrial and commercial demand has been higher in part due to their ability to attract investments by offering a better investment climate and fiscal incentives. At the same time, one of the key determinants of investment decisions is the cost competitiveness conferred upon commercial units through reliable supply of power at reasonable cost.

Figure 5 shows the outcomes of utilities over the four reference years in shifting the composition of load demand. It shows the ratio of units supplied to subsidizing segments (that is, commercial, high- and low-tension industries) compared to subsidized segments (that is, agriculture and domestic consumption). It is striking from the graph that the modal change from 2001–02 to 2004–05 has been fairly small. A substantial majority of utilities sell more units to the subsidized segments than to subsidizing ones (which is an important reason why ARR is below cost). A telling observation on the commercial orientation of utilities is that only a bare majority of them have managed to increase the share of the subsidizing segments in the overall supply. Two of the most mineral-rich states—Jharkhand and Chhattisgarh—have had a major drop in this ratio.

A Composite Index of Revenue Orientation

An important perspective of the results of reform might emerge by ranking utilities on the basis of their operational decisions that result in both

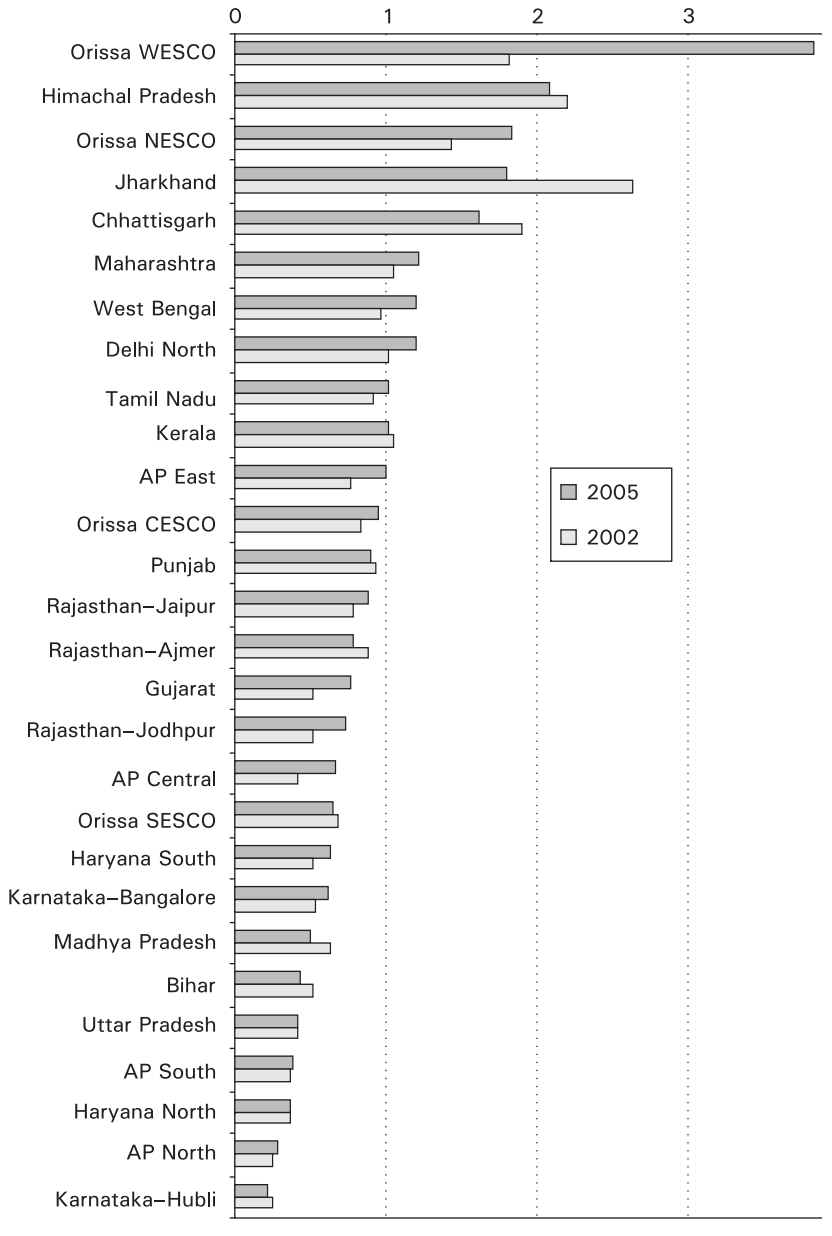
FIGURE 4. Cross Plot of Revenue Gap vs Gap Reduction



Source: Computed by the authors.

Note: Diamond legends in black are discoms which have been privatized. The legend names in bold are those states/utilities that have qualified for the APDRP incentive scheme.

FIGURE 5. Change in Demand Composition



Source: Computed by the authors.

intermediate and final outcomes. In other words, the implicit assumption underlying such a decision-based ranking is to control for exogenous factors that were beyond the control of the utility in evaluating revenue and profit outcomes. A summary indicator that captures the various aspects of what we have described as "commercial orientation"[46] of a utility might be a useful "sufficient statistic" for the revenue and cash performance of a utility. Toward this end we construct a utility-specific IRO for 2001–02 and 2004–05.

The authors are aware of only one previous attempt in constructing such a composite measure and that too in a somewhat different context. Internet Content Rating Association (ICRA) and Credit Rating Information Services of India Limited (CRISIL), two of India's credit rating agencies had been mandated by the Power Finance Corporation at the instance of the Union Ministry of Power to carry out a performance rating exercise for state electricity boards/discoms. The first report was for data available up to 2003 and the fourth edition was released in June 2006 (ICRA and CRISIL, 2006). There are several problems with the methodology of this exercise. First, the scope of the variables included was too extensive and unwieldy for drawing inferences on financial performance, which is the bottomline outcome measure. Input and output indicators could have been combined in a more logical manner. Second, the methodology for translating the indicated metric into the final score is not publicly available although the list of variables that have been deployed is. Third, the weights assigned to the aggregated grouping of individual metrics are not only subjective but have also undergone significant change during the four years over which the ratings score were calculated. If that was not enough, the scores were changed "based on the feedback obtained from the Ministry of Power and the utilities, as also the most recent developments in the sector."

Although a better understanding of the rating process is certainly useful, some of the parameters are too blunt and unquantifiable. Others are open to a mechanical interpretation, ignoring ground realities. For instance, the measure of progress in attaining 100 percent rural electrification and electrification of households is likely to provide a much distorted picture since the extant definition of an electrified village is the provision of an electricity pole and that some wires have reached the outskirts of the village.

46. We construe "Commercial Orientation" as a wider construct than "Revenue Orientation," encompassing actions that are likely to result in sustainability of increasing revenue realizations, which is the objective of the latter concept. Although key aspects of commercial orientation were earlier elaborated in section 2 ("operational efficiency and sustainability"), it is difficult to adequately quantify and grade since there has been little action on many of these aspects, and patchy data where there has been progress.

Given the shortcomings associated with such an omnibus measure, we decided to focus on a few parameters that are relatively well-defined; those that are based on more or less observed outcomes and might be thought to be the upshot of several processes instituted over the years. The aggregation is meant to capture one very important aspect of commercial orientation, specifically, what we term "Revenue Orientation."

Electricity provision is a commercial business, like any other service provision such as banking or healthcare. Admittedly, there is a *merit* good aspect in this service, involving the provision of access to economically disadvantaged sections of consumers or in remote areas. These functions, however, are best enabled through financial support from the government and should not be embedded in the tariffs and provisions of supply to designated segments. At the end of the day, the electricity supply business has to generate returns on capital employed regardless of ownership (government or private sector).

The index is composed of the following elements:

1. ATC loss levels.
2. Collection efficiency.
3. The gap between the ARR and the ACS.
4. The gap between the ARR from the industry segment and the ACS (as a percentage of ACS).
5. The ratio (in terms of units supplied) of the subsidizing segments [that is, commercial, industry (high tension), and industry (low tension) to the subsidized segment (that is, agriculture and domestic)].

The formula for the index is as follows:

$$\begin{aligned} \text{IRO} = {} & (1 - \text{ATC losses}) + \text{Collection Efficiency} \\ & + (\text{ARR} - \text{ACS}) - (\text{Industry ARR} - \text{ACS}) \\ & + \text{Ratio of subsidizing to subsidized segments} \end{aligned} \tag{1}$$

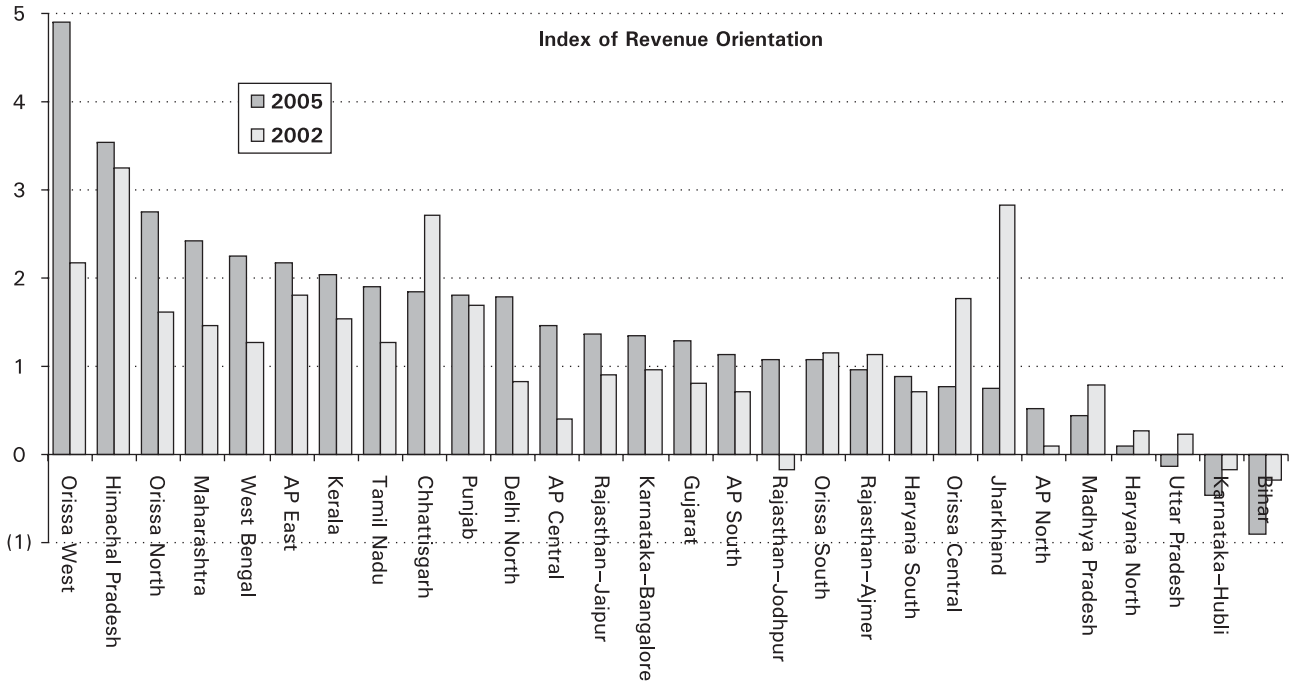
The weights are uniform and are simply +1 or −1 depending on the appropriate definition of the respective measures. Consequently, the simplest aggregation of the indicators comprising each of the indices is an arithmetic mean. Punctilious analysts might argue that the effect of particular elements might be more significant than those of others, in terms of their impact on the extent of revenue orientation. However, in the absence of statistically significant measures of the relative magnitudes of such impacts, the best (in the sense of least biased) weights may be uniform ones. The rationale for the components of the index is as follows:

1. The two sets of numbers for a state electricity system that are relatively reliable and robust are the number of electricity units input in the system and the actual cash collected. The best portmanteau measure, by definition, to capture this is ATC loss, which is measured as a percentage of energy units input.
2. The next measure is collection efficiency, which although a component of the ATC loss, provides a measure of the effectiveness of energy audits, metering, and billing processes. Collection efficiency is being included separately to reinforce the importance of ATC loss reduction, and to emphasize the importance of this step within it since it is probably less likely to be susceptible to political and administrative imperatives that characterize a large part of ATC losses. The measure has to be interpreted a little carefully, since annual changes in the ratio can be exaggerated by collecting arrears from previous years; however, the movement over a period of four years is likely to mitigate this distortion.
3. The ARR is in some sense the summary outcome measure of revenue *orientation*, with the others contributing to improvement (or deterioration) in the ARR. Reduction of the gap between the ACS and the ARR is the basic objective of reforms in the power sector.
4. While overall ARR needs to move toward ACS, so that the system's losses are brought down, this should generally not be the result of tariffs for industry and commercial segments becoming prohibitively high, consequently leading to business uncompetitiveness and exit from the grid.
5. The last measure is demand load management. From a business perspective, increased focus on enhancing the share of paying customers in comparison to those on which the utility incurs a loss is desirable.

There are some obvious limitations in the construction of such an index. The choice of metrics constituting the index involves a degree of ambiguity in the separation, an inevitable degree of double counting inherent not just in the separation of the metrics but also in the nature of the variables used as constituents of the index. For instance, there is a degree of overlap between ATC losses and collection efficiency, and consequently a problem akin to collinearity.

Keeping in mind the caveats, figure 6 allows us to draw the following inferences. In line with our observations regarding the change in the state (and discom)-wise cash losses/profits positions, the spread between utilities

FIGURE 6. Index of Revenue Orientation



Source: Computed by the authors.
Note: The utilities are arranged in descending order of revenue orientation in 2004–05.

has opened out in 2004–05, compared to the situation in 2001–02. While the average index value increased from 1.14 in 2001–02 to 1.3 in 2004–05, the associated standard deviation also increased from 0.9 to 1.2. In other words, utilities had a much more homogenous ordering of revenue orientation in 2001–02 than in 2004–05. The strongest influences on extreme ends of the rankings in the IRO are those of the ratio of subsidizing to subsidized segments. The next important variable was the ATC loss level. There does not seem to be a systematic pattern in the middle range of the IRO rankings.

Most utilities have improved their performance (and orientation), some significantly. The most notable of these were Rajasthan Jodhpur, AP Central, Delhi North, Orissa West, and Orissa North. Among the utilities that had contributed the most to cash losses, UP and Bihar show a substantial deterioration of their revenue orientation, which had been poor to begin with. Some others, also with high losses, for example, Jharkhand and Orissa Central, have shown a significant deterioration in orientation. The index, therefore, reflects the popular perception of the utilities that have improved and those that are perceived to have deteriorated significantly.

Some other generalizations are also possible. First, there is a significant variation between the rankings of individual utilities within a state. Stating, for instance, that Andhra Pradesh has done well as opposed to, say, Haryana, masks the differential performance of the utilities within this. Haryana South has a higher ranking than AP North and Karnataka Hubli has done much worse than the Bangalore circle. Second, most of the utilities that had been privatized have done fairly well and have improved. Of course, some utilities that had been privatized are still not performing well; Orissa South, for instance, is not just relatively low on the scale, but has also deteriorated since 2001–02. At the same time, other utilities have improved as much or more than those privatized.

The states that have qualified for the incentive component of APDRP are spread along the entire spectrum of the index, but are grouped along the upper deciles of utilities in terms of the improvements in their rankings over the four-year window. The picture among those that were privatized is less uniform, and shows a higher dispersion in terms of their ranking in the index as well as improvement.

Finally, we find that the IRO is relatively robust to alternative transformations of the input data, designed to induce scale-invariance. While there are some transitions in rankings of the utilities in the middle depending on the method adopted, the rankings of the outlying utilities remain unchanged. In other words, while noise levels and effects of "omitted variables" might

influence the middle orderings (which result from small variations around the averages of the outcome values), signals of "Revenue Orientation" of utilities at either end of the rankings are strong enough to dominate the noise.

Conclusion

Following a series of policy interventions instituted after a default crisis in the power sector around 2000–01, the rot in the power sector has been stemmed. The financial situation of the sector has eased and state government subsidy as a ratio to GDP has declined. The sector, nevertheless, is still far from financial viability. Aggregate technical and commercial losses, while having dipped slightly from the 2000–01 crisis levels, have remained stubbornly high. A source of fiscal vulnerability emanates from demand for increased supply of power at below cost to rural areas that could come about on account of the politically important flagship rural electrification scheme of the Central Government to expand the distribution network. The rate of return on capital is reported to have deteriorated in 2006–07. Shortages in many states have worsened over the past couple of years, and supply reliability and quality of power delivered have declined. Industries and commercial enterprises have had to invest heavily in high-cost captive generating capacity, which undermines business competitiveness. Investments in upgrading, improving, and renovation and modernization in wires, transformers, and feeders have been reported to be inadequate, let alone large investments in new generating capacity. Moreover, many of the indicators, after having improved significantly in the immediate aftermath of the reform measures, seem to have plateaued after 2003–04.

The basic problem is that although the sector at an all-India level is expected to have made a small cash profit in 2005–06, there are simply not enough resources in the state government-owned system to add capacity on any appreciable scale, let alone that which is required to power India's economic growth. (The cash profit, of course, does not capture the burden of principal repayments.) By and large, it is likely that there will be incremental improvement in many metrics of performance in utilities over the next couple of years. These, unfortunately, will not be close to those levels required for meeting the soaring demand for energy. There is limited likelihood of fresh lending to the sector on account of poor debt service coverage ratios. Utilities will need to generate vastly higher cash flows to attract significant investments in generation and transmission, which are unlikely

to be forthcoming if there are no major improvements in the variables discussed in the paper.

Five years into the reform effort, we believe that it is time to take stock of the effectiveness of reform measures. If significant change is needed in the reform process to speed up restructuring, an understanding of deep cause-and-effect relationships between inputs and outcomes is critical. Important motivations for the paper were to examine improvements in revenues and cash flows of utilities, delve into the underlying causal factors and then map these factors into a composite metric of commercial orientation; this allows a ranking of utilities on the basis of this quantified metric. We believe that this orientation is the key to inferring the long-term outcomes of the reform steps.

Beyond a point, it is not very meaningful to talk of the power sector as a monolith in terms of commercial and financial viability. Variability in outcomes (and in many of the underlying explanatory variables) has increased after the reform measures; the dispersion was much lower in 2001–02. Some states have improved significantly, some have deteriorated sharply. Five utilities contribute 80 percent of the total cash losses and another five 78 percent of cash profits.

What does this entail for policy? Different utilities have placed emphasis on different strategies for enhancing revenues. Fragmented information indicates that there is progress in many of the basic inputs of utilities. These, however, do not seem to be rapidly translating into higher revenues and cash flows, which would presumably have happened more swiftly had there been a more widespread focus on the top line. The unevenness in performance between discoms warrants granularity in tariff setting, that is, at the level of a discom (rather than at the state), or, even distribution circle and city, which would only be fair to honest consumers (they would attract reliable suppliers because they are paying their bills, and lower tariffs if ATC losses are lower in a particular area). One of the showpiece reform initiatives, the APDRP, has patently had limited success in attaining the objectives for which it was initially established. The variation in improvement in different states is also a warning sign of the increasing disparities in the ability of states to attract investments and foster growth.

The objectives of revenue and cash flow enhancement are likely to improve faster and more consistently if market structures and incentive signals are designed to make utility actions more consistent with these objectives. Deeper reforms are needed to advance these two objectives. These structures and signals are, in turn, synonymous with *inter alia* competition and private (as opposed to state) ownership.

While the data in the paper shows evidence of only a weak relationship between ownership and profitability, it is important to bear in mind that the more successful subset amongst the discoms which have been privatized (that is, Delhi) is a relatively nascent experiment, which has still managed to outperform many of its more mature peer utilities, while having started from a more disadvantaged initial condition. Private utilities have also come out relatively better in terms of one of the key indicators of revenue orientation, that is, ACS–ARR gap reduction.

The other measure of a competitive market structure, the ability of the most efficient generators of electricity being allowed to sell power to the most creditworthy customers has been a non-starter in the context of the prevalent single-buyer model. This is a hypothesis that cannot, as of now, be validated by data, since states have not implemented the policy in an effective manner.

APPENDIX

Appendix 1: Data Appendix: Rationale for Inclusion and Exclusion of Utilities for Computation of the Different Metrics

The paper, using data in PFC (2005; 2006), has included the following states (and the associated utilities) in its analysis: Andhra Pradesh, Bihar, Chhattisgarh, Delhi, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. On occasion, there might be other states like Assam, Goa, Jammu and Kashmir, and Uttaranchal included, but this is usually limited to those analyses where only one metric is involved. These states together accounted for 86 percent of the total units of power sold in 2004–05. Some states were excluded due to missing data for the relevant periods.

Also note that while most indicators using multiple metrics use data from 2001–02 to 2004–05, some utilities do not provide the complete data series. In such instances, we have used the starting year of 2002–03. Occasionally, some utilities have not released data for 2004–05. If the relevant data point was available for 2001–02, we have used the last available data point for 2003–04 in these cases. If none of these end-point data were available, the utility was omitted [for example, Delhi Rajdhani and Delhi Yamuna in the Index of Revenue Orientation (IRO)].

Another aspect to keep in mind is that the electricity boards of some states were unbundled during the period of investigation (Delhi, Karnataka, and Uttar Pradesh). Data for relevant parameters are for the entire electricity system for the initial years, but for only the unbundled discoms for the later years. Although the contribution of these segments to the overall indicators is often relatively small, the resulting discrepancy should be kept in mind. A final point to note is that comparisons between the figures (and the associated datasets) across sections of the paper may not be entirely valid. Various definitions of revenues and profits have been used in the respective sections, depending upon the context of the analysis in that particular section.

TABLE A-1. Mapping of Formal Discom Name to Our Nomenclature

State	*Official name*	*Name used in text*
Andhra Pradesh	APCPDCL	AP Central
Andhra Pradesh	APEPDCL	AP East
Andhra Pradesh	APNPDCL	AP North
Andhra Pradesh	APSPDCL	AP South
Delhi	BSES Rajdhani	Delhi Rajdhani
Delhi	BSES Yamuna	Delhi Yamuna
Delhi	NDPL	Delhi North
Haryana	DHBVNL	Haryana South
Haryana	UHBVNL	Haryana North
Karnataka	BESCOM	Karnataka Bangalore
Karnataka	GESCOM	Karnataka Gulbarga
Karnataka	HESCOM	Karnataka Hubli
Karnataka	MESCOM	Karnataka Mangalore
Madhya Pradesh	Poorva KVVCL	MP East
Madhya Pradesh	Pashchim KVVCL	MP West
Madhya Pradesh	Madhya KVVCL	MP Central
Orissa	CESCO	Orissa Central
Orissa	NESCO	Orissa North
Orissa	SESCO	Orissa South
Orissa	WESCO	Orissa West
Rajasthan	AVVNL	Rajasthan Ajmer
Rajasthan	JDVVNL	Rajasthan Jodhpur
Rajasthan	JVVNL	Rajasthan Jaipur
Uttar Pradesh	Dakhinachal VVN	UP South
Uttar Pradesh	Madhyanchal VVN	UP Central
Uttar Pradesh	Pashchim VVN	UP West
Uttar Pradesh	Poorvanchal VVN	UP East

Source: Authors.

Appendix 2

TABLE A-2. Status of Reforms in 24 States as on End-March 2006

	MoU/MoA signed with ministry of power, GoI	*State electricity board unbundled*	*Constitution of state electricity regulatory commission (SERC)*	*Tariff/ARR order passed*	*Others*
Andhra Pradesh	Yes	Yes	Yes	Yes	Anti-theft law passed, strategy for privatizing distribution is being finalized
Assam	Yes	Yes	Yes	Yes	–
Bihar	Yes	No, extension sought	Yes	–	Anti-theft law passed
Chhattisgarh	Yes	No, extension sought	Yes	Yes	–
Goa	Yes	No, only Electricity Department	Yes (non-functional)	–	–
Gujarat	Yes	Yes	Yes	Yes	Anti-theft law passed
Haryana	Yes	Yes	Yes	Yes	–
Himachal Pradesh	Yes	No, extension sought	Yes	Yes	–
Jammu and Kashmir	Yes	No, only Electricity Department	Yes (non-functional)	–	–
Jharkhand	Yes	No, extension sought	Yes	Yes	–
Karnataka	Yes	Yes	Yes	Yes	Anti-theft law passed
Kerala	Yes	No, extension sought	Yes	Yes	Anti-theft law passed
Madhya Pradesh	Yes	Yes	Yes	Yes	Anti-theft law passed
Maharashtra	Yes	Yes	Yes	Yes	Anti-theft law passed

(Table A-2 continued)

(Table A-2 continued)

	MoU/MoA signed with ministry of power, GoI	*State electricity board unbundled*	*Constitution of State electricity regulatory commission (SERC)*	*Tariff/ARR order passed*	*Others*
Meghalaya	Yes	No, extension sought	Yes (non-functional)	–	–
Orissa	Yes	Yes	Yes	Yes	Distribution privatized
Punjab	Yes	No, extension sought	Yes	Yes	–
Rajasthan	Yes	Yes	Yes	Yes	–
Tamil Nadu	Yes	No, extension sought	Yes	Yes	–
Tripura	Yes	Yes	Yes	Yes	–
Uttaranchal	Yes	Yes	Yes	Yes	–
Uttar Pradesh	Yes	Yes	Yes	Yes	Anti-theft law passed
West Bengal	Yes	No, extension sought	Yes	Yes	Anti-theft law passed
NCT Delhi	Yes	Yes	Yes	Yes	Distribution privatized

Source: *State Finances, a study of budgets of 2006–07*, RBI.

Appendix 3

TABLE A-3. Metering Status, 2005–06

	11 Kv feeders			*Distribution transformers*			*Consumer connections*		
	No.	*Metered*	*%*	*No.*	*Metered*	*%*	*No.*	*Metered*	*%*
Andhra Pradesh	9,239	8,674	94%	351,751	38,729	11%	15,746	15,047	96%
Assam	709	709	100%	21,980	1,528	7%	1,274	1,209	95%
Bihar	1,125	465	41%	15,000	–	0%	1,250	623	50%
Chhattisgarh	2,030	2,030	100%	42,664	7,012	16%	2,459	1,696	69%
Delhi	1,850	1,850	100%	8,000	3,500	44%	2,665	2,665	100%
Goa	179	179	100%	3,562	1,781	50%	396	386	97%
Gujarat (GEB)	5,307	5,307	100%	236,632	1,500	1%	7,477	6,957	93%
Guj.(Torrent AEC)	752	266	35%	4,228	4,228	100%	1,264	1,264	100%
Guj. (Torrent SEC)	303	303	100%	2,300	2,300	100%	520	520	100%
Haryana	3,888	3,888	100%	133,364	–	0%	3,917	3,612	92%
Himachal Pradesh	762	727	95%	18,133	16,730	92%	1,747	1,747	100%
Jammu and Kashmir	1,558	1,480	95%	30,015	–	0%	1,000	400	40%
Jharkhand	461	396	86%	16,500	15,000	91%	653	490	75%
Karnataka	4,570	4,570	100%	144,000	34,500	24%	12,889	10,568	82%
Kerala	1,334	1,334	100%	35,442	5,506	16%	7,799	7,799	100%
Medhya Pradesh	5,660	5,660	100%	160,000	3,000	2%	6,492	4,650	72%

(Table A-3 continued)

(Table A-3 continued)

	11 Kv feeders			*Distribution transformers*			*Consumer connections*		
	No.	*Metered*	*%*	*No.*	*Metered*	*%*	*No.*	*Metered*	*%*
Mah. (BEST)	594	0	0%	2,570	0	0%	66,700	66,600	100%
Mah. (MSEB)	6,148	6,148	100%	215,241	52,923	25%	13,532	11,812	87%
Mah. (REL)	600	300	50%	4,067	3,917	96%	2,495	2,495	100%
Manipur	193	40	21%	–	–	–	170	140	82%
Orissa	1,792	1,699	95%	22,000	20,500	93%	2,149	1,745	81%
Punjab	5,928	5,928	100%	217,000	11,660	5%	5,894	5,039	85%
Rajasthan	8,411	8,411	100%	188,170	–	0%	5,845	5,478	94%
Sikkim	115	115	100%	1,370	531	39%	66	61	92%
Tamil Nadu	3,777	3,777	100%	161,092	4,703	3%	17,033	14,813	87%
Uttar Pradesh	8,507	8,507	100%	330,000	6,652	2%	8,806	8,038	91%
Uttaranchal	1,106	1,106	100%	27,681	9,360	34%	1,060	1,004	95%
West Bengal	2,347	2,347	100%	53,420	13,500	25%	5,731	5,670	99%
Chandigarh	174	174	100%	–	–	–	197	197	100%
Total	80,425	77,136	96%	2,449,613	259,730	11%	198,322	183,549	93%

Source: *Powerline*, December 2006, sourced from the Ministry of Power.

Comments and Discussion

Navroz K. Dubash: Although the language of "crisis" is applied to many sectors in contemporary India, the power sector stands out for holding a seemingly permanent position on this list of infamy. The paper by Bhattacharya and Patel provides a useful stock-taking exercise, and an analytical narrative within which to locate the problems besetting the power sector. Perhaps most important, in my view, it focuses attention on the correct part of the sector—the distribution end and in particular mismanagement of distribution. To see why this focus is important, it is worthwhile to briefly locate this paper within the recent past of India's power sector.

The initiation of power sector reform is normally dated to 1991 when the power generation was opened up for private investment. The larger national macroeconomic crisis of the time, international prevailing winds in the direction of increased private investment and decreased state control, and a re-thinking within the electricity fraternity on the inevitability of public monopolies in electricity, all contributed to this shift. A rash MOU signing followed, stimulated in part by attractive incentives and government financial guarantees of various sorts to insulate new players from loss-making SEBs. The MOUs did not, unfortunately, lead to tangible results on the ground; the decade of the 1990s was a decade of low, rather than high, capacity addition. With the benefit of hindsight, given high levels of theft and losses in distribution (although these were to accelerate considerably in the mid–late 1990s), abetted by poor management practices and efficiencies, power sector reform started at the wrong end of the sector. Attracting money into generation in the early 1990s was like pouring water into a bucket that was missing a third or more of its base.

A second wave of reform in the mid-1990s started at the correct end—distribution—with an emphasis on turning over management of distribution to the private sector. Privatization in distribution was first undertaken with World Bank support in Orissa, in what one participant in the process has described as fundamentally a "bankruptcy workout (Dubash, 2001)." The package followed the then prevalent international prescription of unbundling, privatization, and establishment of a regulator. The primary aim was to demonstrate that privatization was feasible even for mis managed and problematic public utilities. The Orissa story has since been mixed at best. After several

years of uneven gains and performance, political questioning, and the withdrawal of one private player, the situation now appears to be improving. At the time, however, the act of privatization appeared to have been viewed as a "silver bullet" solution, with little thought given to whether ownership change was sufficient, or whether ownership change had to be embedded within a larger set of changes in incentives.

The third wave of changes, from the later 1990s onwards, brings us into the period covered by Bhattacharya and Patel. There was a major national push for an omnibus and landmark legislation, the Electricity Act 2003 (EA) aimed at encouraging a move toward competitive markets in electricity, accompanied by several Central Government-led efforts to induce more prosaic changes in management and approach, such as the Accelerated Power Sector Development and Reform Programme (APDRP). As the paper describes, despite the Act there has been only limited movement toward competition, and, despite the APDRP, indifferent gains on management reforms.

Fast-forwarding to the present, there is currently a renewed frenzy on generation capacity, with the introduction of "ultra-mega" power plants (the term risks creating a real shortage of adjectival superlatives for future electricity policies). By contrast with the first round of efforts to bring in private investment in generation, these projects are being competitively bid, and promise considerable cost savings, which is an important advance. However, it is important that history should not repeat itself and that attention to the generation side, although necessary, not be read as a substitute for urgent and continued attention to the distribution side, without which the financial health of the sector simply cannot be assured.

This context-setting is needed to fully appreciate both the contribution of Bhattacharya and Patel, and the challenge the authors faced in untangling the trends in the sector. The paper provides a detailed stock-taking of the third wave of reform discussed above, which has not been systematically presented elsewhere. This is a complex history with very many continuously shifting policies and programs, and the authors summarize it neatly. They have also sought to compile relevant data with which to track the performance of the sector, a task that is far harder than it should be. Indeed, to track basic performance parameters requires extracting information from at least three institutions, the Planning Commission, the Power Finance Corporation, and the Central Electricity Authority, and grappling with different conventions and seemingly random changes in them.

Beyond stock-taking, the paper provides an analytical narrative organized around a central theme: there has been considerable divergence in state performance in response to various central schemes, and this divergence has to do with utility rather than state-specific performance. An important

implication of the paper is to re-focus much of the current state-centric research on the utility as the unit of research. The authors back up the narrative with an effort to decompose utility effects into three measures of performance: aggregate technical and commercial losses (ATC), tariff rationalization, and demand composition management.

This decomposition leads into the most ambitious part of the paper: to construct a single index of "revenue orientation" (IRO) of utilities as part of a larger effort to capture "commercial orientation." The need for such an index is illuminating. It suggests that well over a decade into attempts to re-make India's electricity, policy makers still do not have a clear and usable metric with which to evaluate progress. And it suggests that simply looking at the bottomline of utilities has proved to be an insufficient diagnostic, an acknowledgment that should take the debate further in the direction of power sector reform as management change, an argument perhaps most forcefully articulated elsewhere by Joel Ruet (2003).

Accepting the value of an index of this sort, how successful are the authors at constructing a useful and robust index to serve as a sector reform benchmark? I examine this question from three perspectives: construction of the index, its deployment, and the results their efforts yield.

First, on construction, it would have been helpful to see a little more discussion on the pros and cons of different forms the index could have taken, and exploration of alternative specifications. As the authors themselves state, the components of the index do overlap and risk overcounting some dimensions of change. For example, ATC losses overlap with collection efficiency. Moreover, the ATC measure—invented as the core of the bidding process during Delhi's privatization effort—is subject to manipulation that may obfuscate measurement of the change sought to be accomplished.[1] Other components of the index such as demand load management—how well does the utility divert power to subsidizing rather than subsidized consumer categories—risks making a virtue out of a pernicious situation that should be transitional at best. Having provided subsidies in the name of the poor, and having then failed to target them appropriately, the solution mooted is to starve the subsidy receiving class, harming potentially deserving consumers along with the not-so-deserving. Although this measure may be needed in

1. Specifically, as the Prayas Energy Group points out in a study of Delhi reforms, since ATC losses are related to (1-Average Billing Rate), manipulation of the billing rate for different consumer classes can affect ATC. Their study shows that two of Delhi's distribution utilities reported an unlikely average consumption level for the lowest tariff slab (<100 units/month) of almost exactly 100 units over the course of a full year. Such a consumption pattern has the useful (to the utility) effect of reducing ATC, allowing them to meet or exceed their loss reduction target for the year. See Prayas Energy Group, 2006.

the short term, surely this measure does not deserve to be enshrined as a best-practice management objective.

Second, the authors suggest the index is "relatively robust" to alternative transformation of the input data, particularly with respect to the extremes of the index. However, the reader would be better persuaded of the robustness of the index if more details of a few alternative specifications were also provided and discussed.

Third, the authors draw out two major observations from their analysis using the index. The first is that the ability to manage load explains a large part of the difference in performance between extremes in the ranking. This is an interesting observation that signals the sorts of insights that such an exercise can throw up. Exploring the implications a little further than do the authors, the observation suggests that the effectiveness of a utility at squeezing subsid-izing categories matters greatly to revenue performance. Viewed positively, it suggests there is an obvious road available to non-performers. Viewed less positively, the result suggests that a measure that, in my view, should only be transitional accounts for much of the gains, while long-term improvements in underlying performance—bringing down losses, increasing collection efficiencies—have been less productive strategies.

A second observation—that privatized utilities have done well—is less robust, and insufficiently developed. Looking only at the data provided by the authors in figure 6 ranking utilities by their index, it is hard to see the basis for this claim. Of the 28 utilities examined, privatized utilities are spread across the full spectrum, occupying ranks 1, 3, 11, 18, and 21. Of course, what we need to know to further examine the authors' claim is whether the privatized utilities rankings change significantly after privatization, but the authors do not address that specific question.

The final conclusions offered by the authors range from perfectly reasonable suggestions following from the analysis—performance variation across utilities warrants greater granularity in tariff setting—to far-reaching suggestions that do not. In the latter category, the paper concludes on the note that deeper reforms aimed at privatization and competition are required. This is indeed the conventional wisdom. However, the conclusion does not emerge from the analysis, and by simply repeating the conventional wisdom, the authors miss an interesting opportunity to reflect on whether and how their analysis suggests modifications or conditioning of the conventional wisdom. In the remainder of these comments, I take a brief stab at this task, with the intent of contributing to a pragmatic debate on how to move forward with power sector reforms.

Looking first at whether privatization leads to improved performance, the evidence presented in the paper suggests the answer is at most a "maybe." We have evidence of privatized utilities that were stalled for many years in Orissa, those that resulted in consumer dissatisfaction and suspicion of manipulation before increasing performance in Delhi, and those that provided substantial gains almost immediately, also in Delhi. We also have evidence, in Andhra Pradesh, of public utilities that have effected a management turnaround equal or superior to the performance of the best-functioning private utility.

This admittedly thin and anecdotal evidence prompts two observations. First, "commercial orientation," the key attitudinal change the authors wish to measure, may under some circumstances also be achieved under public ownership; privatization is sufficient, but may not be necessary for commercial orientation. Second, once privatized, utilities are indeed keener to make money, but whether they do so in a way that leads to public objectives of loss reduction and consumer service depends on the institutional framework of incentives within which they are embedded. With an ambiguous incentive structure and weak oversight, they may chose instead to manipulate data to project loss reductions where few occurred, as may have occurred in Delhi. These observations are hardly novel and rest on institutionalist literature of various pedigrees that stress incentives over ownership. From this perspective, privatization is not sufficient, and may not be necessary for improved performance.

This is not about, or should not be about, ideological beliefs for or against privatization. The prevailing political economy suggests that privatization has proved to be a tough sell politically, and our institutions have proved to be weak at setting incentives and monitoring. Consequently, although privatization may well be the best way to spur a commercial orientation, creating incentives through robust institutions matters more than ownership at this stage in India's power sector.

Competition, particularly in the form of markets for electricity (as opposed to competitive bidding), forms the second prong of the conventional wisdom. Here the belief in favor of competition among many policy makers, as also the authors, is increasingly out of touch with the global empirical record and intellectual debate.[2] Contrary to the authors' assertion, most countries have not progressed rapidly from wholesale to retail competition. Following the California crisis in the US, for example, states that had competition-oriented

2. These views are based on a collection of papers summarizing experience with electricity reform around the world, published in a special issue of *Economic and Political Weekly* (December 10, 2005), jointly edited by myself and Daljit Singh.

reform on the anvil have pulled back from reform. The staunchly libertarian Cato Institute in the US has called for a return to regulated electricity markets, based on a conclusion that fully unfettered electricity markets are not achievable, in part for political reasons. In the developing world, South Korea, South Africa, and Indonesia are among those countries rapidly backpedalling from creating electricity markets.

The questioning of electricity markets is driven by a growing realization that crafting markets for electricity may be much harder than previously imagined, due to structural factors that have to do with the nature of the commodity. For example, incentives for investment in generation capacity are hard to create in the context of the greater price volatility that electricity markets bring. Side markets or incentives are required for transmission infrastructure and short-term adjustment needs of the system. Meshing these various markets together while maintaining both the short-term technical integrity of the system (ensuring that demand and supply are in equilibrium at all times throughout the grid) and the long-term viability (sufficient investment given the long lag times) is an enormous challenge.

None of this is to state that electricity markets are either impossible or undesirable. But it is to say that they are much harder to construct than was earlier imagined, and their suitability and desirability for developing countries is worth dwelling on in some depth. In India, the electricity competition story is stuck on a political reef—to what extent and how much should buyers of electricity compensate previously monopoly sellers for loss of their cross subsidy component. Assuming this barrier can be crossed, there is a lot of hard work that remains to envision how electricity markets can be constructed and with what likely effects. At minimum, they are unlikely to be the panacea that many hope they will be for India's electricity sector.

If not the conventional wisdom of privatization and competition, then what is the way out? The authors provide some hints when they call, in their conclusion, for an "understanding of deep cause and effect relations between inputs and outcomes." Specifically, devising a sensible way forward requires exploring the pathways and mechanisms through which particular policy reforms may change incentive structures for utilities. I see three types of reform agenda for which pathways need to be spelt out.

First, state governments, aided by the Center, could continue on the path of the past few years, encouraging unbundling, independent regulation, and other elements of the standard package with a presumption that moving toward competition is best. However, as I have discussed above, neither the theory nor the empirics is very clear on how this pathway will unfold.

Second, state governments, and particularly their political leadership, could effectively control the sector, as seems to have happened in Andhra Pradesh in recent years, and actively manage the sector with the use of management incentives, bargains with unions, monitoring systems, and strategic changes such as attracting industrial buyer. Here the pathway is clear—political leadership can enforce the relatively straightforward management changes needed to reduce losses. The tricky part, of course, is supplying the political leadership.

Third, regulators could emerge as an increasingly effective form of discipline to shape incentive structures. Although the authors discount regulators somewhat as "by and large exogenous to the reform efforts of state governments/discoms," regulators offer several viable pathways to reform: as disciplinarians, monitors, and (micro) policy formulators. For example, by scrutinizing power purchase agreements (PPAs) and investments, regulators can keep prices down, buying time and political space for challenging reforms. They can also set management targets and attempt to hold utilities to them, although the track record of regulatory enforcement has been poor. Perhaps most important, regulators are the best way of introducing transparency and external scrutiny to a previously opaque sector. In my view, the regulatory route has received insufficient exploration or backing so far.

The analytical conclusion that follows from this brief discussion is that it is necessary to get into the guts of utility reform through more case studies, and understanding of drivers and pathways. How likely is each of these policy reforms to lead to the desired outcomes? Are there unforeseen detours? This research agenda is an essential complement to the sort of data-driven, aggregate picture-building exercise of index construction.

The policy conclusion is that India is faced with a choice between imperfect competition, imperfect state control, and imperfect forms of independent regulation. Policy formulations will need to be tailored to states based on a balanced assessment of competing imperfections, and without hopes for a silver bullet that will deliver policy makers from the curse of hard choices.

Nirvikar Singh: Saugata Bhattacharya and Urjit Patel (henceforth, BP) have written a very useful paper on the power sector in India. The contributions of the paper include a summary of the reform process in the sector, an assessment of the impacts of reform on individual utilities, and a comparison across different utilities, rather than a state-level comparison. The focus at the firm level allows for a detailed consideration of quantitative performance and outcome measures, including technical efficiency, allocative efficiency, and

commercial viability. Given the complexities of the data and the institutional idiosyncrasies of the different components of the power sector, the BP analysis marks an important step forward in furthering our understanding of what has been accomplished, as well as isolating where further analysis may be required, in order to guide future policy decisions. This comment first reviews the contributions of the paper, then examines the robustness of a major analytical tool that is developed there—the IRO—and finally discusses issues of political economy, reform paths, and what else we need to know about power sector reform in India.

It is generally agreed that electric power represents a major constraint on Indian growth. As documented in the BP paper, additions to generating capacity have not met targets and have fallen far short of the requirements of a rapidly growing economy. In practice, industrial and household consumers of electric power resort to self-generation, which is highly inefficient in terms of resources used, being unable to take advantage of economies of scale. Transmission and distribution (T&D) are also subject to severe inefficiencies. Reported T&D losses include illegal diversion of power as well as genuine wastage, but even the former involves inefficiency, allocative rather than technical. The importance of electric power is confirmed by a melding of growth theory and input–output analysis, due to Majumdar and Ossella (1999). They identify the sectors for which exogenous efficiency improvements (reductions in the relevant input coefficients) would have the greatest potential growth impacts, and "electricity, gas and water supply" is the sector that tops the list for 1989 data. Singh (2007) repeats this exercise with the 1998–99 input–output matrix for India and reaches the same conclusion (table 6). In fact, the growth impact of efficiency gains for the leading sector is more than double that of the next one, making the result even more striking.

TABLE 6. Growth Impact of Increasing Efficiency of Sectors by 5 Percent

Sector	*Relative growth factor*	*Growth rate (base 7 percent)*
Electricity, gas & water supply	1.0108	8.16
Iron, steel and ferro-alloys	1.0049	7.52
Non-ferrous basic metals	1.0037	7.40
Other services	1.0031	7.33
Other transport services	1.0028	7.30
Railway transport services	1.0020	7.21
Coal and lignite	1.0018	7.19
Trade	1.0016	7.17
Miscellaneous manufacturing	1.0016	7.17
Inorganic heavy chemicals	1.0013	7.14

The numerical exercise confirms the urgency of steps that will improve efficiency in the electric power sector, particularly where those efficiency improvements will support commercial viability and hence capacity expansion. The BP paper provides an abundance of detailed analysis of the performance of most of the individual utilities that make up the sector. It is useful to summarize their conclusions to make them stand out. Here is my interpretation of what the analysis tells us, in the form of a list of conclusions:

1. Policy reforms implemented so far have neither spurred new investment nor led to reductions in capacity shortfalls or a major turnaround of the sector.
2. Restructuring of debts has temporarily improved payments.
3. Fiscal incentive schemes (the APDRP and its predecessor) designed to curb losses by state-owned power companies have had limited positive impacts.
4. However, large state government subsidies continue unchecked although they have become somewhat more stable.
5. Operating efficiency and monitoring of operations remain poor.
6. The cash losses of state-owned utilities improved dramatically from 2001–02 to 2002–03, but have registered little improvement thereafter.
7. Collection efficiency has improved over the reform period.
8. The ATC losses remain high for the sector as a whole.
9. There is high variability in the bottomlines of the utility companies and this variability increased in the reform period.
10. The worst performers among the utilities are concentrated in a few states.
11. There are a few examples of significant positive turnarounds among the utilities whose data has been analyzed.

The above list represents the trees of the analysis, but what of the forest? Clearly, reform in the power sector has been a mixed bag. As the authors make clear in their discussion, the often poor outcome of reforms does not discredit the idea of reform but rather its particular manner of implementation. The argument is made that reforms have been fragmentary and incomplete and this has contributed to the lack of broad measurable progress in the performance of the power sector. At the same time, the authors admit that, "[T]here is just not sufficient data to effectively infer causal relationships in an environment where institutional eccentricities are predominant, and structural instability is high." This statement is made in the context of

explaining the failure of attempts at formal econometric analysis of the data. Nevertheless, one can argue that some qualitative or conjectural discussion of causality might have been attempted in the paper: that issue is taken up later in this comment.

Some of the background for teasing out missing causal links might lie in what the paper does not cover. The authors explain very clearly that their scope does not extend to the details (or institutional "microstructure") of the reform process, the operational minutiae of the sector (including engineering and organizational/managerial considerations), specifics of financial restructuring requirements, and the regulatory principles that have, or should have informed the process of reform. Of these dimensions, perhaps the first three are not central to understanding the causal chain connecting policies and performance. The fourth, however, is implicitly implicated in considering the role of market structure in performance. Again, the BP paper hints at some views, and we offer an assessment further on in this piece.

First, consider what is the centerpiece of the BP paper. After marshalling a wealth of data on different dimensions of the performance of individual utilities, the authors create and construct an IRO as a way of capturing overall performance. By comparing IROs across two years, 2002 and 2005, they are able to systematically and transparently assess individual firm performance, as well as overall patterns. While the eleven conclusions listed above do not rely on the IRO, the index, as it should, provides a summary measure incorporating key aspects of performance. The IRO is defined by BP as follows:

$$\begin{aligned}\text{IRO} = {} & (1 - \text{ATC losses}) + \text{Collection Efficiency} \\ & + (\text{ARR} - \text{ACS}) + (\text{Industry ACS} - \text{ARR}) \\ & + \text{Ratio of subsidizing to subsidized segments}\end{aligned}$$

Here ARR stands for annual revenue requirement, and ACS for average cost of supply. As explained in the paper, the National Tariff Policy requires that utilities should file an ARR to the relevant State Electricity Regulatory Commission to initiate any process of tariff revision. BP provide an extensive discussion of the rationale for the components, as well as the weighting scheme, so that will not be repeated here. They do note issues of overlap or collinearity between components such as ATC losses and collection efficiency. In the absence of any strong theoretical rationale, the best way to check the reliability of the IRO is to perform a sensitivity analysis. To guide this analysis, one can examine the correlations between the IRO and its components (table 7). The calculations reported in the table show that the subsidizing ratio actually dominates the IRO, having a correlation with the index of 0.89 in 2002 and 0.84 in 2005. Most of the correlations between individual

TABLE 7. Correlation Matrix: IRO and Components

2002	*1-ATC loss levels*	*Collection efficiency*	*ARR-ACS gap*	*Industry ACS minus ARR*	*Subsidizing ratio*	*IRO*
1-ATC loss levels		0.73	–0.07	0.18	–0.16	0.17
Collection efficiency			0.13	0.10	0.07	0.37
ARR-ACS gap				-0.46	0.35	0.47
Industry ACS minus ARR					0.28	0.41
Subsidizing ratio						0.89
2005						
1-ATC loss levels		0.62	0.71	–0.17	–0.05	0.43
Collection efficiency			0.54	0.04	0.20	0.57
ARR-ACS gap				–0.31	0.25	0.65
Industry ACS minus ARR					0.41	0.34
Subsidizing ratio						0.84

components are stable across the two years, and not too high. Exceptions to the stability are the correlations of the ARR–ACS gap with ATC losses and with collection efficiency. These correlations are much higher in 2005, consistent with the authors' observation that utilities with large ARR–ACS gaps were far more likely to have deteriorated over the 2002–05 period, with this relationship being among the strongest that they identified.

The numbers in table 7 suggest that one should investigate the sensitivity of the IRO to lowering the weight on the subsidizing ratio. A weight of one-half seems to be a reasonable alternative to explore. A broader issue arises from the fact that the components of the IRO have somewhat different scales, and their spreads in the sample are quite different as well. This is not necessarily a problem, since variability in a component ought to be reflected in the overall index, but one can also explore robustness of the BP index by normalizing the components in each sample. In a sense, this overdoes the correction, but again, it provides a good robustness check.

The two alternative indices are defined as follows, where m is the mean and s the standard deviation for the respective component:

$$\begin{aligned}\text{IRO1} = {} & [(1 - \text{AT\&C losses}) - m]/s + [\text{Collection Efficiency} - m]/s \\ & + [(\text{ARR} - \text{ACS}) - m]/ + [(\text{Industry ACS} - \text{ARR}) - m]/s \\ & + [\text{Ratio of subsidizing to subsidized segments} - m]/s\end{aligned}$$

$$\begin{aligned}\text{IRO2} = {} & (1 - \text{AT\&C losses}) + \text{Collection Efficiency} \\ & + (\text{ARR} - \text{ACS}) + (\text{Industry ACS} - \text{ARR}) \\ & + 0.5*\text{Ratio of subsidizing to subsidized segments}\end{aligned}$$

Since neither alternative changes the correlations among individual components, table 8 reports only the correlations of the components with the alternative indices, IRO1 and IRO2. As noted, neither alternative is itself inherently superior, but the correlations of the components with the index appear to be more balanced in each case. The main implication and robustness check comes from examining the IRO ranking (levels are not comparable across the alternatives). Table 9 summarizes the rankings for all the cases.

TABLE 8. Correlations of Alternative IROs and Components

	IRO1 2002	*IRO1 2005*	*IRO2 2002*	*IRO2 2005*
1-ATC loss levels	0.62	0.68	0.31	0.58
Collection efficiency	0.75	0.78	0.48	0.68
ARR-ACS gap	0.35	0.71	0.49	0.76
Industry ACS minus ARR	0.41	0.31	0.44	0.29
Subsidizing ratio	0.57	0.59	0.77	0.70

Source: Computed by the author.

In table 9, utilities that move four places or more in the rankings as a result of changing the index are highlighted—bold for those moving down, italics for those moving up. The numbers of these are reassuringly small. For the first alternative, out of thirty-one utilities, there are six sharp movers in 2002, and only two in 2005. For the second alternative index, the sensitive cases are even fewer, two and zero in 2002 and 2005, respectively. The conclusion is that the BP IRO index is quite robust, at least in these samples, to variation in its construction. It is also noteworthy that almost all the sensitive cases are away from the extremes of the rankings.

With the reassurance of the sensitivity analysis, one can use the IRO to examine some of the patterns in utility performance over time. The authors note the improvement in the average index, together with greater dispersion among the utilities, from 2002 to 2005. An important observation is the variation in performance among utilities serving the same state, emphasizing the need to go below state-level indicators of performance. The authors also argue that privatized utilities have done fairly well on average, though at the same time there are privatized utilities that have done poorly, and state-owned firms that have done well. The qualification for APDRP incentives seems to be associated with relatively good performance on an average for utilities in the qualified states, but the incentive payments have been small, as the authors note, so the driving forces for performance may lie elsewhere, in regulatory, managerial or political factors.

The rationale for focusing on the IRO comes from the context of the power sector in India—with lack of capacity, inefficiency, and financial

TABLE 9. Alternative IRO Rankings

2002 (BP)	*2002 IRO1*	*2002 IRO2*	*2005 (BP)*	*2005 IRO1*	*2005 IRO2*
Himachal Pradesh	Himachal Pradesh	Himachal Pradesh	Orissa WESCO	Orissa WESCO	Orissa WESCO
Jharkhand	AP East	Chhattisgarh	Himachal Pradesh	Himachal Pradesh	Himachal Pradesh
Chhattisgarh	Chhattisgarh	Jharkhand	Orissa NESCO	Maharashtra	Maharashtra
Orissa WESCO	Punjab	AP East	Maharashtra	AP East	AP East
AP East	Orissa WESCO	Orissa CESCO	West Bengal	West Bengal	**Orissa NESCO**
Orissa CESCO	Kerala	Orissa WESCO	AP East	Tamil Nadu	West Bengal
Punjab	Orissa CESCO	Punjab	Kerala	Punjab	Kerala
Orissa NESCO	*Tamil Nadu*	Kerala	Tamil Nadu	Orissa NESCO	Tamil Nadu
Kerala	West Bengal	Maharashtra	Chhattisgarh	Kerala	Punjab
Maharashtra	**Jharkhand**	Orissa NESCO	Punjab	*AP Central*	Delhi North
West Bengal	Gujarat	Tamil Nadu	Delhi North	Delhi North	AP Central
Tamil Nadu	**Orissa NESCO**	Orissa SESCO	AP Central	*AP South*	Chhattisgarh
Orissa SESCO	Orissa SESCO	West Bengal	Rajasthan Jaipur	Karnataka Bangalore	Karnataka Bangalore
Rajasthan Ajmer	*AP South*	Rajasthan Ajmer	Karnataka Bangalore	Gujarat	AP South
Karnataka Bangalore	Maharashtra	Karnataka Bangalore	Gujarat	Rajasthan Jaipur	Rajasthan Jaipur
Rajasthan Jaipur	Karnataka Bangalore	Gujarat	AP South	Chhattisgarh	Gujarat
Delhi North	*AP Central*	AP South	Rajasthan Jodhpur	Orissa SESCO	Orissa SESCO
Gujarat	Haryana South	Rajasthan Jaipur	Orissa SESCO	Rajasthan Jodhpur	Rajasthan Jodhpur
Madhya Pradesh	Rajasthan Ajmer	Madhya Pradesh	Rajasthan Ajmer	Haryana South	Rajasthan Ajmer
AP South	Madhya Pradesh	Haryana South	Haryana South	AP North	Haryana South
Haryana South	AP North	**Delhi North**	Orissa CESCO	Rajasthan Ajmer	AP North
AP Central	**Delhi North**	AP Central	Jharkhand	Haryana North	Orissa CESCO
Haryana North	Haryana North	Haryana North	AP North	Madhya Pradesh	Madhya Pradesh
Uttar Pradesh	Uttar Pradesh	Uttar Pradesh	Madhya Pradesh	Jharkhand	Haryana North
AP North	Rajasthan Jaipur	AP North	Haryana North	Karnataka Hubli	Jharkhand
Rajasthan Jodhpur	Karnataka Hubli	Karnataka Hubli	Uttar Pradesh	Uttar Pradesh	Uttar Pradesh
Karnataka Hubli	Rajasthan Jodhpur	Rajasthan Jodhpur	Karnataka Hubli	**Orissa CESCO**	Karnataka Hubli
Bihar	Bihar	Bihar	Bihar	Bihar	Bihar

weakness, all contributing to the sector's acting as a constraint on growth. As the BP paper emphasizes, large-scale new investments in capacity will require a significant improvement in the financial performance of India's utility companies. The authors argue that the incentive structure facing the utilities still does not drive their actions sufficiently toward revenue and cash flow enhancement. The reforms they call for in the paper are greater private ownership and more competitive market structures.

Ultimately, however, the case for reforms of this nature requires attention to the factors that the paper skates over, for reasons of scope and space. One feature of power sector reform that implicitly emerges from the paper is the fragmentation of regulation in the sector, its conceptual lack of clarity, and the shadow of political interference. The broader political economy issues, which include distortion of decision making in state-owned enterprises, as well as regulatory distortion, are alluded to at several points in the paper. However, they are not tied in to the variation in the IRO across utilities. While this connection may not be amenable to a quantitative analysis, it seems that the poor performance of utilities in states such as Bihar and Uttar Pradesh, as measured by the IRO, is attributable to the political economy of these states, just as is their overall poor economic performance.

It is plausible that private ownership would reduce politically induced distortions, but the latter may occur even after privatization, which may not break the nexus of managers, regulators, and politicians.[3] In this context, it would have been useful to have more insight into the reasons why "different utilities have placed emphasis on different strategies for enhancing revenues." Has this variation been due to structural differences (for example, the mix of user segments) or differences in regulation or political influence? In particular, one might conjecture that "institutional eccentricities" at the level of operations of utilities, or in state-level regulatory bodies, can be traced to political economy factors. If so, a case may emerge for a package of reforms that include regulatory reform (Wolak, 2006) as well as ownership changes.

The approach to regulatory reform would, therefore, have to be one that delinks utility regulation from broader political economy factors. Certainly, the authors document that utilities that started out in the worst situations had the worst subsequent performance: "Although the distribution of utilities at

3. Nevertheless, the authors do provide evidence that ownership changes can help. For example, they note that "The performance [in achieving cash profits in 2004–05] of the six privately-owned discoms (in Delhi and Orissa) was all the more remarkable since they did not receive (direct) subsidies from their respective governments in 2004–05; despite this, four of them made profits in 2004–05, which amounted to 41 percent of the profits of the unbundled discoms and 4 percent of total profits."

various loss levels seems more or less random, high loss ones (i.e., those with losses above 50 percent) seem to have predominantly deteriorated. Among the others, though, a dominant majority have reduced their losses." Furthermore, they note that "Utilities with a large [ACS–ARR] gap were far more likely to have deteriorated over the four reference years …; this relationship seems to be among the strongest that we have found. On the other hand, those with the lowest gap in 2004–05 have managed a loss reduction on average."[4]

The claim I make here is that political economy factors may be the explanation for the poor initial conditions as well as the failure to register improvement, in a subset of utilities. The location of these utilities in states that have been laggards in overall economic reform and economic performance is consistent with this claim. Even within a state differences may be traced to aspects of political economy. For example, the cross-subsidization that occurs between industrial/urban users and agricultural/rural users is driven by political compulsions, and limits to manipulating the demand composition can differentially affect different regions within a state: Karnataka-Hubli's poor performance relative to other Karnataka utilities may be partially traced to this factor.[5] A more systematic analysis of the linkages going from economic structure and political constraints to utility performance would clearly be beneficial.

An important answer to problems of collusion and political influence is to rely on competitive markets as disciplining devices. The BP paper calls for this solution. Certainly, competition in power markets is feasible, as the experience in several other countries has demonstrated. However, the international experience also illustrates that power markets can be manipulated,[6] and that regulation has to be well designed and effectively implemented to enforce competition in power markets. The authors rightly point out the obstacles to competitive markets imposed by current tariff structures,[7] and they note the political economy constraints inherent in cross-subsidy regimes of state-owned monopolies. If this is the case, then regulators have to

4. See the authors' figures 4 and 5 for respective illustrations of the two quoted statements.

5. See the authors' figures 5 and 6.

6. It is also worth noting that industrialized countries' reform efforts began from situations where electric utilities were financially viable and tariffs were thought to be too high—competition was seen as a way of bringing down prices. In the Indian case, substantial fractions of users are heavily subsidized, even paying nothing for power.

7. For example, the authors point out that "The magnitude of wheeling charges and cross-subsidy surcharges has *de facto* made open access unviable. Maharashtra is probably the only state where the surcharge formula allows for the possibility of open access sales to be remunerative."

be change agents; as suggested in the paper the authors note that this sequence from agenda setting and discussion to implementation was relatively successfully accomplished by the telecommunications regulatory body in India. The precondition for greater competition in power markets, therefore, may have to be more effective regulation (Wolak, 2006).[8] In fact, some might argue that attracting investment in the sector will require restraining com-petition to some extent, to allow attractive rates of return. However, this would still leave the door open to rent-seeking and inefficiency of operations.

In fact, one should be careful to disentangle different aspects of reform. Certainly, little can be achieved in the power sector without effective regulation. A key issue that remains unanswered in analyses such as that of Wolak (2006) is how to construct a politically feasible path to well-functioning regulatory institutions. The complications created by the federal dimensions of responsibility with respect to the power sector (making regulation much more challenging than in telecommunications, for example) have been noted by several analysts.[9] However, even if the Central Government cannot impose its will on state regulators, it can play a more assertive role in establishing and disseminating best practices in regulation—as the authors discuss briefly, there are a host of complex technical issues in the power sector, throughout the supply chain, which interact with economic considerations.

The need for a clear, conceptually sound regulatory framework has perhaps not been fully appreciated by the government.[10] Two facets of regulation, which have been areas of more general weakness in regulatory reform in India, are worth stressing. The first is the need for as much independence as possible for the regulators: this has been difficult to achieve in practice because of the reluctance of ministries (whether bureaucrats or politicians) to give up influence: this is yet another aspect of the political economy factors at work. The second is the need for wider and more detailed academic inputs into the regulatory process. The paper under discussion makes an important contribution in this respect.

8. Wolak (2006) is very categorical on this point, stating that "My analysis of the current situation in the Indian electricity supply industry demonstrates that the potential benefits to the Indian economy from establishing an effective regulatory process swamp the short-term and medium-term benefits of introducing a competitive wholesale electricity market." One implicit argument is that the kinds of tariff anomalies that are inimical to competitive efficiency (see previous footnote) can and need to be addressed in the regulatory sphere, whether or not there are markets with bidding for power.

9. See Singh and Srinivasan (2005) and references therein.

10. For example, a long, detailed account of power sector reform by the then seniormost bureaucrat in the power ministry (Shahi, 2006) gives short shrift to regulatory issues such as the details of tariff-setting.

Given the importance and priority of regulatory reform and institution building, one should not underestimate the benefits of privatization. Even though the empirical evidence on this point presented by BP is somewhat limited, one can argue from first principles that moving toward private ownership is necessary, simply to reduce politically-induced distortions, even before any gains from greater competition are realized. Certainly, competition must remain an ultimate goal, but the lessons of experience elsewhere suggest that designing and running competitive power markets can be tricky, and needs setting the stage carefully.

All the latter issues we have discussed are somewhat outside the avowed scope of the BP paper, which successfully seeks to answer the question, "How well has electric power reform worked in India?" The authors have marshaled a vast amount of data, and filtered and analyzed it in a manner that gives a clear picture of the recent performance of utility companies in the country, though only hints as to the underlying causal factors. Clearly, some kinds of reforms already implemented have had limited impacts on commercial orientation and financial performance. However, other reforms that have not been tried in India cannot be assessed using Indian data—only international experience, not assessed in this paper, can provide any kind of guide. The paper, therefore, leaves a gap between the assessment of the current position of utilities and the broad direction of policy reform that is called for by the authors. Mapping out a feasible path of reform for the power sector remains to be done.[11] Nevertheless, this paper is an important analytical and empirical contribution. It uncovers for the first time details of changes in structure and performance over time, and variation in performance across individual utilities. It also provides a significant new quantitative index to measure financial orientation and performance of the utilities.

General Discussion

T. N. Srinivasan began by asking if the paper considered why electricity subsidy was being rationalized as an instrument of poverty reduction. Without appropriate pricing of electricity, no reform in the sector was going to be sustained over the long run. He also questioned periodic debt reduction schemes that effectively amounted to loan write-offs.

Another participant stated from the floor that the mafia is often behind electricity theft. It steals from the distribution lines and sells to the poor who

11. Wolak (2006) makes an important start, but without fully getting to grips with political economy constraints that must be dealt with.

do not have access to electricity otherwise. The participant asked whether the NSS (National Sample Survey) data were good enough to glean the information on how much the poor were spending on electricity informally or formally. There have been a number of studies of privatization of electricity distribution in Latin America. These do not support the hypothesis that privatization has adverse distributive effects.

Saugata Bhattacharya responded that there had been a number of surveys of willingness to pay and patterns of electricity consumption in rural areas by the World Bank. But there had been no studies of the impact of privatization on income distribution. Agreeing with Srinivasan, Bhattacharya stated that electricity pricing could not be an instrument of targeting income distribution and other social objectives. He added that the analysis in the paper did deal with prices, even if indirectly. The difference between ARR and ACS on which they focus depends on pricing of electricity and demand—load management. He agreed, however, that a more direct measure of tariffs was needed but said it is difficult to get tariff measures across the states.

Turning to inconsistencies between revenue decomposition and the IRO measures noted by Nirvikar Singh, Bhattacharya acknowledged that the measures they use are first pass and further refinements are required. He then pointed out that the revenue decomposition and IRO were meant to measure different aspects of the reform outcomes and were not strictly comparable. He then returned to the issue of privatization discussed by Navroz Dubash. He said that Delhi's privatization was a benchmark case for the process of privatization in India. All the economic, financial, and commercial steps required by a proper privatization process were followed in Delhi. But even then the outcome has been less than satisfactory. Dubash explains the reasons for this in a recent paper. The bottom line is that replacing a public monopoly for private monopoly is not a complete solution for the problem.

Referring to the successes in Andhra Pradesh and Gujarat within public ownership structure, Bhattacharya noted that these seem to have resulted from initiatives by specific individuals at the top. But he expressed a need for deeper, more careful look at the experience in several states. Some four or five reports had appeared in the preceding six months that may shed more light on how successes are being engineered.

Urjit Patel joined the discussion stating that outside of Orissa, which had been poorly designed, privatization of distribution has been a success. In the Delhi privatization, all three of the distribution companies had met all the benchmarks that the regulator had set. The ATC losses had come down from 55 percent to 30 percent. Given the risk of law and order in collecting

dues, this kind of turnaround was commendable. This performance well surpasses that of the public sector companies.

Patel went on to note that the big question regarding the Andhra experience was whether it could be sustained. We had a Chief Minister who was *de facto* CEO of the Electricity Department. Is this going to be sustainable? It may not happen and may not last much longer. And do we really want to turn the Chief Minister into *de facto* CEO of the electricity system? What we need is profit making and high rate of return on capital to drive electricity industry. There is conclusive evidence that private sector distribution companies in India are doing very well and we need to recognize that to take that model forward.

Montek Singh Ahluwalia, as Chair, asked whether the authors were taking the view, espoused by Srinivasan, that privatization is essential for commercial orientation or the alternative view that commercial orientation was possible even without privatization. Patel stood his ground, however, arguing that the real issue was privatization and that the government had decided not to go for it.

Arvind Panagariya raised three issues. First, regarding privatization, he noted that replacing private monopoly for public monopoly may be an improvement but it is not sufficient. The message from telecom sector was that you needed competition through the entry of multiple suppliers of the service. In telecom, the performance of even the public sector supplier, BSNL (Bharat Sanchar Nigam Limited), dramatically improved under competitive pressure from private suppliers. Therefore, from incentives perspective, even if you think that commercial orientation is possible under public ownership, you need private suppliers operating side-by-side.

The second point Panagariya raised related to cross-subsidy whereby industrial customers were charged a higher price to subsidize residential customers. The EA had set a deadline for eliminating this cross-subsidy but the current government had amended the Act to allow the cross-subsidy indefinitely. The authors need to discuss the issue of cross-subsidy. The final point Panagariya raised related to captive plants, which no one had mentioned. Where did these fit in the overall reform process? These plants were not only very costly sources of electricity but also imposed heavy environmental costs. Where did the authors see these plants going in ten to twenty years time? Will these still be there or replaced by cleaner and less costly large-scale suppliers as they should be?

Dubash reminded the group that the paper and discussion seemed to underemphasize regulatory institutions. The option to privatize all distribution circles in the next five years is simply not available. But the option

to strengthen regulation is. This institutional solution needs to be studied and emphasized more than has been the case.

The session concluded with Montek Singh Ahluwalia, the session chair, giving his perspective on the sector. He pointed out that there was improvement on several fronts: grid management had improved; some states were moving toward supplying subsidized electricity to agriculture at night when the marginal cost of supply was lower; most tariff orders had reduced the price difference between industrial and residential customers; and challenges to undue interference by state governments in regulatory matters were receiving backing from the courts. Ahluwalia made the case that even though privatization was not happening, many improvements in the sector were underway and were reflected in gradual reduction in distribution losses, though a great deal remained to be done.

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