India Power Sector Review

More Power to India: The Challenge of Distribution

Sheoli Pargal and Sudeshna Ghosh Banerjee
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### Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>discom</td>
<td>distribution company</td>
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<tr>
<td>EA</td>
<td>Electricity Act</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>kWh</td>
<td>kilowatt hour</td>
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<tr>
<td>MW</td>
<td>Megawatt</td>
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<tr>
<td>RGGVY</td>
<td>Rajiv Gandhi Grameen Vidyutikaran Yojana</td>
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<tr>
<td>SEB</td>
<td>State Electricity Board</td>
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<td>SERC</td>
<td>State Electricity Regulatory Commission</td>
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All amounts are in Indian Rupees unless otherwise indicated. All dollar amounts are in U.S. dollars.

Indian Rupees are converted to dollar amounts using the year specific exchange rates taken from the *World Development Indicators*. 
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Introduction

The government of India has emphasized that an efficient, resilient, and financially robust power sector is essential for growth and poverty reduction (Ministry of Power 2005). Almost all investment-climate surveys point to poor availability and quality of power as critical constraints to commercial and manufacturing activity with implications for national competitiveness. Further, more than 300 million Indians live without electricity, and those with power must cope with unreliable supply, pointing to huge unsatisfied demand and restricted consumer welfare.

This report reviews the evolution of the Indian power sector since the enactment of the landmark Electricity Act (EA) of 2003 with a focus on distribution as key to performance and viability of the sector as a whole. While all three segments of the power sector—generation, transmission, and distribution—are important, revenues ultimately originate with the customer at distribution, so subpar performance there affects the entire value chain. The persistent operational and financial shortcomings of distribution have repeatedly led to central bailouts for the whole sector even though power is a “concurrent” subject under the Indian constitution and distribution is almost entirely under the control of state governments. Ominously, the sharp increase in private investment and market borrowing in recent years has increased the potential for power sector difficulties to spill over to lenders and thus affect the broader financial sector. Government initiated reform efforts initially focused on the generation and transmission segments, reflecting the urgent need for adding capacity and the complexity of issues to be addressed at the consumer interface. Consequently, distribution reforms have lagged behind but now need to be the highest priority for sector improvement efforts going forward. This report analyzes the multiple sources of weakness in distribution and identifies key challenges to improving performance in the short and medium term.

Evolution of Policies and Institutions

India implemented sweeping economic reforms in 1991 following a debilitating balance-of-payments crisis. The state-dominated power sector was inefficient, hamstrung by years of under-maintenance and inadequate investment, and had large financial losses. With only 70,000 megawatts (MW) installed, it was also extremely short of generation capacity. In light of the massive additions to capacity needed to support growth, private sector participation was seen as a necessary complement to public investment. Beginning in 1991 with amendments to the Electricity Supply Act, the sector was opened to private participation in generation. As the economy continued to face crippling power shortages, individual states started restructuring their vertically integrated state electricity boards (SEBs) and establishing state electricity boards.
regulatory commissions (SERCs) under their own state reform legislative initiatives to improve performance (figure 1). The Electricity Regulatory Commission Act of 1998 set up the Central Electricity Regulatory Commission and brought regulatory consistency to the states. Despite these efforts, the commercial performance of state utilities continued to deteriorate, with losses mounting to Rs 250 billion in fiscal 2002 (US$6 billion or 1.5 percent of India’s gross domestic product [GDP]). In 2002, a decade after the opening of the sector, total SEB debt to central public power suppliers had risen to Rs 400 billion (US$8.5 billion), threatening their financial solvency and resulting in a central bailout of the state power utilities.

The EA 2003, responding to these developments, was designed as a forward-looking, pro-competitive policy and institutional framework for developing the power sector. Superseding existing legislation, it de-licensed thermal generation; set timelines for open access to transmission and distribution, providing choice to power procurers and end-users; introduced power trading as a licensed activity to foster competition; and encouraged private sector entry into generation and transmission. Considering that the dismal performance of state utilities reflected internal and external shortfalls in governance, the EA mandated unbundling and corporatizing the SEBs and establishing independent regulators at the central and state levels as well as the Appellate Tribunal, all in order to bring about a more accountable and commercial performance culture. Subsidiary policies that followed laid the groundwork for competitive bulk procurement of power, multiyear tariff frameworks, rural electrification, and renewable energy expansion.

**Impressive Achievements in Many Dimensions**

Bolstered by a sound policy framework and a favorable economic environment, the sector has taken giant strides on many fronts. Generation capacity tripled between 1991 and 2012, bringing installed capacity to 214 gigawatts, boosted by a surge in the share invested by the private sector from 3 to 29 percent (figure 2). Renewable energy generation capacity, both on- and off-grid, increased sharply in response to government incentives such as feed-in tariffs on the generation end and renewable purchase obligations on the distribution end, as
well as renewable energy certificates that have promoted trade in renewables. Starting with 18 MW in 1990, grid-connected capacity rose to 25,856 MW in March 2013—12 percent of total capacity. Off-grid renewable energy capacity stands at 825 MW.

By recognizing trading as a licensed activity; opening entry into generation; permitting multiple distribution licensees; introducing a “smart” transmission tariff to relieve network congestion through point-of-connection pricing; and separating transmission from dispatch, trading, and generation along with open access, the EA has led to the development of an active power market and power exchanges that have eased the entry of latent (captive) capacity into the market. The move from negotiated memorandums of understanding with guaranteed rates of return to investors to market-driven competitive procurement brought forth a huge private response in generation and very low tariff bids (although recent experience indicates that allocating fuel-price risk to bidders may have been unrealistic and is now being adjusted). Subsequently, the shift from feed-in tariffs to reverse auctions underpinned the expansion of solar capacity from 17.8 MW in 2010 to 1,440 MW in 2013 while competitive bidding for projects under the National Solar Mission drove down prices for grid-connected solar energy to as low as Rs 7.49 (US$0.15) per kilowatt-hour (kWh). A state-of-the-art integrated transmission grid that can balance demand and load flows across the country has been realized—with the recent connection of the southern grid, all of India is now synchronously connected in a single grid.

While successes in distribution have been less widespread than those in generation and transmission, a major achievement in this segment has been the sharp increase in access to electricity. Access rose from 59 percent of the population in 2000 to 74 percent in 2010, on the back of an ambitious central scheme—the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY), with the number of new users fairly uniformly distributed across income quintiles (figure 3). The bulk of new consumers were located in rural areas, where electricity access rates jumped 18 percentage points, to 66 percent from 48 percent.

Promising models to obtain efficiencies from private participation in distribution have been developed but need to be scaled up for impact. Globally, private participation has long been considered an effective way of resolving efficiency issues in distribution. In India, the “legacy” private distribution utilities in Kolkata, Mumbai, Surat, and Ahmedabad, with their impressive performance on efficiency and customer service, have been recognized as obvious examples of the potential gains from private participation. They were the inspiration behind the public–private joint ventures in power distribution.

- Between 2000–10, 283 million Indians gained access to electricity.
- The electrification rate rose by 2.4 percent annually between 2000–10.
- Two-thirds of the population without electricity belongs to the bottom 40 percent of the income distribution.
taken forward first in Orissa, with limited impact, then in Delhi (learning from Orissa’s experience) with greater success. Recognizing the limited political space for such “privatization,” the EA 2003 established the concept of “distribution franchises.” Following the success of the Bhiwandi franchise operation in Maharashtra, which demonstrated the considerable efficiencies and reduction in losses that could be achieved, private participation through the franchise route is today being explored in Madhya Pradesh, Maharashtra, and Uttar Pradesh. A push toward rural franchises has also occurred, to help state utilities manage (metering, billing, collection, and operation and maintenance) low-income and low-consumption rural distribution networks, which have expanded under the RGGVY program.

The Agenda for Addressing Distribution Finances Must Now Be a Priority

Despite considerable progress in implementing EA mandates and associated policies over the past decade and lowered physical losses, the distribution segment continues to lose money. Utility finances—critical to realizing sector goals—deteriorated sharply over 2003–11. Power sector after-tax annual losses excluding subsidies came to Rs 618 billion (US$14 billion) in 2011. These losses, equivalent to nearly 17 percent of India’s gross fiscal deficit and around 1 percent of GDP, are overwhelmingly concentrated among distribution companies (discoms) in the unbundled states, and SEBs and power departments in the states that have not unbundled. When subsidies are included (as revenue), recorded losses fall by more than 50 percent to Rs 295 billion (US$6.5 billion). Six states reported profits in 2011, but only three would have reported a profit if subsidies had been excluded: Delhi, Kerala, and West Bengal (figure 4). Total subsidies booked by power sector utilities amounted to Rs 323 billion (US$6.9 billion) in 2011.

Aggregating profits and losses over time, sector-wide accumulated losses stood at Rs 1,146 billion (US$25 billion) in 2011, more than twice the value in 2003 (in real terms). Accumulated
losses grew at a compound annual growth rate of 9 percent in real terms from 2003, though the share of losses relative to GDP remained stable at about 1.3 percent, largely because the economy also grew strongly over this period. Discoms and bundled utilities (SEBs and power departments) are once again the largest contributors to accumulated losses, although their share of the total has fluctuated from 90 percent in 2003 down to 79 percent in 2008, and back up to 86 percent in 2011 (figure 5).

Sector losses have been financed by heavy borrowing by all segments of the value chain. Total sector debt grew to Rs 3.5 trillion (US$77 billion) in 2011, equivalent to 5 percent of India’s GDP. Discoms are responsible for the largest share of this debt (36 percent in 2011), followed by generation companies, including independent power producers. Of great concern is the fact that many discoms have relied on short-term loans to meet operating expenses in recent years: long-term loans declined from 87 percent of total sector borrowing in 2007 to 77 percent in 2011.

Mounting debt and continuing losses have led to a precipitous decline in overall discom creditworthiness—in Uttarakhand, Rajasthan, Meghalaya, and Haryana, power sector debt exceeded 10 percent of state GDP in 2011 (figure 6). Facing the prospect of huge and increasing nonperforming assets and approaching their sector exposure limits, by late 2011 lenders pulled the plug on loss-making utilities. As credit dried up, these discoms were unable to pay for power purchases, with a knock-on effect on upstream (generation) investor sentiment. The absence of alternative buyers for
power has spelled trouble for power generation companies, which are overly dependent on state discoms as customers. This, in turn, has meant a simultaneous slowing of investment in generation, also resulting in difficulties in that segment of the sector as significant funds are locked up in generation projects that have had to be delayed or shelved. Thus, at the end of 2011, just 10 years after being bailed out, the sector was looking at another rescue from the center, four times larger than before.

The 2011 crisis was different from that in 2001 because this time players from outside the power sector and government were involved. Lending by banks and financial institutions to all segments of the sector has implicitly relied on the quasi-guarantee of state governments in the face of known insolvency of discoms, the offtaker and source of revenues for the entire sector. In 2011, about half the sector’s borrowing came from commercial banks. Additional amounts were lent at concessional rates by financial institutions, such as the Power Finance Corporation, the Rural Electrification Corporation, and the Infrastructure Development Finance Company, to bring the total contribution of commercial banks and financial institutions to 86 percent of power-sector borrowing. The flow of liquidity limited the pressure on discoms to improve performance and on state governments to permit tariff increases. It was not until 2011, when banks were directed to stop lending to insolvent utilities, that states reacted to push through tariff increases (Unnikrishnan and Gadgil 2011). Such profligate lending has harmed banks’ capital adequacy and net worth. More than half of 13 major state-owned banks have funded loans to the power sector amounting to 50 percent or more of net worth. At the extreme, the funded exposure of some smaller banks exceeds their net worth, leading to concerns about contagion to the financial sector and possibly other parts of the economy if poor power sector performance leads to difficulties for some or all of these financial institutions.

Thus, two decades after the initiation of reforms, an inefficient, loss-making distribution segment and inadequate and unreliable power supply have become major constraints to India’s aspirations for growth, inclusion, job creation, and middle-income country status. The peak electricity supply deficit today stands at 10.5 percent, and the overall deficit at 7.5 percent. More than 300 million people remain without electricity, and the level of per capita annual consumption, at 780 kWh, is among the lowest in the world (Press Information Bureau 2011). Despite the low tariff bids from competitive procurement, the cost of power purchased by utilities has been increasing. And while the private sector has enthusiastically participated in building power plants, there has been less of an interest in inviting private participation into distribution, where its expertise in raising efficiency is most needed.

Analyzing Operational and Financial Performance of Distribution

Aggregate technical and commercial losses, which measure utility operational and financial performance, have fallen from 38 percent to (a still-high) 26 percent over 2003–11 (figure 7). Aggregate technical and commercial losses consist of distribution losses, which are comprised of physical losses due to both technical and non-technical factors, and losses from collection inefficiency. Distribution losses have dropped from 32 percent in 2003 to an average of approximately 21 percent in 2011. So despite the encouraging trend, utilities have still not been paid for more than one-fifth of the power they...
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purchased and supplied. In 2011, the lowest distribution losses were reported in Kerala, at about 12 percent, similar to international best practice. Andhra Pradesh, Goa, and Punjab also recorded distribution losses of less than 15 percent. While distribution’s contribution to total utility losses has fallen in more than two-thirds of states, performance has deteriorated in nine states, most dramatically in Uttar Pradesh and Orissa.

To understand the relative contribution of different factors to performance, distribution-utility revenue losses can be decomposed as follows (figure 8): losses from under-pricing (average billed tariffs below cost-recovery tariff levels), from under-collection (not collecting the full amount billed), and from physical losses of energy (losses above international norms due to technical reasons or due to non-technical factors, such as theft). In 2011, the absolute amount lost was highest in Tamil Nadu, followed by Rajasthan and Andhra Pradesh; losses in Mizoram, Nagaland, and Manipur, among others, were more than 100 percent of distribution revenues earned.

Collection efficiency has generally remained stable, rising from 89 percent in 2003 to 94 percent in 2011. Most states are above 90 percent, although performance declined in about half the states during 2003–11.

The time taken to collect payments—debtor days—is another operational inefficiency that has contributed, through the collection rate, to the poor financial performance of distribution utilities. Average debtor days have come down from 213 to approximately 170 days in 2011, with the ten best performers averaging 21 days in 2011, but the ten worst—indicating gross mismanagement of cash flow—averaging 489 days.

In 2003, states were, in aggregate, charging an average billed tariff well above cost recovery, and losses that year were overwhelmingly driven by distribution losses—that is, above the norm physical losses of energy. By contrast, in 2011, states were, in aggregate, charging an average billed tariff below cost recovery. Thus, underpricing emerged as an important contributor to losses, although distribution inefficiencies, while smaller than in 2003, continued to be the largest contributor to total losses.

Across all states, the margin of cost recovery declined over 2003–11 because tariff increases failed to keep pace with cost increases. While in 2011, the average billed tariff was

Gross mismanagement of cash flows is indicated by the time taken to collect payments, which averaged 170 days in 2011, with the ten worst performing utilities averaging 489 days.

In 2003, tariffs did not meet cost recovery in only 7 states; in 2011, this number was 14.
higher than cost recovery in 15 states, technical losses, theft, and under-collection can (and often do) lead to an absence of revenues from a significant amount of power supplied by utilities, resulting in financial losses. The fact that most utilities still have losses despite having tariffs at or above cost recovery levels reinforces how much operational inefficiencies contribute to utility losses. Only Delhi, Kerala, and West Bengal had tariffs that covered costs in 2011 and made a profit without requiring subsidies (see table 1).

The Sector Operating Environment Has Contributed to Discom Financial Difficulties

On the cost side, unforeseen shortages of fuel (mainly coal) and poor planning by discoms have led to a steep rise in the price of bulk power. This has led to a growing gap between discom costs and revenues (figure 9). While average revenues grew at an impressive real compound annual growth rate of 6 percent over 2003–11, the average cost of supply rose at a real compound annual growth rate of about 7 percent, growing by 70 percent in real terms over the period. The share of power purchases in total discom costs rose from 56 percent in 2003 to 74 percent in 2011. Power has become more expensive because of a decline in domestic fuel availability resulting in an acute increase in the price of fuel and because of poor procurement planning by discoms, which has led to last-minute purchases of power for supply to end-consumers. Such purchases must be procured from the spot market and tend to be more expensive than power contracted for longer periods. A sharp increase in the use of imported coal, which is often two to three times as expensive as domestic coal, and power producers’ increased use of e-auctions, which are typically expensive, to purchase coal have further pushed up the cost of power generation. Rising interest expenses, driven by discoms’ increased borrowing to meet cash-flow needs (often due to inadequate revisions in tariffs), have also contributed

Table 1. Tariff Performance and Utility Losses, 2011

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
<th>States</th>
</tr>
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<tr>
<td>1</td>
<td>Tariffs are not set at cost recovery, but states achieve profits with subsidies</td>
<td>Andhra Pradesh, Rajasthan</td>
</tr>
<tr>
<td>2</td>
<td>Tariffs are not set at cost recovery, and states make losses with subsidies</td>
<td>Assam, Bihar, Haryana, Punjab, Tamil Nadu, Tripura</td>
</tr>
<tr>
<td>3</td>
<td>Tariffs are not set at cost recovery, and states make losses without subsidies</td>
<td>Goa, Himachal Pradesh, Manipur, Mizoram, Nagaland</td>
</tr>
<tr>
<td>4</td>
<td>Tariffs are set at cost recovery, but states do not achieve profits even with subsidies</td>
<td>Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Sikkim, Uttar Pradesh, Uttarakhand</td>
</tr>
<tr>
<td>5</td>
<td>Tariffs are set at cost recovery, and state achieves profits with subsidies</td>
<td>Gujarat</td>
</tr>
<tr>
<td>6</td>
<td>Tariffs are set at cost recovery, and states achieve profits without subsidies</td>
<td>Delhi, Kerala, West Bengal</td>
</tr>
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</table>

Source: Khurana and Banerjee 2013.

Note: Subsidies refers to those booked by the distribution utilities.
to higher costs. The escalation in cost is not always permitted as a pass-through, adding to the pressure on discoms.\textsuperscript{14}

\textbf{Inefficiencies and lack of coordination among the agencies responsible have resulted in coal production and supply well below projections.\textsuperscript{15}} Approximately 76 percent of the coal consumed in India is used by the power sector, and 67 percent of electricity generated comes from coal. Coal India Ltd.’s monopoly on coal production and sales, coupled with its inefficiency, has led to consistent shortfalls in coal availability against official estimates over the past two Plan periods (2002–07 and 2007–12). Plan targets for coal production have been overly optimistic considering the volume of exploration undertaken in earlier years. Poor coordination among the multiple agencies that need to provide clearances has added long delays to mine development. Infrastructure for evacuation of coal produced has not kept up with production, either. The gap between coal requirements for plants that had been awarded coal linkages and that were to be commissioned during the Plan period and the actual increase in coal production, particularly over 2010–12, points to an urgent need for harmonization between the concerned ministries. In fact, a considerable volume of investment in thermal power plants with power purchase agreements based on the projected availability of cheap domestic coal is now likely to remain stranded.

\textbf{The expense of providing below-cost power to key consumer groups, such as agricultural and rural consumers (a political decision in many states) has also weakened utility finances.} The health of the distribution business is closely linked to the share of agricultural consumers in the total. Not only are these consumers heavily cross-subsidized by industrial and commercial consumers as a conscious policy of the government, but utilities usually require an additional explicit subsidy contribution from the state to cover the cost of serving them. The share of agriculture in total electricity consumption was 23 percent in 2011, while revenues from agriculture were only 7 percent of the total (figure 10)—thus compensation from the state budget to cover the cost of supply to agriculture is critical to utility financial viability.

\textbf{The problem for utility finances arises because there is often a gap between the volume of subsidies booked by utilities as compensation and the amount received from the government (figure 11).} This worsens the economics of already-struggling utilities, undermining their creditworthiness and preventing them from investing to improve service delivery. The gap was Rs 119 billion (US$2.6 billion) for all states in 2011. Since 2003, subsidies booked have grown by 12 percent per year, and subsidies received by 7 percent per year; the cumulative gap between them was US$10 billion for 2003–11.\textsuperscript{16}

The share of agriculture in total electricity consumption was 23 percent in 2011, while revenues from agriculture were only 7 percent of the total.
State support to the power sector includes explicit fiscal transfers in the form of subsidy payments as well as subsidized loans and contributions of equity to utilities. Fiscal transfers to the power sector account for a significant share of state budgetary spending. On average, state support to the power sector amounted to 1.3 percent of state GDP in 2011 across the 16 Indian states in which distribution utilities received support, and was as high as six percent in Punjab and five percent in Uttarakhand (figure 12). As a share of the state budget in 2011, state support averaged about 2 percent but was 15 percent in Bihar and 22 percent in Uttarakhand.

A majority of states also subsidize a substantial portion of domestic consumption. Eighty-seven percent of all electricity consumed by domestic consumers in India was subsidized in 2010. As the domestic sector consumes almost one-quarter of electricity sold, this is equivalent to 21 percent of all electricity consumed, with the average subsidy being Rs 15 per kWh. While 25 percent of households lack access to electricity and therefore receive no subsidy, over half of subsidy payments (52 percent) India-wide went to the richest 40 percent of households in the country in 2010, underlining the potential gain to utility revenues from better targeting that would reduce household subsidies.

In 2010
- Eighty-seven percent of all electricity consumed by domestic consumers was subsidized.
- In 21 states, the average household consuming less than 30 kWh a month paid more per unit of electricity than the average household consuming 30–100 kWh a month.
- In 10 of those states, the average household consuming less than 30 kWh a month paid more per unit of electricity than even the average household consuming more than 300 kWh a month.
- Some 87 percent of subsidy payments India-wide were delivered to households above the poverty line.

The opportunity cost of budget support to the power sector is high. About 15,000 hospitals and 123,000 schools could have been developed in 2011 if the power sector had not preempted the funds.
Institutional Factors and Governance Shortcomings Are Other Contributors

**Key reforms mandated by the EA have still not been implemented.** EA mandates in six key areas—access, quality and affordability, cost recovery, accountability and transparency, renewable energy, and competition—have been unevenly carried out. An index that measures the actions taken by state actors (that is, governments, regulatory commissions, and utilities) to realize the objectives of the EA and its associated policies indicates that most states have completed only half the reform actions envisaged. Among the reform areas, statewide performance was the lowest on promotion of competition by a wide margin. Service quality and affordability has seen the most progress, closely followed by access (figure 13).

In fact, open access, a key enabler of competition under the EA, has still not been implemented in a manner such that a robust merchant market could compensate for a decline in sales to state discoms and thus balance demand and supply. Of the five indicators used in this study to assess progress in promoting competition, only notification of open access regulations and unbundling have been completed by most states. In addition to these measures, most state regulators have notified wheeling and transmission charges and the cross-subsidy surcharge, but only one has specified a path for the cross-subsidy reductions necessary for open access to take effect. Implementing open access and ensuring adequate available evacuation capacity are also necessary to permit third-party sales to compensate generation companies if discoms fail to honor their power purchase agreements.

With regard to the states, Delhi has progressed the most by far in implementing EA mandates, followed by Gujarat, Maharashtra, Madhya Pradesh, and Andhra Pradesh (figure 14).

**Sector outcomes are highly correlated with the extent of implementation of EA mandates (figure 15).** An index of outcomes on objectives ranging from power availability and affordability through access and reduction of fiscal burden to openness and sector financial viability was used to measure overall sector performance. It shows that sector outcomes, in line with the implementation of reforms, have been uneven across states, with Gujarat and Punjab ranking highest in achievement of outcomes (see figure 15).

**Continued state interference in utility governance weakens incentives for commercial operation.** The unbundling and corporatization of utilities envisaged under the EA was
intended to limit state involvement in their operations, increase transparency and accountability, and bring a commercial orientation to their operations. But while unbundling the SEBs has progressed quite well on paper, actual separation and functional independence of the unbundled entities is considerably less than it appears—and clearly identifying the contributions of individual entities in the service value chain and holding them accountable for their performance remains difficult.

### Figure 13. State Performance on Reform Areas

**Source:** Deloitte 2013.

**Note:** Within each reform area, the index identifies between one and four objectives. For each objective, several implementation parameters (indicators) are used to measure progress toward that objective, with scores across indicators averaged to obtain scores for each objective and scores for the objectives averaged to obtain performance scores in each reform area.

### Figure 14. Progress on Reform Implementation—Top and Bottom Five States by Reform Area

<table>
<thead>
<tr>
<th>Competition</th>
<th>Accountability and transparency</th>
<th>Cost recovery</th>
<th>Access</th>
<th>Quality and affordability</th>
<th>Renewable energy</th>
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<tbody>
<tr>
<td>• Rajasthan</td>
<td>• Maharashtra</td>
<td>• Delhi</td>
<td>• Delhi</td>
<td>• Mizoram</td>
<td>• Orissa</td>
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<td>• Maharashtra</td>
<td>• Gujarat</td>
<td>• Assam</td>
<td>• Goa</td>
<td>• Orissa</td>
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<td>• Punjab</td>
<td>• West Bengal</td>
<td>• West Bengal</td>
<td>• Sikkim</td>
<td>• Assam</td>
<td>• Other</td>
</tr>
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</table>

- **Bolded** states are in the top five overall; *italicized* states are in the bottom five overall.

**Source:** Deloitte 2013.
Corporatization has been unable to insulate utilities from state interference because boards remain state dominated, lack sufficient decision-making authority, and are rarely evaluated on performance. Utility boards tend to have more government and executive directors than recommended under the good practice guidelines issued by the Department of Public Enterprises and even fewer independent directors—only 16 percent of 69 utilities studied have the recommended share of independent directors, and several entirely lack independent directors entirely (figure 16). Further constraining the autonomy of the boards and management’s ability to operate on a commercial basis is the state government’s involvement in key recruitment, personnel, procurement, and enforcement decisions.

The regulatory environment has not sufficiently pushed utilities to improve performance, in part because a lack of accountability, limited autonomy, and constrained technical capacity on the part of SERCs have prevented the creation of an independent, transparent, and unbiased governance framework for the sector that balances consumer and investor or utility interests. SERCs have been established in all states but generally perform poorly on an index of regulatory design that measures their autonomy, capacity, and transparency, and that is highly correlated with utility financial performance (figure 17). True autonomy from state governments is lacking, partly because of relationships built into the EA itself. In addition, many SERCs lack the resources to carry out their functions fully, especially with regard to adequate numbers of professional staff and appropriate information technology systems. Although most SERCs are nominally promoting consumer empowerment and transparency, they need to do far more to create frameworks for meaningful public input to the regulatory process, such as promoting consumer engagement and ensuring that high-quality information is publicly available.

Only 16 percent of 69 utilities studied have the recommended share of independent directors, and several entirely lack independent directors.
available. Perhaps most importantly, there is no clear accountability mechanism to govern SERCs themselves and to hold them responsible for implementing their mandates.

**SERCs face challenges in carrying out their mandates largely because the utilities they regulate are almost all state owned.** As a result, most SERCs have notified the key regulations necessary to enact the mandates of the EA 2003, but many have yet to take concrete steps to actually implement them. The regulatory mandates reviewed in this study relate to tariffs, protection of consumers, standards of performance, open access, renewable energy, and notification of regulations in selected other areas. On average, states score 74 percent on an index measuring implementation of regulatory mandates (figure 18). Andhra Pradesh, Himachal Pradesh, and Karnataka are the highest ranking SERCs.

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**Figure 16. Share of Utilities in Compliance with Key Good Practices in Corporate Governance**

Source: Pargal and Mayer 2013.

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**Figure 17. Institutional Design Index Scores**

Source: Pargal and Mayer 2013.
Examining implementation more closely, for example, while tariffs cover average costs in most states, very few states issue multiyear tariffs that would enable long-term planning by utilities and incentivize efficient operations. On average, states increased tariffs at least once every two years from fiscal 2008 to fiscal 2013. Three states increased tariffs each year while Sikkim did not revise tariffs at all in the entire six-year period. The frequency of tariff increases varied from year to year—for instance, in fiscal 2009, 13 states reported tariff increases, while in fiscal 2013 about 26 states issued orders to raise tariffs. Goa, one of the best performers, did not issue a tariff order for the first five years in this period, finally raising tariffs only in fiscal 2013. Steady revisions in tariffs avoid the shock to consumers from having to adjust to a sudden large jump in the tariff. And they enhance the general acceptability of tariff increases and help prevent receivables such as “regulatory assets” from building up in utility accounts.

Mounting regulatory assets have increased the discoms’ cash-flow problems, jeopardizing routine operations. In Tamil Nadu, Rajasthan, Punjab, Uttar Pradesh, Haryana, Delhi, and West Bengal, utilities have had to borrow heavily to fund the deficit of revenues over costs. Although the Appellate Tribunal has ruled that regulatory assets must be recovered over three years, the sheer magnitude of current regulatory assets means this would cause a major tariff shock. Therefore, recovery has been spread over a longer period with no relief to utility finances. Exacerbating the problem are delays in “truing up,” regulators assigning lower power purchase costs than used by discoms in their projected revenue requirements just to keep starting tariffs low, and the interest burden on cash-strapped discoms that have to borrow to purchase power.

Another source of pressure on utility finances is the mandate to build and “power up” the vast network of lines being laid across the country under the central government’s flagship access program, RGGVY. There are structural disincentives to supply power in rural areas: low demand per consumer and overall; the high cost of service provision; and low, frequently below-cost, tariffs. In 2011, utilities lost Rs 3 (US$0.06)–Rs 4 (US$0.08) per unit of power sold to rural consumers; the aggregate burden of serving rural consumers in 2010 was around Rs 200 billion (US$4.4 billion) in the 12 large states studied (figure 19). Apart from this, losses related to
RGGVY implementation have placed a heavy weight on the finances of distribution utilities, and this is not always compensated by state governments as the cost of rural service delivery is very difficult to estimate exactly. Under RGGVY, the Rural Electrification Corporation provides a 90 percent subsidy for the capital cost of grid extension. As of January 2013, the amount sanctioned by the Rural Electrification Corporation for all RGGVY projects, Rs 342 billion (US$8 billion), covered only 58 percent of the estimated actual cost of Rs 590 billion (US$13 billion), and the government had only disbursed 84 percent of the sanctioned amount. The reasons for this misalignment are inadequate and unrealistic estimates by states of the funding required to meet RGGVY goals; the Rural Electrification Corporation’s application of standardized cost norms that do not consider variations in geography, cost of living, or other significant factors; a long and unwieldy revisions process, which has deterred states from requesting revisions to approved amounts; and RGGVY’s provision of free connections only to households below the poverty line, which restricts potential aggregate demand to a small group with low consumption levels.23

A potentially transformative two-part central scheme to increase distribution efficiency, the Restructured-Accelerated Power Development and Reform Programme (R-APDRP), has not yet realized its potential. The R-APDRP aims to reduce aggregate technical and commercial losses in selected urban areas to 15 percent through support for collecting baseline data; adopting information technology applications for key functions; and the provision of grant funding for investments to renovate, strengthen, and modernize distribution end operational/technical and service delivery mechanisms.24 But no state has completed even the first part of the scheme, largely because it was rolled out without sensitizing utilities to the extensive “change management” needed for implementation, exacerbated by limited resources, a lack of appropriate capacity, and the absence of a supportive information technology ecosystem in the broader economy.

In sum, multiple institutions with diffuse accountability have undermined the sector’s commercial orientation. The EA 2003 sought to limit government interference in utility operations, yet state governments are still a major presence with a generally detrimental impact on utility operations. They have worsened discoms’ financial difficulties by compelling them to borrow to cover operational expenses, given the revenue shortfalls caused by the under-recovery of power purchase costs and incomplete or late subsidy payments by the state governments; by applying political pressure to keep tariffs low; and by pressuring discoms to purchase power during

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**Figure 19. Financial Burden of Serving Rural Consumers**

(a) Revenues and costs (2010)

(b) Total losses (2010)

Source: Banerjee and others 2013.
elections to appease voters. Irregular and inadequate tariff increases over the past decade, despite the ability of state regulators to act on their own initiative, have lowered cost recovery and increased regulatory assets. Banks and financial institutions continued financing insolvent discoms through 2011, ignoring due diligence and prudential norms; indeed, lending to unbundled discoms grew 35 percent per year over 2006–11. This flow of liquidity limited the pressure on discoms to improve performance and on state governments to allow tariff increases.

The Way Forward: Priority Areas for Action

The problem of poor power sector performance has its roots in inefficiencies and limited accountability at the distribution end of the sector value chain, so fixing these aspects of distribution is key to improving service delivery and other metrics of sector performance, putting the sector on a financially sustainable path, and ensuring that power is no longer a bottleneck for growth. Priorities for action are as follows:

Fully implement key EA mandates, especially those regarding competition and distribution (tariffs, open access, and standards of performance). This will incentivize loss reduction, modernize operations, and improve service delivery and cost recovery, thus bringing distribution performance up to international benchmarks of quality.

Ensure regulatory autonomy, effectiveness, and accountability. Widespread concerns about the objectivity of decisions and autonomy of decision-making arise from the revolving door among the regulator, utility, and government that is the result of a limited pool of qualified staff in the sector. One option would be to establish a common pool of regulatory staff working across states and regulatory commissions. Financial autonomy could be enhanced by charging regulatory expenses to the consolidated fund of the state so that the SERC has a dedicated source of funding, independent of the state. Most critically, safeguards need to be developed against the misuse of section 108 of the EA, which permits states to “direct” SERCs. The limited ability of SERCs to penalize state-owned utilities and to overcome state political considerations (on tariff increases, for example) highlights the need to weaken the connection among an individual state government, its utilities, and the state electricity regulator. Establishing four or five regional regulators that would be responsible for regulating the sector in a group of states is an option. An overarching issue is enhancing the accountability of regulators. Given the general lack of involvement of the state legislatures, alternatives include reporting every six months to a standing Parliamentary Committee, possibly through the Forum of Regulators.

Ensure the availability of high-quality, updated data and the use of these data for monitoring and benchmarking performance as well as for planning and decision-making. Sector monitoring can only be as good as the data it is based on, but there is a lack of consistent reliable data. This hampers planning, decision-making, implementation monitoring, and compliance enforcement, and affects all players as well as both internal accountability (e.g., of utility management to its board and owners) and external accountability (e.g., the utility, government, regulators, and consumers/civil society to each other). The regulator can also bring greater transparency and accountability to sector institutions by routinely collecting and publishing data on performance targets and achievements. A statutory requirement for utilities to regularly collect and publish primary data is advisable, including data on customer satisfaction and compliance of states with their subsidy commitments. Third-party monitoring of utility performance should be encouraged.

Insulate utilities from state government to prevent interference with internal operations. State utilities should comply with corporate governance guidelines from the Department of Public Enterprises regarding the inclusion of independent directors on boards and limiting the share of executive directors on them. Independent directors should be appointed by a committee, with members drawn from entities like the Central Electricity Authority or other representatives of the public interest, in order to avoid capture by the state government. An arm’s length relationship between government and utilities can be more easily institutionalized if utilities’ articles of association specify a limited role for the government. Using compliance with listing requirements (“shadow” listing) as a precondition for central or other support can bring greater accountability to utility boards while limiting state interference. Divesting an ownership share to central public sector undertakings such as National Thermal Power Company Ltd. or Power Grid Company of India Ltd., which are recognized for strong results, may also limit state government influence because as equity owners, they would have the ability to push for better performance. The performance of utilities can be strengthened through memorandums of understanding with the state government, following the practice of central public
An Eight Point Agenda for Action

Central Government to Actively Align Stakeholder Incentives
- Use central schemes to incentivize better distribution-segment performance.
- Hold state governments accountable for sector performance. Make central transfers contingent on payment of subsidies due.
- Use utility performance ratings to inform lending by government institutions. Link the Power Finance Corporation/Rural Electrification Corporation loan disbursements to performance and creditworthiness.
- Promote responsible lending by avoiding bailouts for poor decisions or inadequate due diligence.
- Give lenders step-in rights to bring in new management if there is default/non-compliance with financial covenants.

Ensure Availability of High-quality, Updated Data and Dissemination of Good Practices
- Assign responsibility for data collection and publication, and base decisions on data analysis.
- Induce better performance by benchmarking utilities against each other.
- Establish feedback loops: set performance targets, monitor commitments, and publicize achievements to incentivize regular updating and vetting of data.
- Reinvigorate planning, coordination mechanisms, and knowledge capture.
- Strengthen system-wide planning, possibly by Central Electricity Authority, and make it the sectoral knowledge repository.

Center and States to Strengthen Regulatory Governance and Processes
- Ensure autonomy of regulators through dedicated funding, the option of regional regulators, a common pool of technical staff for all regulators, and safeguards against misuse of Section 108.
- Develop SERC technical capacity to design, implement, monitor, and penalize noncompliance with regulations.
- Enhance transparency and credibility through open hearings, participatory processes, publication of studies, comments, and decisions.
- Make SERCs accountable, possibly to Parliament with a performance evaluation by Appellate Tribunal.

Regulators to Implement Key Regulatory Mandates
- Specify, measure, and publicize standards of performance.
- Revise retail tariffs regularly but avoid passing through up-stream inefficiencies.
- Determine charges required for open access and a sustainable path for removal of cross-subsidies.

Center and States to Improve Corporate Governance of State Utilities
- Require state utility compliance with the corporate governance guidelines issued by the Department of Public Enterprises.
- Complete operational and financial unbundling to improve accountability.
- Use memoranda of understanding to strengthen incentives for utility performance, following the practice in Central Public Sector Undertakings.

States to Explore Different Models to Improve Distribution
- Use management contracts to allow learning-by-doing.
- Separate urban and rural areas to tailor service to differences in load, the ability and willingness to pay, and the need for reliable power.
- Allow differentiated service above the mandated minimum at an additional charge.
- Experiment with different approaches to private participation. Delhi, Mumbai, Bhiwandi, and Kolkata are examples.
- Pilot retail choice through separation of carriage and content to understand the information and regulatory requirements for success.

Center and States to Promote Electrification in a Financially Responsible Manner
- Fully compensate discoms for RGGVY line extensions and for power supplied to rural consumers.
- Promote coordination through a single central agency for planning and monitoring grid and off-grid investments.
- Increase rural commercial load by encouraging productive uses.
- Bring households above the poverty line into RGGVY to enhance social cohesion and sustainability of the access expansion achieved.
- Use prepaid meters, payment through cell phones, and rural franchises to improve rural billing and collection systems.

Regulators to Improve Targeting and Reduce the Fiscal Burden of Domestic Tariffs
- Move to volume-differentiated tariffs rather than incremental block tariffs, tariff block cut-offs that better match the consumption patterns of households at different income levels, and to above cost-recovery tariffs for higher-consuming households.
- Define clear eligibility criteria for subsidies and design tariffs to restrict subsidies to eligible households, ultimately transitioning from consumption subsidies to cash transfers.
sector undertakings, many with exemplary performance records. States also need to be held responsible for making timely and complete subsidy payments when they mandate below-cost supply of power to certain consumer groups. The central government’s budgetary transfer to the states could be a potential source for making up shortfalls if the state government does not make payments that are due.

**Use central programs and other support to incentivize operational and financial efficiency.** The central government and its agencies can have immense financial leverage. The large centrally-sponsored programs such as the RGGVY and the R-APDRP can be used to promote responsible behavior by utilities and state governments, particularly if their implementation is coordinated and if disbursements are tied to reaching operational and financial performance targets. Another promising approach would be a consistent use of ratings recently developed by the Ministry of Power by the Power Finance Corporation and the Rural Electrification Corporation as a core input in lending decisions (Ministry of Power 2013). Because the Power Finance Corporation and the Rural Electrification Corporation are the leading lenders to the sector, this would send a clear signal about the need to achieve and maintain strong operational and financial performance.

**Make better use of India’s size and diversity to experiment with and learn from different models of service provision,** including private sector participation through joint ventures (Delhi), franchising (Bhiwandi), management contracts, and so on. Key issues faced in attracting outside expertise and investment for improving distribution are a lack of reliable information on asset quality; very different demand, needs, and ability to pay of rural and urban consumers served by the same utility provider; long-lived assets that require heavy upfront investment; and government sensitivity to potential for “extra” profits being earned by private investors leading to excessive conditionality (damping interest in the newer franchises offered).

On these factors, potential approaches include:

- **Make provision for learning by doing,** starting with management contracts or franchises that permit the discovery of the true state of assets and that bring basic efficiencies to operations before specifying investment requirements over the longer term.
- **Ring-fence urban and rural customers and consider license, franchise, or public–private partnership models** only in urban areas, while letting state discoms maintain their responsibility for rural supply (or separately contract out specific functions like revenue collection to a rural franchisee) and assigning low-cost public sector generation such as the National Thermal Power Company Ltd. power purchase agreements to them. The private urban operators would be responsible for procuring power for their own consumers and could transparently contribute to a universal service fund that would cross-subsidize rural supply.

  - Establish urban franchises and encourage them to gradually expand their services to cover rural areas through, for example, a series of concentric circles, so that learning becomes consolidated. Variants of this basic approach could include permitting private entrants to offer greater service reliability than the mandated standard upon payment of fees in addition to the basic regulated tariff.
  - Appoint operation and maintenance contractors to upgrade dilapidated distribution networks for discoms, beginning with the most lucrative, high-value feeders. This will improve service and increase collections, and a portion of the increased collections can be paid to the contractors as incentives. Such loss-reduction practices can gradually spread over the entire network.

**Promote electrification in a financially responsible manner and support diverse delivery models.** Rural service delivery will become viable only if discoms are fully compensated for supplying power to rural consumers. Supporting productive uses of power through capacity building, provision of information, complementary microfinance, and technical support is critical for aggregating the rural load and improving the commercial viability of rural service delivery. Beyond this, funding needs to be allocated in the state budget to make up the shortfall in discom revenues from supplying power to rural communities. While increasing rural loads will make it cost-effective to meter, bill, and collect, innovations in technology and use of rural collection franchisees can help reduce the associated transaction costs. Prepaid meters would lower commercial risks to utilities and allow rural households to have more control over their consumption. It may also be beneficial for state utilities to explore management contracts with private operators who can deploy new metering technology. Use of own-state funds to extend free connections to households above the poverty line can increase community support and improve sustainability of the access expansion achieved.

A single central agency for planning and monitoring grid and off-grid investments can promote coordination by leading the development and regular updating of state rural electrification plans as well as providing a countrywide picture of
the rollout of grid and off-grid facilities, critical information for private investors in distributed generation. Coordination would require more reliable information on people without electricity living in villages which have power (important for state utilities) as well as in villages without power (important for off-grid providers).

Rationalize domestic tariff structures to improve targeting and reduce fiscal burdens. An accurate system of identifying households below the poverty line would allow states to better target subsidies to the poor, using special tariff schedules or cash transfers. Until such a system is functional, it would be useful to work toward rationalizing tariff structures through:

- Volume-differentiated tariffs instead of incremental block tariffs. In the former, households are grouped by total monthly consumption, and each household in a given group pays the same (constant) tariff for all the power it consumes.
- Tariff block cut-offs that better match the electricity consumption patterns of households at different incomes.
- Charging above cost-recovery tariffs to higher consuming households. States with low fiscal costs of subsidies achieve this by limiting the size of subsidies, restricting how many households receive subsidies and charging a cross-subsidy to some households.
Notes

1. Both central and state legislatures have a role in developing policy.

2. The structure of the sector has moved away from vertically integrated SEBs: unbundled generation, transmission, and distribution entities now exist in 19 of India’s 29 states. As of 2013, 28 regulatory commissions have been established.

3. Such subsidies are primarily given to distribution companies to compensate for below-cost tariffs charged to agriculture and domestic consumers on equity and political grounds.

4. This is equivalent to 2.4 percent of total central budgetary spending or 0.4 percent of GDP in 2011.

5. This figure includes subsidies (booked) from state governments as revenue.

6. Accumulated losses are highest in Uttar Pradesh, Madhya Pradesh, Tamil Nadu, and Jharkhand, which together account for almost 60 percent of the total. By contrast, Kerala, Gujarat, Andhra Pradesh, Goa, and West Bengal had accumulated profits in 2003–11.

7. In October 2012, the government announced the Scheme for Financial Restructuring of State Distribution Companies, available to all loss-making discoms that wish to participate, which potentially amounts to a bailout of about Rs 19 trillion.

8. The Integrated Energy Policy of 2006 forecasts that generation capacity will need to increase to about 800 gigawatts by 2030 to meet predicted demand and sustain growth of 8 percent a year—four times current generation capacity.

9. That is, the difference between input energy (which is paid for by the utility) and energy sold (which generates revenues for the utility).

10. That is, the difference between total revenues accrued and total costs = profit before tax.

11. Collection efficiency is the proportion of energy realized (as revenue) to energy billed; anything less than 100 percent is inefficient.

12. Average billed tariff is revenues billed/energy sold.

13. While cost recovery basically requires the tariff to equal or exceed average cost, a more stringent requirement is used in this review. Cost recovery is defined as the tariff level that covers (equals) average cost plus a premium to account for “normal” distribution losses, which are set at 10 percent for India for this analysis. Thus an efficiently operating utility (with normal distribution losses and 100 percent collection) that has a tariff equal to cost recovery, as defined above, would break even.

14. There are also significant inefficiencies in fuel use by generation that feed into end-user tariffs. While an important area for immediate action by regulators to capture possible savings, over the medium term, as existing power purchase agreements wind down and all new power is procured through competitive bidding, this source of inefficiency can be expected to decline.

15. While beyond the scope of this review, a considerable body of work has analyzed the options for moving India to a lower carbon growth path and increasing the share of renewable energy in India’s generation mix. See, for example, World Bank studies on “Unleashing the Potential of Renewable Energy in India” (Sargyana and others 2011); “Energy Intensive Sectors of the Indian Economy: Path to Low Carbon Development” (Gaba, Cormier, and Rogers 2011); and “Development of Local Supply Chain: A Critical Link for Concentrated Solar Power in India” (Kuchlenko and Khanna 2013).

16. Cumulative subsidies booked and received between 2003 and 2011 are Rs 1,496 billion (US$32 billion) and Rs 1,044 billion (US$22 billion), respectively.

17. All but 2 states have notified open access regulations, and 13 states have reduced cross-subsidy surcharges over the last five years. Only 10 states have initiated competitive power procurement, and only 8 have begun implementation of an availability-based tariff (ABT) beyond notifying ABT regulations.

18. In the Indian context, “notifying” a regulation means the regulation has been published in the necessary channels and is enforceable.

19. Specifically, regulations related to the supply code, power trading, metering, multyear tariffs, and intra-state availability based tariffs.

20. Regulatory assets are due to the discoms, typically on account of tariff increases that the regulator accepts as justified but does not allow in the year they are incurred to avoid a sudden jump in tariffs, on the presumption that they will be recovered through gradual tariff increases in the future.

21. Borrowing against regulatory assets is becoming less feasible. Because commercial banks are unsure how to value regulatory assets that may not be worth their face value, discoms can no longer borrow up to the full amount of the regulatory assets they own.

22. In other words, adjusting the value (for example, of costs, revenues, and tariffs) approved by the regulator in advance (when passing a tariff order) against what was actually achieved. In this instance, actual costs are used to update the cost estimates provided by utilities in their tariff petitions.

23. Increasing both the consumer base and per consumer consumption levels will address low load, and for this it will be critical to improve the quality of supply so that there is greater consumer interest in connecting (“hooking up”) to the grid and thus generating effective demand.

24. The program requires participating utilities to demonstrate performance improvements [sustained loss reductions] to obtain financial assistance. Thus utilities need to collect accurate baseline data and measure performance. To ensure data integrity, reliable and “no manual touch” systems need to be established for data collection, while adopting information technology for energy accounting. Under the program, there is support for both aspects, recognizing that they are preconditions for successful distribution-strengthening projects.

25. Nationwide it is estimated that regulatory assets are more than Rs 700 billion (US$15 billion) and that the interest cost alone adds up to around Rs 95 billion (US$2 billion) a year.

26. Payment release could be conditional on concurrence with the performance report by lenders’ representatives sitting on utility boards.

27. “Try before you buy.” The process of operating the system will give the incumbent franchisee an information advantage when bidding for concessions or privatizing the utility (if that is envisaged in the next stage). Appropriate mechanisms for capturing this knowledge and handling the information advantage will need to be developed that provide incentives for franchisee performance but also allow for an open competitive procurement process.

28. Delhi utilities are technically public-private partnerships as they are joint ventures between the government of Delhi and the different licensees.

29. Because many rural dwellers in India already use prepaid cards for mobile-phone airtime, mobile phones could be trialed to pay electricity bills, similar to M-Pesa in Kenya.
References

**Background Papers**


**Other Papers**


