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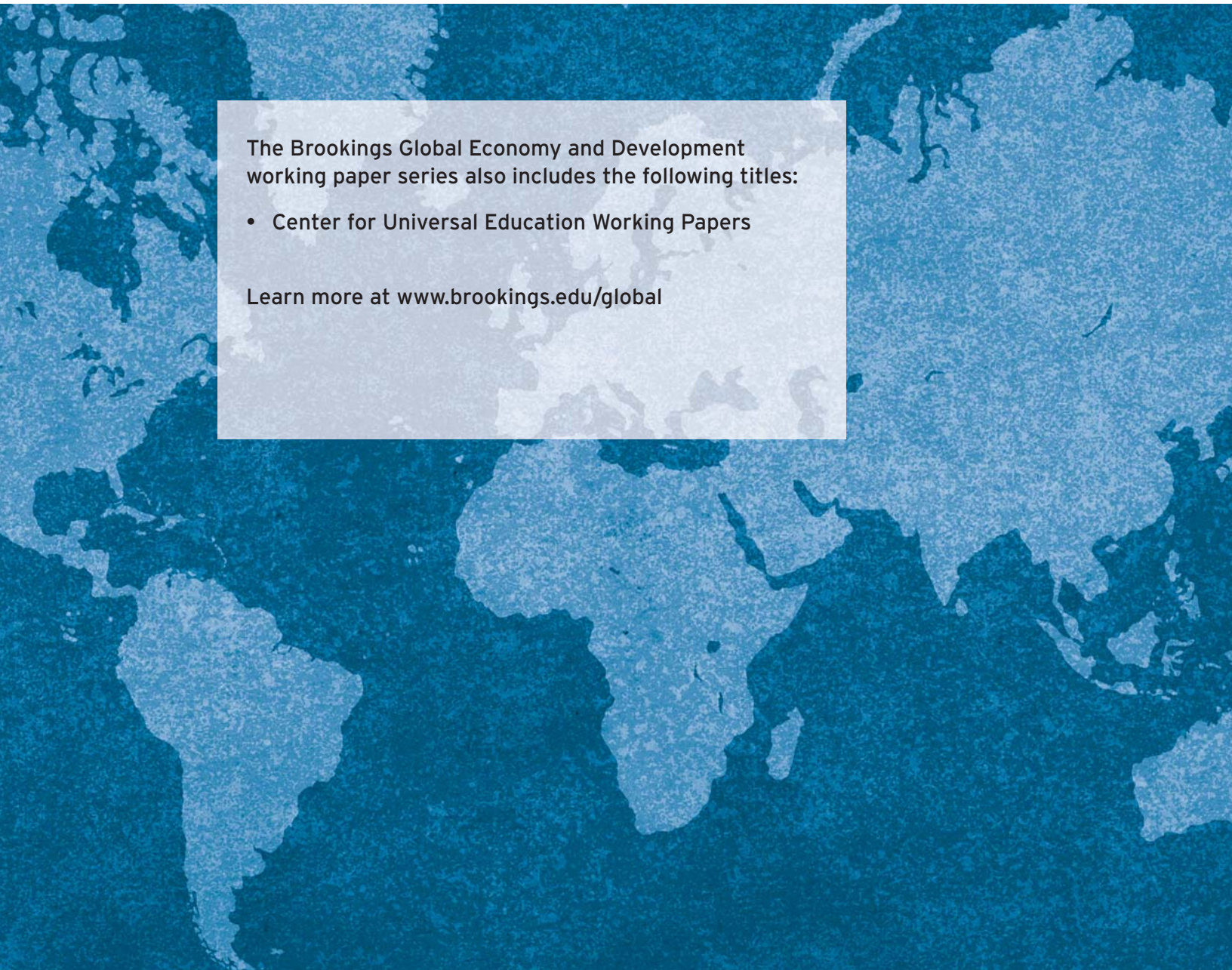

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CONTENTS

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ABSTRACT

The increasing losses of state electricity utilities are again starting to affect the evolving contours of federalism in India. The power sector has an important role, not just due to the high levels of government subventions to the sector, but increasingly due to the implications for debt servicing capacities, following the massive expansion in power sector projects that are currently under implementation. The paper, *inter alia*, uses a framework developed earlier by the authors for decoding and evaluating the "commercial orientation" of distribution utilities, for the purpose of assessing the potential of these losses worsening. The increasing gap between the Average Cost of Supply and Average Revenue Realisation of electricity, specifically pertaining to the industrial segment, is probably the most important driver of the deteriorating losses. This gap is mainly due to the sharply increased cost of procured power outpacing the (relatively modest) increase in revenues as reduction in Aggregate Technical and Commercial losses has lost traction in recent years. The mid-decade improvement in sector performance has not been transformative. In the context of the extant upsurge in investment in the sector, it is pertinent to query whether risk and leverage has been miscalculated—a case of irrational exuberance and sub prime funding?

INTRODUCTION

Recognition of the power sector's central role in hindering India's competitive cost advantage hardly needs elaboration; industrial power tariffs in India are probably the highest amongst its major emerging market peers. In an increasingly globalised and open trade environment, this is a significant disadvantage in sectors with a major power cost component. A faltering in India's industrial growth momentum has implications for debt servicing capacities of large, bulk consumers, further aggravating sector financials.

The power sector is a prime example of difficult issues related to the division of roles, finances and fiscal transfers between the centre and states. Electricity in India is a concurrent subject, with responsibilities for the multiple segments vested across multiple jurisdictions—centre, state and even the Panchayat levels.[1] A significant aspect of this sharing includes: sale of power to states by central generators (National Thermal Power Corporation (NTPC) & National Hydroelectric Power Corporation (NHPC)), supply of fuel (Coal India Limited, Petronet LNG & Indian Oil), transport of fuel (Gas Authority of India Ltd. & Indian Railways), and transmission of power (Power Grid Corporation of India Ltd. (PGCIL)).

Consequently, unless the incentives of government entities are aligned, operations are likely to bring about sub-optimal outcomes. The severity of the consequences of a breakdown was dramatically highlighted in the early 2000s, when some of the then State Electricity Boards (SEBs) had defaulted on their obligations to central public sector unit (PSU)-vendors. Unpaid dues (including interest and penalties) of SEBs had reached Rs. 415 billion—about 2 percent of 2000/01 GDP. Only a debt securitisation package (with significant hair cuts for "creditors") orchestrated by the central government prevented the sector from a default crisis which would have taken some Government of India (GoI) PSUs down, financially. About two-thirds of the bonds—worth Rs. 188 billion—are still outstanding (Reserve Bank of India (RBI) [2010a]).[2] In an effort to obviate a repetition, a tripartite agreement (called "One Time Settlement Scheme") was drawn up between the central government, state governments and the Reserve Bank of India, involving conditionality covenants on sequestering central government transfers of states whose SEBs had defaulted.

There are several channels of centre-state relationships that (potentially) manifest through the electricity sector. Firstly, subsidies, that are partially or fully financed by state taxes, much of which is a share from central tax collections. A deterioration of state finances implies an increasing appropriation of central transfers meant for commercial operations. One of the big gains of the improving finances of the power distribution segment since 2004 was a reduction in the need for subsidies, thereby lowering states' fiscal deficits, contributing not just to boosting India's savings rate, but also—probably not insignificantly—improving India's credit rating. Secondly, irregular payments (defaults) by state government-owned distribution companies (discoms) which impact the commercial viability of generation and other projects sponsored by, *inter alia*, the central government, that often incur explicit state guarantees, or in more moderate instances, influence the credit ratings of states. Given the increasing access to bond markets that states aspire to, the dilution of market discipline will have an unfavourable effect on their cost of borrowings.

The second issue has further—potentially unpleasant—implications. Concerns about deteriorating conditions of financials of utilities were hitherto largely confined

to fiscal issues. However, with the increasing generation capacities being developed by the private sector (scheduled to come on stream soon), this could be transforming into potentially a larger systemic problem, involving segments of the financial sector which has sizeable (and growing) exposures to the power sector. In other words, the fiscal dimension is probably morphing into a credit risk and consequently a potential financial stability issue. But caution is warranted lest all this is blamed on states alone since diverse stakeholders—private- and central government-sponsored—are also responsible for due diligence.

Another centre-state channel which has implications for the power sector is centrally-funded schemes—presumably reflecting preferences and priorities of the central government—to widen the electricity network in rural areas. (Only 44 per cent of rural households have access to electricity, and hardly anyone would argue against lifeline access to electricity as a merit good). In 2005, the government launched an ambitious flagship programme, "Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)", whereby the government provides 90 percent of the project cost as subsidy for mainly free electricity connections in hitherto non-electrified villages to below-the-poverty-level households. Thus far, the government has sanctioned Rs. 330 billion as capital subsidy for the scheme. To the extent that state governments are compelled to provide electricity, almost inevitably, at below the average cost of supply because of a skewed tariff structure that favours agriculture and household consumers, *ceteris paribus* financial implications for state-owned discoms is adverse. Empirically, it would be almost impossible, in the absence of detailed data availability pertaining to the change in rural consumption (by state) on account of the RGGVY, for determining how much of the financial performance in recent years can be explained by the central scheme.

A fourth interface has recently opened up for centre-state interactions, really for all large projects, but particularly for infrastructure projects of which power projects are a major component—environment. However, although this has become a significant impediment for many projects, and actually caused significant financial losses for NTPC in its Lohari Nag Pala hydro project, the scope lies largely outside this paper, meriting separate, extensive discussion.

Against the backdrop of a revival in investment in the sector and the concomitant larger context of concerns about the possibility of credit stress, the development of power markets, and open access and third party sales are assuming increased importance. First, if power markets (and the enabling facilitation of open access) are allowed to develop, the risk concentration of power generators to state discoms' financials will moderate, reducing the credit risk exposure to these utilities. Second, open access enables better pricing, with price signals reflecting the changing dynamics of demand and supply. Third, if development of these markets is entrenched and leads to expansion in scope, state distribution utilities will be left with increasingly unviable segments of consumers, vulnerable to political revocation of regulator driven tariff rationalisation, adversely impacting their financial situation. There are two (mutually reinforcing) sides of the same issue, viz., while markets-based transactions help private generators better manage off-take and payments risks, the exposure to state discoms is still large, and for state governments paying down liabilities on account of contractual obligations for buying much larger quantum of electricity could prove onerous unless discoms markedly improve their commercial performance quickly. In essence, have systemic flaws and sector vulnerabilities documented elsewhere—Bhattacharya and Patel [2008] and Patel [2008]—diminished appreciably/vanished to warrant

investment optimism?

At a broader policy level, given the emerging importance of competition driven transactions and the evident reluctance of most states and state regulators to push for greater consumer choice, how much of a role is warranted for central authorities in inducing progress? Is an expansion of the Restructured Accelerated Power Development and Reform Programme with suitable incentives a step in the right direction?

These are issues which are likely to have a profound impact on the nature and speed of development of the power sector. The paper focuses on two: (i) the fiscal implications of the changing financials of the distribution segment and (ii) the evolving conditions of commercial orientation of the sector. The first concern is self evident. The second follows from the increasing participation of private developers of generation plants, the rapidly growing exposure of domestic and foreign debt financiers in the projects and the critical role of distribution utilities in generating cash flows for successful enabling of power purchase agreement (PPA)-tied debt servicing for borrowers.

To aid this exercise, a summary measure—Index of Revenue Orientation—which had earlier been conceptualised and constructed by the authors in Bhattacharya and Patel [2008] to capture critical (commercial) aspects of the sector is updated. The reasoning was as follows. Ensuring a sustainable growth of the sector requires significant investments in generation, transmission and distribution, the cash for which is sourced from the supply of power to end-consumers. Controlling losses is not just a matter of moving the Average Revenue Realisation (ARR) up toward the Average Cost of Supply (ACS) which has traditionally remained higher, but the manner in which this convergence is achieved. For instance, continually increasing tariffs for industrial and commercial entities (traditionally the subsidising customers) will inevitably lead to shrinkage of demand, particularly if captive generation, the enablement of open access and third party sales for generators is significantly increased. Utilities not only have to keep their tariffs for (paying) customers competitive, but also to manage the consumption load of the system.

The plan for the rest of the paper is as follows. Section 2 provides an overview of recent developments in the power sector, which helps to underscore archival (macro) details of the fiscal and operational aspects of concerns outlined above. Section 3 attempts to investigate variables that explain performance and examines the (dis)similarity in financial performance across states and discoms. Section 4 concludes the paper.

RECENT DEVELOPMENTS

Capacity addition

India's power sector has been characterised throughout the country, with some pockets as notable exceptions, by a sharp demand-supply imbalance, frequent power cuts, and inadequate coverage. At the same time, there is an emerging dichotomy regarding prospects of the sector. There seems to be an assessment by important and diverse stakeholders that there is a revival underway in India's power sector. Actual and planned investment and financing decisions based on hard data and anecdotal evidence seems to corroborate this. 2009/10 witnessed capacity addition, much of it thermal, of 9.6 GW, the highest ever in a single year.[3,4] Reports indicate that in 2010/11, the sector is expected to add even more, and about 60 GW in all over the 11th Plan period (ending in 2011/12), virtually triple that in the previous five years.[5] (The upsurge in capacity over the last couple of years and given that it takes about 3 years to bring power plants on stream must imply that firm financing decisions were made in and around 2006, 2007 and 2008.[6]) Of course, this is not to say power shortages are about to disappear—peak load deficit was 9.4 percent during April-October 2010—and that the quality of service has been dramatically altered for the better.

Conversely, there is an increasing voice, strangely enough from important policy authorities, sounding concern on the deteriorating financial position of (largely) state controlled utilities. Since bulk of the additional capacity is being financed on the basis of long term PPAs, the prospects of these utilities being unable to fulfil these commitments should indeed be analysed carefully.

Reasons for optimism

There are several "forces" catalysing the relatively upbeat outlook of the sector (whether this is justified or not is another matter, however). The regulated rate of return on equity on power generation assets has been enhanced from 14 percent to 15.5 percent in January 2009 (with a further 0.5 percent inducement provided for timely completion—motivation for this is not self evident since the opportunity cost of (risk) capital declined appreciably on account of easy global monetary policies). At the margin, the share of the private sector in capacity addition is now over 40 percent compared to about 10-15 percent previously, following an increased exposure of the sector to market forces, viz., trading through power exchanges, and increase in the number of applications/transactions for open-access in distribution/transmission.

- The share of power traded to total power generated has risen to 8 percent, including bilateral deals and Unscheduled Interchange (UI) trades. (In terms of value though, it is likely that the share is much higher, given the higher spot and forward rates. Spot power prices have gone up significantly: after declining to a low of Rs. 3.39/unit in October 2009 - February 2010, currently a unit costs Rs. 5.83 on average.)

- While much of the capacities coming on stream are tied with distribution utilities through long term PPAs, generation companies are increasingly leaving 15-20 percent of their capacities untied, with the intention to sell the power through the merchant power market to profit from the spread between merchant power prices and PPA bulk tariffs. (By 2014/15, merchant power capacities are expected to account for 5-6 percent of the country's generation capacity compared to 1-1.5 percent presently.)

- The total volume of energy approved for open access across states was at an estimated 39,000 million units (MUs) in 2009/10,[7] up by about a quarter

from the previous year; and open access in distribution has been implemented for 7.5 GW, with almost three quarters of this in one state, viz., Gujarat (GoI [2010a]).

Furthermore, experimentation with distribution reforms is taking place in unexpected parts of the country, which is being taken as precursor for widespread changes in this key cash-generating segment of the sector—a case of taking a leap (see Electrical Monitor [2010] and Prayas [2009]).[8] Also, in recent years there have been no reports of defaults by state government-owned utilities to their suppliers. Finally, there has been little evidence of funding constraints (equity and debt) for the slew of independent power producers (IPPs) that have been launched.[9] The largest specialised intermediary for the power sector has virtually doubled its loan asset book since 2007, and lending from banks to the sector in recent years has shown a steep increase (Table 1 on page 7).[10]

Emerging concerns

In contrast, the "exuberance" of investment is somewhat confounding when we examine recent official "macro" commentary on the Indian power sector:

- Planning Commission—mid-term appraisal: "Aggregate technical and commercial (ATC) losses, although lower than in the past, are not declining fast enough." The scale of commercial losses—Rs. 400 billion in 2009/10—is described as "unsustainable" (Government of India (GoI) [2010c]).[11]
- Finance Commission: In early 2010, the losses of state-level transmission and distribution utilities at current (2008) tariff levels were projected to increase by 70 percent from Rs. 686 billion in 2010/11 to Rs. 1.2 trillion for 2014/15 (GoI [2010b]).
- Power Finance Corporation (PFC): Within a year (between 2007/08 and 2008/09), the gap between per unit cost of supply and average revenue realised (after accounting for subsidy paid) jumped from Rs. 0.35 to Rs. 0.60 (PFC [2010]).
- World Bank: Technical and commercial losses amount to more than 40 percent of electricity produced. (Reducing these losses to 15 percent will generate additional revenues of US$ 4.4 billion per year.) With the exception of certain central utilities such as NTPC and PGCIL, most state power utilities operate without autonomy and under diffuse accountability systems. They suffer from limited implementation capacities, a shortage of skilled manpower, and *poor financial standing due to inadequate tariffs that do not recover their costs* (our emphasis, from the World Bank website).

Eventually, debt servicing could become problematic and the consequent systemic (adverse) externality for the financial sector is a distinct possibility (as the relatively much smaller exposure to the civil aviation sector—characterised by excess capacity—has already demonstrated). Since the primary legal corporate structure deployed by (new private) IPPs has been project finance with non-recourse to sponsor balance sheet, when matters go awry, banks may be left holding the (tangible) "can" while promoters may suffer the intangible (apocryphal?) "depreciation" of reputation. From publicly available information it is not apparent that state governments have provided counter guarantees as part of recent PPAs with IPPs.

Macro and financial aspects[12]

While there is widespread differences between states (and, indeed, between utilities), the unsettling aspect of recent performance of state level power utilities is the speed of deterioration in the sector's overall financials, with losses doubling to Rs. 526 billion in 2008/09 in a matter of couple of years (see column 4 in Table 2 on page 7). After a period of relative tranquillity, as a percent of GDP, financial losses are back to 2002/03 levels. Reduction in ATC loss (which is a

Table 1: Estimated gross debt flows to the power sector (Rupees billions)

	From banks	Other intermediaries
2006/07	130.0	--
2007/08	219.1	--
2008/09	293.8	126.7
2009/10	420.8* (0.7% of GDP)	164.7 (0.3% of GDP)

**Estimate using the share of power sector credit flows as a percentage of infrastructure over the previous 3 years. Sources: RBI, Prime Database.*

Table 2: Overall state power sector fiscal and financial indicators

	Net cross subsidy* (Rs. bn) (as % of GDP in brackets)	Uncovered subsidy (% of GDP)	Comm-ercial losses* (Rs. bn)	Financial losses* (Rs. bn) (as % of GDP in brackets)	Subsidy received by state-level power utilities (% of GDP)	Govt. ex-penditure on power sector*** (% of GDP)	TD loss (%)	ATC loss (%)	ATC loss (%)	Return on equity (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1991/92	52.8 (0.8%)	0.5%	41.2	--	--	--	--	--	--	-12.7
1992/93	60.4 (0.8%)	0.5%	43.6	--	--	--	21.8	--	--	-11.8
1993/94	79.4 (0.9%)	0.7%	50.0	--	--	--	21.4	--	--	-12.2
1994/95	80.0 (0.8%)	0.6%	63.3	--	--	--	21 .1	--	--	-13.5
1995/96	106.2 (0.9%)	0.3%	83.2	--	--	0.6%	22.3	--	--	-15.1
1996/97	123.0 (0.9%)	0.4%	94.5	--	--	0.7%	24.5	--	--	-17.2
1997/98	154.6 (1.0%)	0.5%	118.2	--	--	0.7%	24.8	--	--	-19.4
1998/99	234.7 (1.3%)	0.9%	180.8	--	--	0.5%	26.5	--	--	-27.5
1999/00	295.7 (1.5%)	1.0%	249.2	--	--	0.5%	30.9	--	--	-41.2
2000/01	309.9 (1.5%)	1.1%	254.0	--	--	0.8%	--	--	--	-41.8
2001/02	308.9 (1.4%)	1.0%	240.6	293.3 (1.3%)	0.4%	0.9%	34.0	37.2	38.9	-32.8
2002/03	257.7 (1.0%)	0.5%	213.8	211.9 (0.9%)	0.5%	0.8%	--	38.6	--	-31.6
2003/04	270.2 (1.0%)	0.6%	203.8	192.4 (0.7%)	0.4%	1.5%	--	37.8	--	-28.3
2004/05	298.0 (0.9%)	0.6%	235.6	240.5 (0.7%)	0.4%	0.9%	--	36.8	33.8	-31.9
2005/06	273.0 (0.7%)	0.4%	227.3	208.7 (0.6%)	0.3%	0.8%	--	33.0	--	-19.7
2006/07	347.8** (0.8%)	0.5%**	288.2**	267.3 (0.6%)	0.3%	0.9%	--	30.6	--	-24.0**
2007/08	344.3** (0.7%)	0.4%**	257.0**	320.6 (0.6%)	0.3%	0.9%	--	29.6	--	-18.0**
2008/09	364.5** (0.7%)	0.4%**	264.6**	526.2 (0.9%)	0.3%	1.0%**	--	28.4	--	-14.3**
2009/10	--	--	> 400	--	0.3%	--	--	--	--	--

**Excluding financial support from state governments; **Not final numbers, they're estimates of disparate vintage, therefore should be treated with caution; ***Aggregate of centre and state governments (revenue and capital) with states accounting for most of this.*
Notes: Rs. bn is billions of Rupees; TD loss is transmission and distribution loss; and ATC loss is aggregate technical and commercial loss. Financial losses presented in col. (4) are an outcome of a fairly comprehensive accounting exercise, akin to financial statements for private incorporated entities, i.e., income & expenditure (cash basis) from utility operations, interest, depreciation & write offs, and taxes are taken into consideration. From the same source as col. (4) subsidy paid by state governments is in col. (5).
Definitions: col. (1): Difference between cost of supply and revenue earned on selling power to (mainly) agriculture & household sectors (gross subsidy on sale of electricity) minus the surplus from selling to other sectors (industry & commercial); col. (2): col. (1) minus sub-vention from state governments to help close the net cross subsidy "gap."
Sources: Columns (1), (2), (3) & (10): Economic Survey (GoI), various years up to 2007/08, and GoI [2010c] for 2009/10; cols. (4), (5) & (8): PFC [2005, 2006, 2009, 2010], except GoI [2010c] for 2009/10 for col. (5); col. (6): Indian Public Finance Statistics (GoI [2010d]); col. (7): Ministry of Power Annual Report, 2002/03 for 1966/67, 1989/90 and 1992/93 to 1999-00, and for 2001-02, Economic Survey, 2003-04 (where it is stated that for 1992-93 and 2001-02 the figure for TD loss includes energy unaccounted for). (The Ministry of Power Annual Report, 2003/04 does not have any TD loss estimate, but on page 11 alludes to ATC losses being in excess of 50 percent); and col. (9): Report on Restructuring of APDRP (GoI [2006b]).

physical measure) has lost traction in the last couple of years; it has not declined much below 30 percent after reduction from a peak of almost 39 percent in 2002/03 (column 8 in Table 2).[13] (It is instructive that electricity distribution losses in China are about 6.5 percent.)

In the context of sector viability, it is worrying that aggregate subsidy received from state governments is a fraction of losses, and currently lower than in the early noughties (column 5 in Table 2). It is inevitable that (many) state exchequers will have to increase their support for the sector to ensure that payments to vendors are current, and the allied fiscal stress on governments will have to be endured (or swift corrective action to improve commercial aspects, such as upward revision in average tariffs charged to consumers, is undertaken).[14] For some governments, subsidy payments are already acutely felt in their fiscal accounts—as percent of their respective gross state domestic product (GSDP) in 2009/10 prominent examples include: Punjab (1.9 percent), Haryana (1.4 percent), Jharkhand (1.3 percent), and Kerala, Karnataka, Madhya Pradesh and Rajasthan nudging towards one percent.[15] Uttar Pradesh, Bihar and Tamil Nadu make subsidy payments at an estimated 0.5 percent of GSDP. It is notable that six governments in 2008/09 and 2009/10, including of large states like Maharashtra (significant losses) and West Bengal (profitable), have not made any subsidy payments to their respective utilities (sample of 20 states in GoI [2010c]). For at least some states, there is clear and present danger that the fisc will go off the rails, driven, not for the first time, by plunging power sector financials. Therefore, not surprisingly, in August of 2010, the Prime Minister constituted a high level panel to assess the financial position of state-level electricity utilities, project losses up to 2017, and suggest "corrective measures."

The financial exposure (and opportunity cost) of state governments to the sector is considerable (GoI [2010b]). Of the total outstanding guarantees provided by state governments of Rs. 1.7 trillion (3.5 percent of GDP), just over half has been extended to power sector utilities (RBI [2010a]); guarantees are primarily on account of governments not in a position to provide budgetary support for investments. While equity investments made in state utilities by respective governments amounted to Rs. 713 billion (end-March 2008), the aggregate return on equity has been deeply negative (column 10 of Table 2 above). Finally, there is also considerable debt financing of power utilities by state governments (aggregating Rs. 707 billion), but interest on this is usually adjusted against subsidy and subventions, and is rarely paid for in cash.

DECOMPOSITION OF FINANCIALS OF STATE DISTRIBUTION UTILITIES

The above section indicated the fiscal side of the loss absorption mechanism of state power finances, but a more detailed operational understanding of the increasing losses is attempted in this section.

Aggregate financial conditions

The deterioration in the financial conditions of distribution utilities has been fairly steady after 2005/06 and particularly sharply in 2008/09 (Table 3 on page 10).[16]

"Losses with subsidy received" have grown at a compounded average growth rate (CAGR) of 37 percent over the four years 2005/06 to 2008/09, compared to around 15 percent for India's nominal GDP over the same period and only 9 percent (in volume terms) for electricity units sold.

The primary cause for the deterioration was plainly an increase in the cost of power procurement. Power procurement costs account for the largest share of total costs (close to half the total costs), and almost across the board, with few exceptions, power procurement costs have risen by 8–35 percent over 2007/08.

Other operational parameters for utilities have not deteriorated to this extent. ATC losses, for instance have improved slightly, although the rate of reduction has slowed sharply. Data also indicate that there has been little significant deterioration in the payables/receivables cycles for the utilities.

The distortions in the composition of consumption are apparent in Table 4 (on page 10). The level of cross subsidisation for utilities with significant agricultural consumption is brought out in the quantum of energy sold vis-à-vis the revenues derived for industrial and agricultural consumers.

The share of electricity supply to agriculture in many states is high but the sector's contribution to revenue is not nearly proportional. For instance, in Haryana the share of agriculture is 36 percent, but contribution to revenue is only 4 percent, in Andhra Pradesh the respective numbers are 31 percent and 1 percent, and in Punjab and Tamil Nadu agriculture contributes practically nothing to revenue despite garnering a large share of the supply. States like Gujarat and Maharashtra fare better but the numbers are skewed even here.

It would be unfair to apportion the blame solely to the utilities, given the state government (politically) supported mandate to supply designated consumer classes with "affordable" electricity tariffs. Subsidy per unit sold had increased from Rs. 0.45 to Rs. 0.54 over 2005/06 to 2007/08, before the problems associated with the sharp growth slowdown in 2008/09 post the financial crisis. Reports indicate that in the most recent times state-owned distributors are tiding over cash shortfalls by borrowing. For instance, in March 2010, Rajasthan had short-term borrowings of around Rs. 145 billion and Uttar Pradesh of around Rs. 350 billion (Livemint [2011]).

Financial performance of individual state utilities

Given that the aggregate picture brings out to some degree the cause of the deterioration, what is the purpose of drilling down to individual state utilities to understand the divergences in performance? Because a correct decoding of dissimilarity is precisely what is needed to establish programmes, funds, and capac-

Table 3: Overview of cash losses of state utilities and potential causes

	Units	2005/06	2006/07	2007/08	2008/09
Energy sold	MKwH	378,717	414,303	457,338	484,276
Losses (without subsidy)	Rs. bn	205.9	267.3	320.6	526.2
Losses (with subsidy)	Rs. bn	34.5	65.2	75.7	284.0
Implied subsidy	Rs. bn	171.4	202.1	244.9	242.2
Losses (w/o subsidy)/unit sold	Rs.	0.54	0.65	0.70	1.09
Losses (with subsidy)/unit sold	Rs.	0.09	0.16	0.17	0.59
Subsidy/unit sold	Rs.	0.45	0.49	0.54	0.50
Average Revenue Realised	Rs.	2.21	2.27	2.39	2.62
Average Cost of Power	Rs.	2.60	2.76	2.93	3.40
ARR - ACS Gap	Rs.	-0.39	-0.49	-0.54	-0.78
ATC losses (%)	% of units input	33.0	30.6	29.6	28.4

Notes: Rs. bn: billions of Rupees; MKwh: millions of units of electricity.

Table 4: Cross subsidisation in 2008/09

State	Agriculture (as percent of total energy)	Agriculture (as percent of total revenue)	Industrial (as percent of total energy)	Industrial (as percent of total revenue)
Haryana	36	4	27	35
Karnataka	36	7	31	35
Rajasthan	37	17	29	43
Punjab	29	-	33	49
Andhra Pradesh	31	1	35	47
Maharashtra	22	11	46	56
Gujarat	32	15	43	58
Tamil Nadu	22	-	37	54
Madhya Pradesh	30	13	28	41

Source: PFC [2010].

ity building to bring state utilities back on the track of improvement evident during 2002/03 to 2005/06. The purpose of this section, unlike Bhattacharya and Patel [2008], is not to verify the sources of the systemic deterioration, but an attempt at understanding the cause and effect between the observed losses and the variables identified as "drivers." These variables are then aggregated into the Index of Revenue Orientation (IRO), whose methodology is briefly indicated next.

Index of Revenue Orientation

The Index is composed of the following elements:

(i) ATC loss levels.

(ii) Collection efficiency.

(iii) The gap between the ARR and the ACS.

(iv) The gap between the ARR from the industry segment and ACS (as a percentage of ACS).

(v) The ratio (in terms of units supplied) of the subsidising segments (i.e., commercial, industry (high tension) and industry (low tension)) to the subsidised segment (i.e., agriculture and domestic).

The formula for the Index is as follows:

IRO = (1–ATC losses) + Collection Efficiency + (ARR–ACS)–(Industry ARR–ACS) + Ratio of subsidising to subsidised segments (1)

The weights are uniform, and are simply +1 or –1 depending on the appropriate definition of the respective measures. These elements above are converted into metrics for the IRO by normalising each individual series, to ensure that scale factors do not introduce bias in the IRO.

Findings

The segment begins with the changes in the performance of discoms over the two years 2007/08 to 2008/09. The first observation is that overall, there has been a clear deterioration of the financial losses of states, with only a handful of states (Chattisgarh, Delhi, Gujarat and Punjab) showing an improvement in losses. Even amongst these, only the first two had increased profits. In particular, very stark in its magnitude, is the extent of deterioration in the financial workings of utilities in two key southern states, viz., Tamil Nadu and Andhra Pradesh (states which had been hitherto lauded for their performance), and of the northern state of Rajasthan. The three states alone accounted for over 70 percent of the Rs. 200 billion increase in losses in 2008/09. The losses of the Southern Region (before subsidy) increased from Rs. 53 billion to Rs. 193 billion over 2006/07 to 2008/09, with their contribution to total losses increasing from around 20 percent to 37 percent, contributed almost entirely by the two states. In contrast, the Northern Region, which had contributed half of the total losses in 2006/07, actually improved its position slightly; and the maximum improvement has been in the Eastern Region, with losses coming down from 21 percent to 5 percent, contributed almost entirely by the positive performance of West Bengal.

The following charts and text attempt to capture and explain some of these changes, partially through a measure designed by the authors in the earlier paper cited above.

Chart 1 on page 12 shows the wide dispersion in 2008/09 of IROs of states and individual discoms, with discoms even within individual states exhibiting very different characteristics (Appendix at the end of the paper lists the states with the respective acronyms deployed in the charts). However, there is a broad tendency for discoms of states with large losses to cluster towards the bottom of the IRO scale. For instance, Rajasthan, Uttar Pradesh, Andhra Pradesh all have negative scores for the IRO, and Tamil Nadu's score is close to zero. On the other side, many states with financial surpluses or those whose losses have improved (Chattisgarh, Delhi, West Bengal, and Kerala) have positive IRO scores. States with good financials, but which have deteriorated (Orissa) are near the middle of the band.

Chart 1: Ranking of state utilities by IRO, 2008/09 (uniform weights)

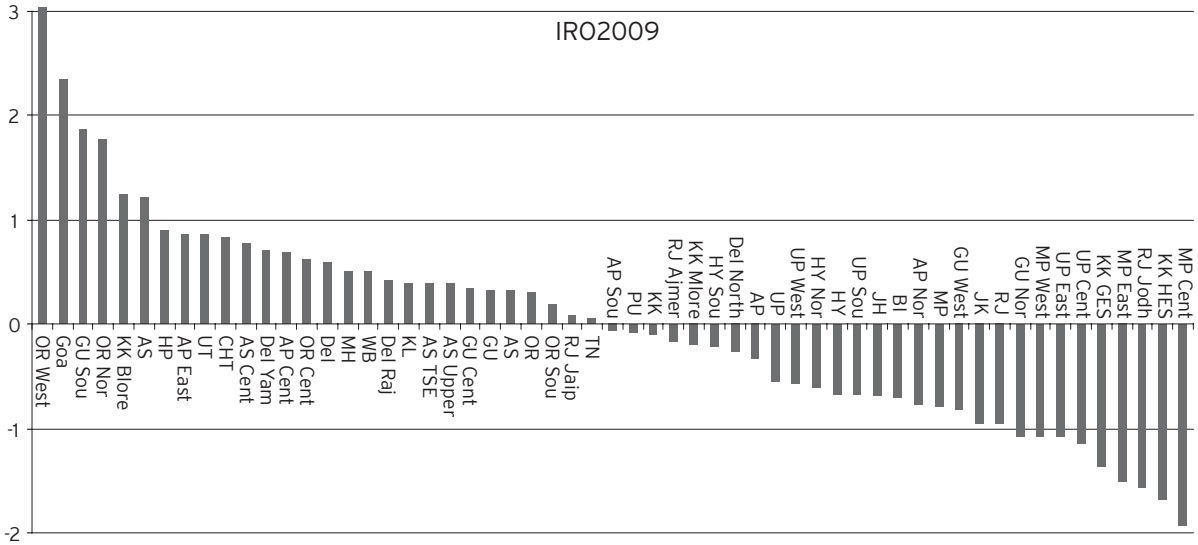


Chart 2: Change in 2008/09 IRO versus 2002/03

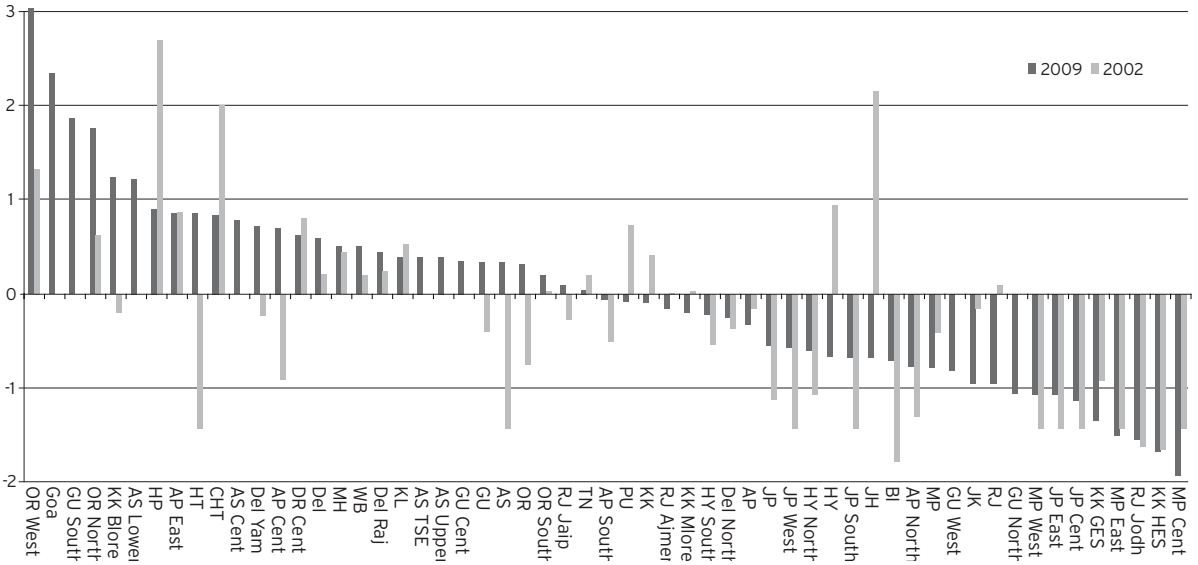


Chart 2 documents a long term change of the revenue orientation of utilities over the period 2002/03 to 2008/09. Overall, a striking pattern is the preponderance of improvement in the IROs of discoms, particularly among those with higher IRO scores to begin with (that is, better initial conditions regarding commercial orientation and revenue sustainability). Even among the low IRO discoms, more have improved their IRO scores (even if marginally) than those whose scores have deteriorated.

Chart 3: Longer term shifts in IRO at the state level

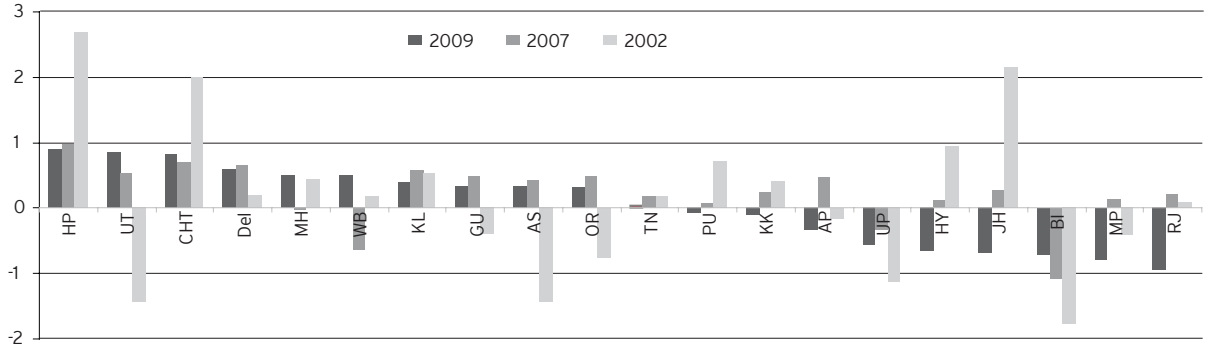
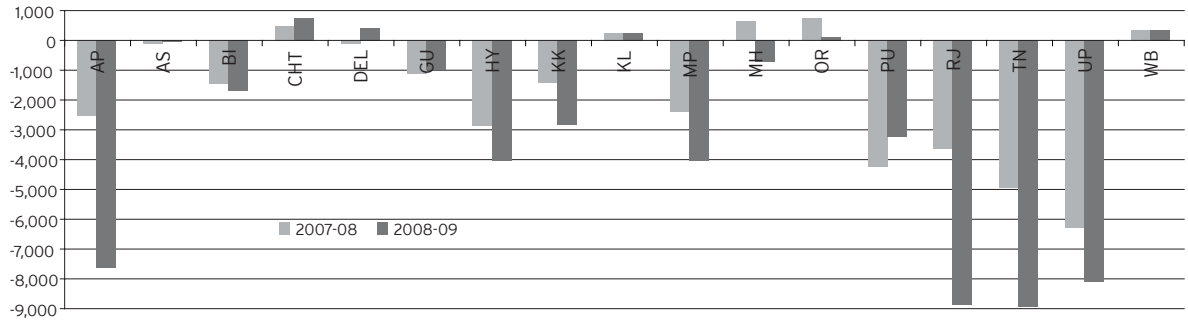


Chart 4: Losses of states, 2008/09 versus 2007/08



Charts 3 and 4 show the same evolution, aggregated at the state level, serving to bring out more clearly the association with the financial losses reported earlier.[17] The objective of this exercise is to start looking at the effectiveness of the IRO as not just a correlate, but a device for projecting the distribution of losses and thereby use it as an operation tool in facilitating policy discussion. It is noteworthy that states like Tamil Nadu, Uttar Pradesh and Rajasthan that have recently deteriorated in terms of their financial losses (including some of the discoms associated with these states) were precisely those which were perceived by the 2002/03 IRO (reported in our earlier paper for 2004/05) to be struggling to impart the requisite commercial orientation, essential for sustaining positive cash flows.

Charts 5 and 6 depict these linkages more explicitly over the recent past. Chart 5 cross-plots the patterns of Chart 4, showing the losses in 2008/09 (the horizontal axis) with the change in the financial losses during the two previous years (plotted on the vertical axis). The deterioration of the three states (Andhra Pradesh, Tamil Nadu and Rajasthan) since 2006/07

Chart 5: Cross plot of 2008/09 losses of selected utilities versus change in losses since 2006/07

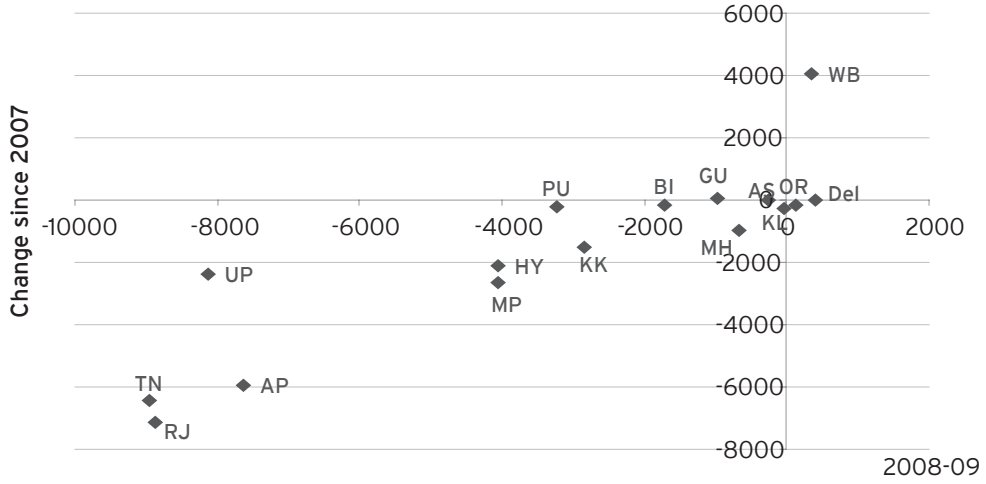
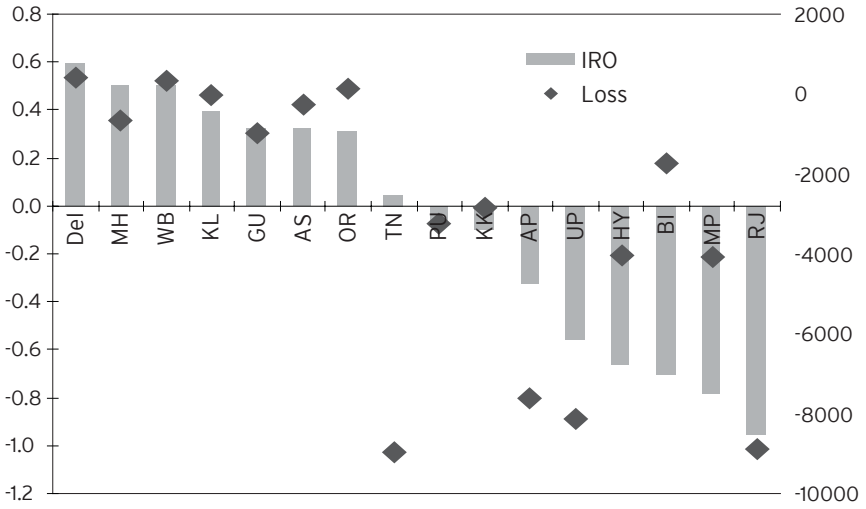


Chart 6: Examining the robustness of the IRO: Plot of the 2008/09 IRO and financial loss



Note: Both axis in Chart 5 and the vertical axis in Chart 6 are in crores of Rupees (accounting unit deployed in India), which can be converted into billions of Rupees by dividing by 100.

becomes immediately obvious. Uttar Pradesh, despite having high losses, has not deteriorated significantly. Chart 6 links 2008/09 losses (represented on the right vertical scale) to the IRO of that year. Overall, there seems to be a fairly close fit of losses to the IRO, albeit with a certain asymmetry. The IROs of states with surpluses (or moderate losses) seem to have a better correlation, but those with large losses display somewhat larger variability. It may be the case that the comparatively poorer IROs of states with moderate losses point to impending problems.

Table 6: Principal Components Analysis of IRO constituents

(a) 2006/07-2008/09

Total variance explained

	Initial	eigenvalues
Component	Total	Percentage of variance
1	1.31	81.19
2	0.21	13.16
3	0.08	5.15
4	0.01	0.50

2002/03-2008/09

Total variance explained

	Initial	eigenvalues
Component	Total	Percentage of variance
1	1.64	40.92
2	1.21	30.37
3	0.72	18.04
4	0.43	10.67

(b) Component Matrix

Component	1	2	3	4	1	2	3	4
ATC Loss reduction	**0.012**	-0.041	0.003	0.089	**-0.654**	0.576	0.319	0.372
ARR-ACS Gap reduction	**0.596**	0.387	-0.039	0.006	**0.088**	0.894	-0.346	-0.270
Industry Gap reduction	**0.970**	-0.243	-0.012	-0.005	**0.848**	0.148	-0.257	0.439
Subsidising Ratio change	**0.121**	0.044	0.285	0.000	**0.694**	0.248	0.659	-0.152

Sample size: 64

Despite the signals given by the IRO in helping to get a preliminary determination of the financial health of state utilities, much greater attention is needed to understand the nature of deterioration of the finances of these utilities, since this will have important implications for strategies for both the centre and states to put in place (incentive) mechanisms and procedures to sustain improvement. At least initially, the central government's "new" financial assistance programme for the states has a recurring theme embedded in inputs and processes (as opposed to proximate emphasis on, say, "final" commercial outcomes like reduction in cash losses).[18] The Restructured Accelerated Power Development and Reform Programme (R-APDRP) would provide loans to state governments aggregating Rs. 100 billion for IT applications for energy accounting and auditing for preparing baseline data covering metering of distribution transformers and feeders for, *inter alia*, establishing the integrity of data relevant to losses of state discoms. How this in of itself will be a spur to sharp sustained reductions in ATC losses is a mystery. Has the apposite cost-benefit calculation for expenditure on IT (financed through borrowing) been undertaken?

Statistical characteristics of the IRO

The IRO constructed in Bhattacharya and Patel [2008] had used a simple uniform weighting mechanism, in the absence of robust results for a statistical explanation at that time. We have attempted an exploratory data analysis of the explanatory variables underlying the IRO, using Principal Components Analysis (PCA), with the intention of validating the choice of the uniform weighting structure (Table 6).[19]

Segment 6a in the table above shows the largest eigenvalues of the variance decomposition of the explanatory variable for the two time periods 2006/07–2008/09 and 2002/03–2008/09. Segment 6b displays the weights associated with the largest eigenvalue for the variances for each of the above periods.

The Industry ARR–ACS gap variable is the dominant explanator, particularly for the changes in the IRO over 2006/07 and 2008/09. The PCA assigns much larger relative weighting to this variable, in contrast to the uniform weighting of the IRO. However, the percentage of variance explained for the extended period 2002/03–2008/09 is quite low. The percentage of variance explained over the truncated period 2006/07–2008/09, although higher, is also lower than standard benchmarks. In other words, there seems to be a divergence in the relative weighting over a period of time. As a result, an inter-temporal comparison of the two periods might not be useful, using the PCA results. Pending further investigation, it might seem more prudent to continue with the uniform weighting of the IRO.

CONCLUSIONS

The mid-decade improvement in the performance of the power sector has not been transformative. Although the recent increase in the losses of state utilities have not yet overrun GDP growth to the extent of the situation in the late 1990s and early 2000s, and hence *might* be containable from a fiscal perspective at least in the short term (which is still a matter of disquiet given the desirability of fiscal consolidation), the implications for servicing the debt required for funding additional capacity is potentially of considerable concern if the recent trajectory of sector performance continues.

The proximate cause for the recent adverse performance is a sharp rise in the unit cost of supply, which has not been matched by a corresponding increase in the average revenue generated. This resultant failure to collect adequate revenue combined with a larger quantum of supply contracted at prices that reflect (i) new generating stations (with associated higher depreciation charges compared to the stock of older plants) and (ii) enhanced share of market-determined short-term supply via trading platforms that reflects scarcity value (in an environment of pervasive shortages—in other words, a sellers market) has virtually doubled financial losses in the aggregate of state level power utilities. Moreover, even if ATC losses were appreciably lower, the higher marginal cost of additional supply would not be (fully) reflected in higher consumer tariff given irregular tariff filings to state electricity regulatory commissions (SERCs) by respective state governments for revising prices; tariffs have been unchanged for at least three years in seven states (GoI 2010b]).

Of course, it would be unfair to attribute the overall deterioration of the sector to all states. As usual, there is a wide disparity in performance of state utilities. In the text, we have emphasised that the deterioration in financials in 2008/09 was largely caused by three utilities. It is becoming increasingly evident that not only is the power sector less homogenous than it used to be less than decade ago, it has become more heterogeneous in 2008/09. What had initially begun to appear as a "separating" equilibrium in 2005/06, with some state governments (as owners) managing a financial turnaround and sustaining (cash) profits for several years has unfortunately not sustained for many states.

Is there any indication that the course of increasing losses can be reversed quickly? Not that we can see. What is worrying about the deterioration and its concentrated origins is that the utilities of the relevant states were considered, till even very recently, to be some of the better ones in operational terms. The continuing losses reported in 2009/10 and projected for 2010/11 can only suggest that the deterioration has spread to other states as well. (At least some state utilities are reported to have resorted to large short term borrowing.)

The paper has identified two data-oriented metrics (i) the gap between average revenue realised from supply to industry and the average cost of power and (ii) the ratio of "subsidising to subsidised" sales, as an indicator of "commercial orientation" of utilities, reflecting initiatives to manage the supply of power in order to bring revenues up towards cost. The analytic exercise seems to indicate that it is precisely these two that is contributing towards the change in ARR and the IRO, implying that any improvement will be tariff led, without fixing the underlying malaise.

It is not an exaggeration to deduce that the health of state government-owned discoms is critically important for determining the payment risk and

(accordingly) assessing the sustainability of sector stakeholders. Since financial sector exposure to the sector has grown robustly in recent years there is the possibility of a wider challenge if the health of the cash-generating segment has been misread by private investors and lenders on account of moral hazard engendered by (i) sops of attractive regulated returns on capital; (ii) payment security underpinned by legal "crutches" from the past, viz., long-term PPAs; and (iii) the prospect of an officially sanctioned sector refinancing "work out" in the future by, say, establishing government-approved infrastructure debt funds to buy up (sub prime?) debt under the guise of maturity enhancement. Given recent global experience of coping with the aftermath of miscalculated risk and leverage it may not be as unlikely as one would *prima facie* think. When private entities (and the financial backers/banks) involved are deemed too systemically significant (too big, too complex, too interconnected) or too politically connected to fail, bailouts (even of irrationally exuberant sectors) take place. Other than implications for reputation, project finance with non-recourse to the corporate balance sheet establishes a floor for losses borne by sponsors.

Are we at yet another threshold of private gains but losses socialised? To some extent, the answer will depend on the degree to which improved open access and power trading can help alleviate the strains on cash flows engendered by reliance on the viability of long term PPAs of generators signed with state utilities. This is an issue that will be explored in future versions of this paper.

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APPENDIX

The states in the data analysis (summarised in the various Charts) with their respective acronyms are:

AP: Andhra Pradesh

AS: Assam

BI: Bihar

CHT: Chattisgarh

DEL: Delhi

Goa

GU: Gujarat

HY: Haryana

HP: Himachal Pradesh

JH: Jharkhand

JK: Jammu & Kashmir

KK: Karnataka

KL: Kerala,

MH: Maharashtra

MP: Madhya Pradesh

OR: Orissa

PU: Punjab

RJ: Rajasthan

TN: Tamil Nadu

UP: Uttar Pradesh

UT: Uttaranchal

WB: West Bengal

ENDNOTES

1. 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 government cannot (in practice) really force the other to take specific action. 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 vertically integrated government-owned electricity board. On the other hand, state governments do not require central legislation to lead through pioneering reforms, for example, Orissa and Andhra Pradesh established regulatory commissions and unbundled the sector under the purview of their own acts, prior to the Union government's Electricity Act, 2003.
2. The issue of power bonds as part of the workout by state governments to central utilities and PSUs started in 2003/04 and peaked at Rs. 316 billion in 2005/06. The last repayments are scheduled for 2016/17.
3. India's accounting/fiscal year runs from April 1 to March 31.
4. Total installed utility capacity is 167 GW, of which 70 percent is thermal; captive capacity is estimated at about 30 GW, of which 19.5 GW is connected to the grid.
5. Other work based on project-by-project status indicates addition of about 48 GW.
6. This means barely three years after the payments crisis described earlier was resolved.
7. This represents a capacity of about 4,450 MW.
8. Although outright privatisation of distribution zones has stalled after Delhi (in 2002), long-term distribution franchisee agreements with private discoms have been activated in recent years by state governments of Maharashtra (for Bhiwandi with aggregate technical and commercial (ATC) loss of about 60 percent in 2006/07) and Uttar Pradesh (Kanpur with ATC loss of 47 percent and Agra with ATC loss of 42 percent in 2008/09). (See Patel and Bhattacharya [2010] for analysis and critique of privatisation efforts.)
9. In fact, until the recent offering from Coal India Ltd., the largest initial public offering (IPO) in India was of a power company in the private sector.
10. The financial sector has, on average, lent Rs. 7 for every Rs. 3 invested by the sponsor.
11. Media reports, quoting high level government sources, have reported projections of losses in 2010/11 of Rs. 640 billion.
12. A caveat is in order: There are diverse official sources for data on the Indian power sector, and we do not attempt reconciliation (of definitions and numbers) in this paper. Suffice it to observe that for the most part all sources manage to convey the magnitude of the challenges, and turning points in sector performance. Agencies that publish data include Ministry of Power, Ministry of Finance, Planning Commission, Finance Commission, Central Electricity Authority, Regional Load Dispatch Centres, Power Finance Corporation and Reserve Bank of India.
13. How much of the reduction in ATC was due to government schemes requires deeper investigation. It is important to recall that in 2002/03, as a supplement to the sector workout ("One Time Settlement Scheme") mentioned in the introduction, the central government established the Accelerated Power Development and Reform Programme (APDRP). There were two streams of support under the APDRP—one for investment and the other as an incentive based on reducing operational cash losses (in other words, the latter was an outcome-oriented scheme). The Union Budget, 2002/03 formally rechristened APDP as APDRP,

and enhanced the allocation to Rs. 35 billion from Rs. 15 billion in the previous year with the stipulation that "*access of the States to 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.

14. On the cost of supply, active implementation of mandatory bidding for procuring power (as envisaged in the Electricity Act, 2003) would help to engender greater competition among bulk suppliers to discoms and likely lower procurement price for the latter.

15. Some of these states are already indebted way beyond targets established by the 12th Finance Commission. Average debt-GSDP ratios over 2005-2008 are: Punjab 43.2 percent, Rajasthan 48.2 percent, Kerala 37.1 percent, Uttar Pradesh 54 percent and Bihar 51.8 percent (RBI [2010a]).

16. Note discrepancies in some of the numbers relative to Table 2. We have quoted the respective numbers from the source tables, without an attempt at reconciliation. The broad trends are, however, completely in line.

17. Vertical axis in Chart 4 is in crores of Rupees (accounting unit used in India), which can be converted into billions of Rupees by dividing by 100.

18. Also see footnote 13.

19. An exploratory data analysis is required, since a regression analysis is not possible in the absence of a dependent variable.

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