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From Gloom to Boom: Bihar's Electricity Sector

Working Paper
Mapping Power Project

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Project Overview

This working paper was written as part of a collaborative research project, Mapping Power, which aims to provide a state-level analysis of India's electricity governance. The project is coordinated by Sunila S. Kale (University of Washington, Seattle), Navroz K. Dubash (Centre for Policy Research), and Ranjit Bharvirkar (Regulatory Assistance Project), and carried out by a team of 12 researchers. The research explores the views and perspectives of various stakeholders and organizations in each state and how they will be affected by new initiatives in India's electricity sector, as well as the forces and constraints that shape decision-making in electricity governance. Using data from qualitative interviews with key informants buttressed by quantitative data, the research team covered 15 states as part of the analysis: Andhra Pradesh, Bihar, Delhi, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh, and West Bengal. You can learn more about Mapping Power as well as access other working papers in the series here: http://www.cprindia.org/projects/mapping-power.

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Table of Contents

Abstract

Bihar symbolizes the worst of India. A very high incidence of poverty and low human development achievement are its hallmarks. However, recent trends show that Bihar's economy is showing signs of improvement. The electricity sector has also seen significant progress since 2005, and more so after 2012. Since mass protests against the dismal performance of power delivery in the state in 2011, the government has been pumping huge sums of money into increasing the supply of and access to electricity.

This paper shows that the electricity sector's performance is intimately linked to political context of the state. During the Lalu Yadav/Rabri Devi regime from 1990 to 2005, which was mainly supported by lower castes and Muslims, the economy stagnated and so did the electricity sector. This was a direct result of Yadav's hostile attitude towards the bureaucracy and corporate sector. In his view, the upper-caste-dominated bureaucracy was the main reason for the continued impoverishment of the lower castes. After 2005, Nitish Kumar's government, which came into being thanks to an alliance between upper castes and some lower castes that did not benefit much under Yadav's regime, began to seriously explore bureaucratic solutions to improving various public services, such as education, roads, and electricity. The political and social empowerment of lower castes during Yadav's rule has since made it difficult for any Bihar government to survive without addressing basic needs of the population at large. This is a clear deviation from previous governments, which remained immune to addressing people's needs and which allowed most resources to routinely be appropriated by the upper castes.

Introduction

In interstate comparisons of many social and economic indicators, usually Bihar is ranked among the group of worst performers, along with Odisha, Assam, and Uttar Pradesh. Among major Indian states, Bihar has the lowest electricity consumption in per capita terms. Though Bihar's residents are known for their political awareness, and the state played a key role in pushing for democratic rights during the emergency period of the mid-1970s, governments were barely held accountable for their dismal performance in provision of basic services like education, health, and basic energy needs. A recent paper using the composite index method ranks Bihar among the worst performers in terms of delivering infrastructure, social services, and law and order (Mundle et al, 2016).

The anti-emergency movement, led by Jayprakash Narayan and known as "complete revolution," is a watershed event in the history of modern Bihar. Since then we have seen new players, belonging to lower castes, competing in the political arena of the state—each one claiming to be the rightful torch-bearer of the so-called "complete revolution." From 1990 to 2005, when all of India was experiencing a sea change in its economic life, Bihar stagnated economically under Chief Minister Lalu Prasad Yadav. By the late 1990s or early 2000s, most states had unbundled their monolithic electricity boards and introduced independent regulation owing to central government laws, but Bihar's electricity sector continued to operate under the monolithic electricity board mode. One major blow to Bihar's access to resources came in 2000 when the original state was divided in half, also creating the state of Jharkhand. Most areas of natural resource reserves and industrial hubs were located in the area that became Jharkhand. The split also adversely affected the electricity sector, because most generating capacities and industrial consumers were located in Jharkhand.

Some scholars note that the economically sluggish period of Yadav's regime also saw much-needed political empowerment of Dalits and backward classes in the state (Witsoe, 2015). But this pattern of political empowerment of the backward classes but little or no economic progress led Jeffrey Witsoe to title his book about Bihar *Democracy Against Development* (Witsoe, 2013). Contrary to expectation, lower-caste political empowerment was not a result of reforms in the corrupt "system." Instead, by systematically weakening upper-caste-dominated state institutions and development activities, Yadav sought to break upper-caste hegemony (Witsoe, 2013, Chapter 2). To Yadav, it was clear that state-directed development programmes were largely appropriated by the upper castes because under the *zamindari* system, a legacy of the colonial era that gave landowners wide and hereditary control, the dominant landowning class/caste at the *panchayat* or village level often mediated between the state and the poor. Though it was officially abolished after independence, the zamindari system remained largely intact even after four decades due to ineffective implementation of land reform. The entrenched network of upper castes at the local/panchayat level, as well as at every level of bureaucracy, made it impossible for Yadav to work through the "system" to empower the lower castes.

Implementation of the Mandal Commission recommendations regarding Other Backward Classes (OBC) reservation by the V.P. Singh central government in August 1990 further heightened the conflict between bureaucracy and the Bihar state government. Yadav supported this move fervently, and in fact, he provided formidable counterslogans to Indira Gandhi's famous *"Garibi hatao"* ("Eradicate poverty") with *"Bhurabal hatao"* ("Eradicate the upper castes," including the Bhumihars, Rajputs, Brahmins and Lalas or Kayasthas) and "*Vikas nahin samman chahiye"* ("Not development, we want dignity"). To weaken the grip of the upper castes on the bureaucracy, Yadav often resorted to a) frequently transferring the high-level bureaucrats, b) out-of-turn posting of lower-caste bureaucrats to significant positions, and c) not filling the vacant positions with new appointments. Thus he was prepared to let governmental institutions deteriorate in order to stop upper-caste hegemony. This antipathy extended to Yadav's dealings with corporations. For example, he initiated various charges of corruption against the conglomerate Tata and did not extend their mining lease (Kale and Mazaheri, 2014). As result of this political context of "state incapacity by design,"[1] Bihar's electricity sector also stagnated/deteriorated.

Already weakening bureaucratic institutions got a further blow when the infamous "fodder scam," an embezzlement scandal that led to the end of Yadav's government, surfaced during 1997. Officers hesitated to sign any approval for spending fiscal resources due to fear of being investigated for corruption. The institutional standstill was so complete that the government was running a revenue surplus when Nitish Kumar replaced Yadav as chief minister (Mukherjee, 2010). In 2005, when Kumar walked into his new office after winning the election, he found some Remington typewriters and moth-eaten papers, so he hand-wrote his first order as chief minister (Mukherjee, 2010).

Due to the deterioration of law and order situation and weakening of bureaucracy in the state, stealing of distribution wires and transformers became commonplace, which effectively led to de-electrification of many already electrified villages. According to an experienced regulator who formerly worked for the Bihar State Electricity Board (BSEB), stealing wires almost became a profession, with thieves so skilled that they could actually trip the system and cut live wires. On one occasion this source, while on night duty, suspected that a disturbance in the system was due to wire thieves. He instructed the operator to immediately switch the system back on. The next morning, they found the thieves dead by electrocution.

[1] Mathew and Moore (2011).

To some extent, de-electrification of villages through stealing of distribution wires was also a result of political rivalries. If a political representative could not get his villages electrified through the BSEB due to a caste war between politicians and bureaucrats, he would encourage people of his constituency to de-electrify villages that were already connected to the grid.

One expert interviewed for this paper suggested that engineers working in BSEB were demoralized due to fact that non-technical staffs handling finance and human resource branch of the BSEB often harassed them over issues of promotions, pensions, etc. Non-technical staff were also able to influence decisions about whether to transfer engineers. In fact, during this period BSEB began to get higher-level official from non-technical backgrounds due to transfers of Bihar Public Services Commission (BPSC) officials. For example, the secretary of BSEB was usually a BPSC officer. This interviewee also stressed that well-functioning central organizations of the electricity sector such as the NTPC (formerly known as the National Thermal Power Corporation) and the NHPC (National Hydroelectric Power Corporation) are successful because they are headed by technical people.

As a result of the continued dismal performance of electricity in the state,[2] every segment of the economy began to evolve alternative ways to meet modern energy aspirations. Most groundwater irrigation facilities in rural areas were powered by diesel/kerosene (Wilson 1999). A new class of small entrepreneurs emerged who owned diesel generators and supplied electricity to households and commercial establishments in large and small towns of Bihar. Even in villages, mini-grids or microgrids formed, mostly fueled by diesel, though a significant number of them used biomass (particularly bagasse). The situation of electricity supply during those days was so dismal that during field research in 2004, the author of this study saw and heard loud diesel generators running everywhere in the capital city of Patna. In villages, households began installing small battery-backed solar photovoltaic panels for their lighting requirements. To serve this demand, retail shops for solar panels had mushroomed in almost every district town since 2000. In fact, solar panels became an important dowry/gift item for marriages.[3] However, the highly unregulated nature of this marketplace lured ill-informed consumers into buying cheap Chinese-made panels that came without any service or product warranty/guarantee and often became non-functional after a few months. A select few villages had shopkeepers who rented out battery-fueled lamps to villagers at dusk which were charged during the day using solar photovoltaic panels installed at the shops. All these alternative models of accessing modern energy services were largely geared towards home lighting. They did not address the need of high-voltage electricity required for irrigation and cooking. Additionally, these models did not make a quantitative impact in proportion to the need of the overall population; they remained mostly as demonstration items.

Many in the intelligentsia of Bihar believe that fundamental political and social changes during Yadav's regime were the precursor of economic changes that we see in present-day Bihar. In a leading researcher's view, Yadav empowered the masses belonging to the lower castes to demand services from the government, while Kumar is simply serving those demands due to political compulsion. Thus Yadav's role is more important in such a transformation in political accountability in the state[4]. Empowerment of the backward classes during Yadav's period compelled the high castes to forge a coalition with yet another set of disempowered castes whose interests Yadav did not address. Nitish Kumar, representing

[2] To be precise, the situation of the electricity sector was no better in the days before the Yadav government, but it became even worse during his time.

[3] Ankur Paliwal, "Power-starved Bihar lights up with cheap solar panels," *Business Standard*, September 16, 2012, http://www.business-standard.com/article/companies/power-starved-bihar-lights-up-with-cheap-solar-panels-112091602019_1.html.

[4] Interview with Dr. Shaibal Gupta, member secretary of Asian Development Research Institute, Patna.

these left-behind castes, became chief minister with the help of the Bharatiya Janata Party (BJP), which represented upper castes—the traditional owners of power. This was the first instance in Bihar when a party solely representing the upper castes had accepted a subsidiary status in a power-sharing coalition. It is important to note that though Bihar's economy grew slowly during Yadav's regime, this is also the time when poverty rates declined faster. It was during this period when Bihar for the first time lost its infamous tag of the state with the highest poverty level, which went to Odisha. From 1993–94 to 2004–05, the poverty ratio of Bihar and Jharkhand combined declined 14 percent (from 54.5 percent to 41.5 percent), compared with less than an 8 percent decline in rural India as a whole and a less than 2 percent decline in Odisha (Dev and Ravi, 2007, Table 8). Thus the empowerment of backward castes prior to 2005 had real distributional consequences, raising aspirations and setting up challenges for any government in the future. Later on, popular protest across the state compelled Kumar to promise that he would not seek votes if he could not improve the power supply.

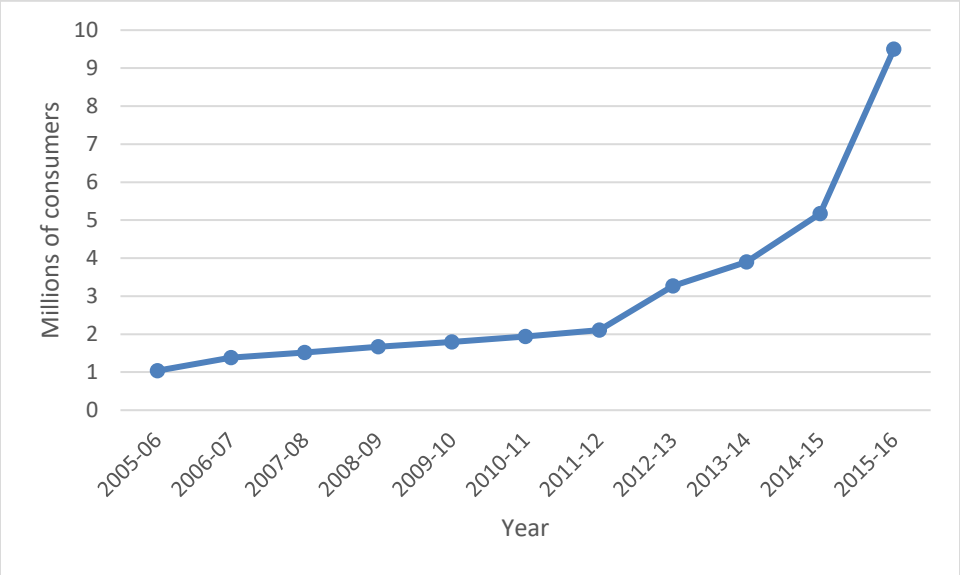
Bihar's trajectory of economic performance, including that of the electricity sector, changed significantly post-2005 after Kumar took over as chief minister. The state began to experience significant upward movement in many social and economic indicators. Bihar has posted 10.1 percent of annual growth in real net state domestic product for the period of 2004-05 to 2014-15 (Government of Bihar, 2017). The rate of serious crime began to fall significantly (See Mukherji & Mukherji, 2012, for detailed analysis of the situation pre- and post-2004)[5]. These results were applauded by the media as a consequence of Kumar's *shu-shashan* (good governance). An independent regulatory body, the Bihar Electricity Regulatory Commission (BERC), was established in 2005 and, finally, functional unbundling of the electricity board was accomplished in 2012.

Bihar's Gloomy Performance on Access to Energy for Households

About 89 percent of Bihar's 103.8 million population still lives in rural areas (Census, 2011). The latest available information (2014-15) shows that daily electricity consumption per household in Bihar is 1.4 units for rural areas and 4.3 units for urban areas (Ministry of Power, 2015). Village-level electrification has expanded rapidly during the last few years, and about 97 percent of the state's villages were considered electrified (i.e., access was available and at least one household had electricity) by the end of May 2016. The growth in the number of domestic consumers since 2005-06 has been phenomenal, going from 1 million in 2005-06 to 9.5 million in 2015-16. A major boost to new connections came after the 2012 unbundling in 2012—a policy move that was driven in part by the massive protests against the dismal situation of electricity supply in the state, as mentioned earlier.

[5] However, crimes against women were on the rise during this period; see Gupta (2010) for detailed discussion.

Figure 1: Growth in number of domestic consumers, 2005-06 to 2015-16



Source: Various tariff orders of BERC

However, universal household-level electrification still a long way to go in rural Bihar. As of the end of May 2016, about 87 percent of the total 17 million rural households in Bihar were yet to be electrified (GoI, 2016). Even in urban areas, the 2011 Census found that 44 percent of households were yet to use electricity as main source for lighting. Even more serious is the deprivation of access to clean cooking facilities in Bihar. Only 8.7 percent of the total 18.94 million households in Bihar had access to some kind of modern cooking fuel, including kerosene, as per the 2011 Census. Given this level of deprivation of modern energy, Bihar has the immense potential to benefit from promoting renewable energy innovation to make its energy sector more environmentally friendly and fueling green jobs and entrepreneurship for remote corners of the state. However, we do not see any indication that state policymakers are taking advantage of such opportunities. In most interactions, officials painted a bleak picture of renewable energy's potential in Bihar, owing mainly to the high cost of land, which in turn is rooted in the state's high population density and intensive use of land for agriculture.

At the end of November 2015, the chief minister announced plans for extending electricity connections with zero upfront charges to every household, with the goal of achieving universal access to power by November 2017. Before this, free connection was available only to households below the poverty line, under the centrally funded plan *Deen Dayal Upadhyaya Gram Jyoti Yojana*, and other households had to spend around Rs 1,500 for every new connection. Implementation of this policy has begun in villages very recently. At the end of May, 14.7 million households lacked electricity connections. A large majority of villages needing electrification are in the Katihar district. Out of a total of 675 villages that need electrification, according to the most recent update (November 29, 2016) from the GARV[6] portal on rural electrification, 471 (70 percent) are in Katihar. This was because the company that was awarded the contract could not garner the required human resources to deal with the size of the task at hand. Later, an additional company was granted a contract to work in Katihar.

[6] See the portal's website: http://garv.gov.in/dashboard

Bifurcation of State's Electricity Sector Assets

A significant of portion of the erstwhile BSEB's assets were transferred to the Jharkhand State Electricity Board in 2001 due to bifurcation of the state. Major generating plants were located in what became Jharkhand. From close to installed capacity of 2000 MW, Bihar went to less than 600 MW, a reduction of more than 70 percent in installed capacity of the state. Bifurcation also resulted in a substantial loss of industrial consumers for the BSEB, along with an increase in the share of domestic consumers. The share of industrial load in Bihar was reduced from 48 percent to 25 percent, while in Jharkhand the share of industrial load was a whopping 72 percent after bifurcation. Changes in load pattern by consumer category created further financial challenges for the BSEB. In view of a retired official with significant experience in power sector both at the Centre and in the state, the loss of industrial consumers due to bifurcation was a much bigger blow to financial sustainability of the BSEB and had a persistent impact on the financial performance of the sector. It is easier to deal with loss of generation capacity, as a sufficient amount of power is available nationally for procurement at reasonable prices in the short-term market.

I. Era of Independent Regulation and Unbundled Operation

The BERC began operating on 15 August 2005 and started issuing tariff orders from the financial year 2006-07. This was a period of president's rule in the state as a result of a hung assembly after the elections in February 2005, which lasted till the next election in November 2005. The second assembly election of 2005 in November delivered a clear mandate for the Kumar-led coalition of Janata Dal (United) and the BJP. It would not be misplaced to say that president's rule allowed bureaucracy to function after a considerable period of slumber during Yadav's period (Mukherji, 2010). Establishment of the BERC was a clear example of this new ability.

However, the BSEB continued to operate as a monolithic body. It was only after the poor state of power delivery prompted protests around the state in April 2012 that Kumar was compelled to give due attention. The Bihar State Electricity Reforms Transfer Scheme, which went into effect on 1 November 2012, restructured the BSEB into five successor companies, listed in the table below.

Table 1: Successor Companies to the BSEB

1.	Bihar State Power (Holding) Co. Ltd. (BSPHCL)
2.	Bihar State Power Generation Co. Ltd. (BSPGCL)
3.	Bihar State Power Transmission Co. Ltd. (BSPTCL)
4.	North Bihar Power Distribution Co. Ltd. (NBPDCL, or Northern Discom)
5.	South Bihar Power Distribution Co. Ltd. (SBPDCL, or Southern Discom)

The generation, transmission, and distribution companies created from assets of BSEB are now subsidiaries of Bihar State Power (Holding) Co. Ltd. (BSPHCL). Interestingly, all organizations relating to the electricity sector are still located on different floors of Bidyut Bhavan in Patna, where the erstwhile BSEB was located.

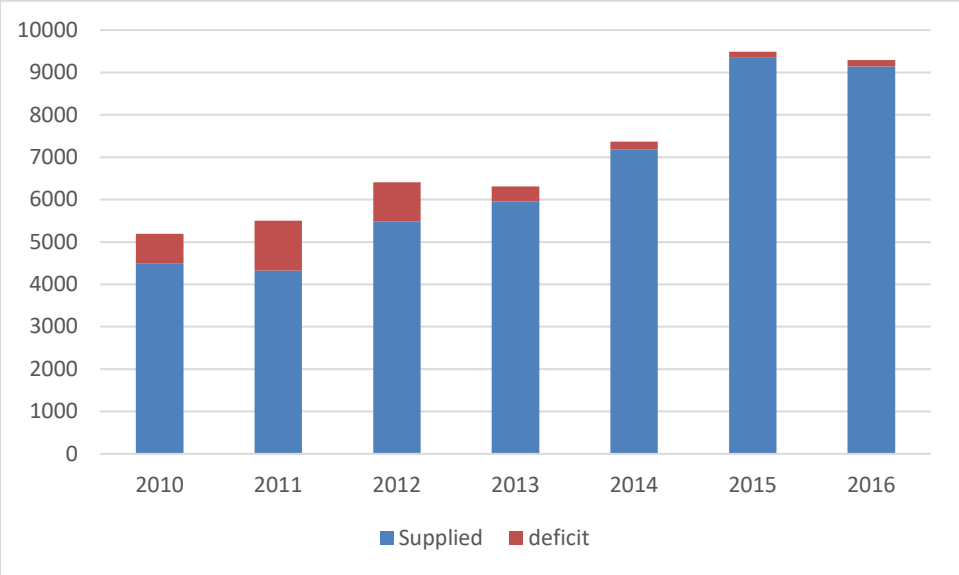
Importantly, having a holding company has helped in sharing of capabilities and human resources across the companies. Often the same people were in charge of similar positions at two discoms. For example, the general manager of revenue for both the northern and southern area discoms is the same person. Additionally, there was informal sharing of responsibilities and information across the companies. In one case, it was found that a senior official of the transco was handling the responsibility of power purchase, which is traditionally a domain of the discoms. The chairman-cum-managing director of BSPHCL has the authority to transfer employees across the organization, and many cases, contracts for other organizations are routed through BSPHCL. Thus, having separate entities increases the flow of information at a disaggregated level due to the regulatory requirement that each company must file its own annual revenue requirement for tariff allowance, but at the same time these companies are able to share their capabilities due to the presence of the holding company.

Improved Power Supply

Despite many households that remain unelectrified in Bihar, deficits in power supply have significantly reduced both in terms of energy and capacity. The state has been able to procure sufficient amounts of power, but increasing the reliability of the transmission and distribution network remains an issue. Availability of power became the cornerstone of the election campaign for the 2015 state election, so much so that Kumar vowed that his party would not go out to seek votes in the next elections if his government did not improve the power supply situation in the state by then. This promise was a response to the widespread protests in Bihar over the looming power crisis in the state. Press reports from March 2011 indicate that mobs of people across the state blocked roads and ransacked electricity board offices and power substations. For example, in Bhagalpur district, people were so enraged that the district magistrate and superintendent of police narrowly managed to escape from being lynched by a mob in March 2011. Also in Bhagalpur, a group of more than 300 women lay siege to the general manager's office of the BSEB. Such protests were a common scene in almost every district town[7]. Their anger was rooted in a widespread failure to keep sufficient electricity flowing; Bhagalpur, for example, was getting only 1-7 MWs of electricity during March while its demand at the time was about 60 MW. Notably, these protests were mostly spontaneous, not driven by political parties. One group in particular that drove the protests was workers in Bhagalpur's renowned silk and textile industry, a major source of employment for the district and among the worst victims of the power crisis. These protests eventually had an impact on the discussion that took place in the state assembly. There were various interventions from all sides of politics, urging the government to urgently improve the electricity situation in the state. Another emblematic moment of the power crisis came on July 30, 2012, when Kumar was giving an independence day speech on the historic grounds of the Gandhi Maidan—as a blackout hit across northern India.

[7] Gautam Sarkar, "Residents on warpath over power crisis," *The Telegraph (Calcutta),* March 26, 2011, https://www.telegraphindia.com/1110327/jsp/bihar/story_13769279.jsp.

Figure 2: Million units of energy demanded (satisfied + unsatisfied) during April-August

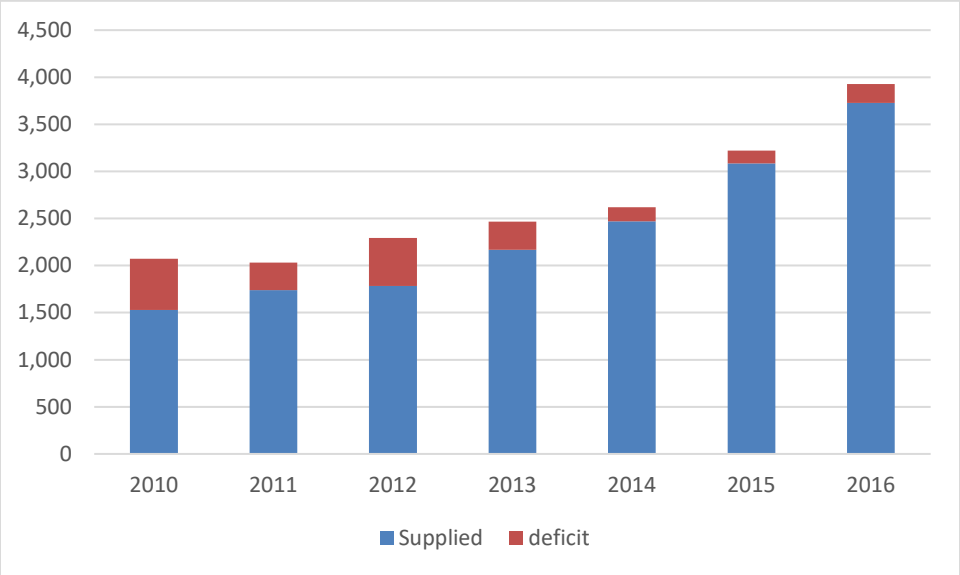


Source: Calculated from monthly reports archive on power supply situation: http://www.cea.nic.in/monthlyarchive.html

A noticeable revelation from Figure 2 and Figure 3 is that the state has been able to close the power demand-supply gap even in a situation of fast-growing demand for power. As can be noted, the deficits in supply are particularly low after 2012. This increase in power demand is mainly due to rapid electrification and addition of new domestic consumers, as shown in Figure 1. Meeting demand with little or no generation capacity of its own meant that Bihar procured a significant amount of power from external sources. About 72 percent of Bihar's power purchases in 2014-15 were sourced from central sector generators, i.e., the NTPC and the NHPC. The states' own generation capacity contributed little more than 4 percent. About 19 percent of the total power purchase of the state came from short/medium-term purchases.

Obviously, this quantity of cheap power was largely made possible through a huge revenue subsidy from the state government. For example, in 2014-15, the revenue subsidy to the electricity sector, known as the "resource gap grant", was Rs. 2891 Crores. It is clear at the same time, however, that accountability of the government towards its people has increased significantly.

Figure 3: Megawatts of capacity demanded (satisfied+ unsatisfied) during April-August



Source: Calculated from monthly reports archive on power supply situation, http://www.cea.nic.in/monthlyarchive.html

Saga of Subsidies and Losses

Because retail tariffs are based on the basis of approved distribution loss, the lion's share of this money goes to finance revenue losses of the discom owing to the gap between actual and BERC-approved distribution losses. In 2014-15, actual distribution loss was 37.89 percent for Northern Discom and 49.73 percent for Southern Discom, against the approved loss level of 21.4 percent. Table 2 provides details of the utilisation of the resource gap grant. But of the resource gap grant for the Southern Discom goes to fund unapproved distribution losses. Even after such a large subsidy from the state government, the Southern and Northern Discoms have net revenue gaps of Rs. 736 and 170 crores, respectively.

During various interactions during the research for this study, it was evident that increases in tariffs at this moment are unthinkable because of the emphasis on achieving universal access. Raising tariffs immediately may lead to a decrease in demand for new connections. The emphasis is clearly on keeping the lights on, and a reliable supply of power is the sure way to entice new connections (provided that distribution network is available).

Table 2: Utilisation of Resource Gap Grant for 2014-15

Particulars	Northern Discom	Southern Discom
Resource gap grant received from State Government	1217.22	1674.65
Disallowed power purchase* funded through State Government grant	518.54	1463.98
Available balance for resource gap assistance	698.68	210.67

**Disallowed power purchase cost: This is because the actual distribution loss of the discom is invariably higher than the loss level approved by the BERC tariff order.*

Source: BERC tariff orders for Southern and Northern Discoms, issued on March 21, 2016

The problem that Bihar has faced is of low demand for electricity connection, even in electrified villages. In order to deal with this situation, the discoms are providing connections without any upfront installation charges, but that will be billed later to the consumers. There was clear emphasis among discom executives on increasing efficiency of physical performance and billing the energy supplied. Every new connection is metered, and there is lot of emphasis on minimizing the gap between meter reading and billing. Discoms have launched a pilot project of spot billing, in which the meter reader delivers the bill to the consumer directly using a mobile billing device. During field visits, it was found that there were serious financial penalties and prison sentences for stealing power. Owing to this, many people have chosen to become legal consumers. At this moment, it appears that the government is willing to subsidise electricity consumption of the rural masses.

II. Drivers of Change

Regulatory Oversight

The role of BERC in improving the sector's transparency can hardly be overstated. It is because of the commission's continued effort that BSEB eventually began to file annual revenue requirements on time. BERC's role was crucial in ensuring availability of information regarding cost of operations and ensuring that state formally recognizes the electricity subsidy. In sharp contrast to other states, in Bihar electricity tariffs are low not because the government forces regulators not to increase tariffs, but because of the massive subsidy from the state budget as discussed earlier. For example, in its tariff order on March 24,

2017, BERC approved a 55 percent hike in electricity retail tariff to cover the costs of the discoms. Seeing such a massive hike, the government immediately announced an additional subsidy of 248 crores to limit the effective tariff increase to 20 percent. Thus, the BERC has been successful in enforcing cost-reflective tariff as mandated by the Electricity Act, and could ensure an explicit subsidy commitment from state finances if the government wished to keep retail electricity tariffs low. Unlike many other state electricity regulators, where governments use the threat of unwanted repostings or other informal means to keep them from announcing tariff hikes, BERC has not become a victim of arm-twisting by politicians.

Availability of Financial Resources

Bihar has been able to improve the availability of electricity because political willingness to improve the sector was backed by timely availability of corresponding financial resources for asset building. The Accelerated Power Development Programme (APDRP) and its later avatars were used for improving urban network and meter installations. These funds helped improve the distribution network, which was critical for reliability of supply. Another source of funds for Bihar's electricity sector to improve and expand the rural network came from the *Rajiv Gandhi Grameen Vidyutikaran Yojana* (RGGVY), which later became *Deendayal Upadhyaya Gram Jyoti Yojana (*DDUGJY) after change of government at the Centre in 2014.

These resources were available from the central government and were tied funds, so it was natural to think that the distribution sector would have been strengthened and extended as a result. However, simply improving and extending the distribution network would not have delivered power to end consumers without much-needed complementary investment in high voltage transmission capacity for transporting power from generation centres to demand centres. Interestingly, Bihar became a big beneficiary of the Backward Regions Grant Fund (BRGF) which is now mostly diverted to the electricity sector. A large part of this fund was allocated for strengthening the transmission network, which played a key role in improving the availability of power. So in large part, the electricity sector has been able to improve at least in terms of physical performance because of various sources of funds that were made available to Bihar's power sector.

Out of a total of Rs 12,000 Crore that was awarded to Bihar under BRGF for the 12th Five-Year Plan period (2012-17), Rs 8308.67 crore was earmarked for the electricity sector. It is also notable that Rs 6,395.19 crore is yet to be released by the central government, according to information available at the end of May 2016. A senior bureaucrat working in the sector shared with the author a letter from the central finance minister to the Bihar government in which the Centre expressed its inability to transfer the due amount immediately. As a result, Bihar is planning to raise a loan against this expected amount in order to avoid time and cost overruns for the projects. Even during the 11th Five-Year Plan period (2007-12), Bihar's electricity sector, especially the transmission subsector, received a significant amount of money under the Centre's *Rashtriya Sam Vikas Yojana* (RSVY), a precursor of BRGF, to help the backward districts of India. Note that these grants on capital expenditures are in addition to the above-mentioned resource gap grant.

Another factor that was critical to success was the increased ability of Bihar's electricity sector to spend the available fiscal resources. It has often been the case that Bihar could not utilize funds due to limited capacity to spend them. However, a recent recruitment drive and organizational restructuring of the discoms, discussed later in this report, has significantly enhanced the sector's capacity to spend available resources.

Thus, due to availability of BRGF resources, all sectors could improve simultaneously. This coincidence of availability of funds for improving the distribution and transmission sector at the same time, along with the cheap availability of power in the short-term market, has helped government deliver an improved availability of electricity even in rural areas.

Organizational Changes

Even after financial resources became available, work have been very slow because of cumbersome tendering process and limited human resource availability, which restricted the sector's ability to spend. Tenders regarding rural electrification projects were invited twice between January-June 2014, but both were cancelled due to lack of interest from bidders' side or due to very high bid amounts demanded by contractors.

In one senior officer's view, tendering is a process that should be handled by an independent agency of state. Engineers of the concerned organization should not be dealing with the tendering process. The major reason for delay in the process is officers' apprehension regarding corruption allegations. There is a fairly long history of many tendering processes ending up in legal disputes in the electricity sector of Bihar, most notoriously the "fodder scam" that brought the bureaucracy to a standstill.

The new officer appointed as chairman-cum-managing director of Bihar State Power (Holding) company decided to do things differently. As a first step, they wanted to know why bidders have little interest in rural electrification works. Through an informal meeting with potential bidders, an understanding developed that certain provisions/conditions of bidding application are acting as barrier for applicants. Accordingly, these were changed and clearance for the changes was sought from the Rural Electrification Corporation. One major condition for technical eligibility was that the bidder have previous experience of at least 50 percent of BOQ (bill of quantities) with respect to the current bidding quantity. This was reduced to minimum work experience of the company in the relevant sector. In the amended bidding process, provisions for incentives/penalties for faster/delayed execution of work were also included. After submission, bids were opened (both technical and financial) within three days' time and the entire bidding process was put on video to ensure transparency and allow non-winners to see the bidding documents of the winner. Even the REC cooperated with responding by quickly releasing the money. After the award for rural electrification projects, contractors were monitored routinely through engineers of the discoms. Due to increased transparency, there was no legal dispute after the bidding process, which would have been unheard of in the past.

Another significant organizational change took place in workforce organization and augmentation. In pre-2014 period, engineers dominated the electricity sector. In a 2014 recruitment drive, a significant number of non-engineers were brought from other sectors. For recruiting engineering graduates, Graduate Aptitude Test in Engineering (GATE) scores were used instead of testing them through additional examinations, which reduced cost, increased transparency, and preempted any legal haggling on account of a lack of fairness in the examination process, for which bureaucrats in Patna are famous.

Additionally, the hierarchy was restructured on a functional basis. Usually the hierarchy runs in the following manner: Chief engineer → executive engineer → assistant engineer → junior engineer.

However, this hierarchy operates along well identified functional areas, namely operation and Maintenance, revenues, and projects. Before 2014, functional areas were not clearly identified, which

made the fixing of responsibilities a problem. Due to increased staff strength and clarity in responsibilities, capacity to spend money on projects has increased significantly.

Outsourcing Rural Revenue Collection

Bihar's rural revenue collection has improved after implementation of Rural Revenue Franchisees (RRF). This model is slightly different from the standard model that was floated by the Ministry of Power at the Centre. In Bihar's case, RRFs are paid for each activity, as opposed to basing payment on overall collection efficiency on the basis of billing at the distribution transformer level. RRFs are paid Rs 4.50 for each meter reading, Rs 1.50 for each delivered bill, and 3 percent of total revenue collection for collection activities. The scope of RRF is limited to meter reading, bill distribution, and revenue collection. They have no role in managing the network or undertaking capital expenditure. There are 3,500 RRFs currently active, covering about 51 lakh rural consumers of the state—averaging around 1450 consumers for every RRF. In most states RRFs are mostly non-functional, but in Bihar RRF is the backbone of rural revenue collection.

Coordination Between Political and Executive Leadership

The top executives leading the electricity sector since mid-2014 are two Indian Administrative Service officers from Bihar cadre. Prataya Amrit is principal secretary of the Energy Department and chairman-cum-managing director of the BSPHCL. and R. Lakshmanan is managing director of the transco; previously he was managing director of both discoms. They have successfully demonstrated their abilities in improving bridges and the road sector of Bihar prior to this (Mazaheri et al, 2013). When they were brought into the electricity sector, the intention was clear: the Government wanted to see similar improvements there. It is quite interesting that during the independence speech at Gandhi Maidan in 2012, the chief minister promised to fix the dismal performance of supply and access to electricity—or else he would not come asking for votes in the next election in 2015[8]. Notably, BSEB was unbundled within two months of this speech. These officials joined the electricity sector in mid-2014 which gave them a little more than one years' time to get things done. The first thing Amrit admitted in his discussion was the limited time he had to deliver the expected outcome before the state elections in November 2014. Therefore, his first priority was to get rural electrification contracts awarded and follow that up with speedy execution and replacing 35,000 non-functional distribution transformers, in which he was successful. The impetus to improve the electricity sector has been sustained after Kumar won the elections in November 2014. Thus, coordination between the political and executive leadership has been a key aspect of positive changes in Bihar's electricity sector.

III. Experiment With Distribution Franchising in Urban Circles

Currently, there are three urban circles that are being run by distribution franchisees (DF): Muzaffarpur, Gaya, and Bhagalpur. The first distribution circle is under the northern discom, and the other two are

[8] Manish Kumar and Amit Chaturvedi, "If power situation doesn't improve, I will not seek votes in 2015: Nitish Kumar," *NDTV*, August 15, 2012, http://www.ndtv.com/india-news/if-power-situation-doesnt-improve-i-will-not-seek-votes-in-2015-nitish-kumar-496924.

under the southern. These distribution franchisees operate under the license of government-owned distribution companies. Therefore, they do not have to lodge separate petitions to the regulator for allowing them tariffs. These three franchises were granted around end of 2013 to beginning of 2014. The franchisees were selected through competitive bidding floated by BSPHCL. The competitive bidding process was based on a standard bidding document for appointment of an input-based urban franchisee floated by the Ministry of Power. DFs were awarded to different companies. The role of DFs is much broader compared with that of RRFs. In addition to activities performed by RRFs, DFs are responsible for day-to-day management of the distribution network and undertaking capital expenditure to strengthen and extend the network. Since DFs operate under their discom's license, it charges the same tariff to its consumers as the discom does in other areas. Thus, a DF pays to the discom for each unit of electricity on the basis of terms of agreement. It is important to note here that DF experiments in urban areas of Madhya Pradesh, namely Ujjain, Gawalior, Sagar, and Indore, are already closed now. Another franchisee operating in Nagpur is also about to be shut down.

Distribution companies are supposed to provide details of capital expenditure plan undertaken by their franchisees and asset creation to the regulator under the Electricity Act 2003. But distribution companies have not yet complied with this obligation due to their conflict with franchisees regarding what can be considered as capital expenditure (capex). This situation compelled BERC to issue a suo motu order asking the distribution licensees to submit the capital expenditure plan for their franchisees as soon as possible. Field work in the Bhagalpur area revealed that DFs have reported the capital expenditure, but Southern Discom has been taking its own time to examine these capex. According to a senior official of the Bhagapur DF, the "DF monitoring unit of the discom operates more like an auditing team than a monitoring team". Due to delayed inspection of capex, a number of issues arise. Firstly, it becomes difficult for the discom to arrive at an appropriate conclusion about capex claim. For example, suppose that a transformer implemented by DF gets stolen before it is inspected due to delayed inspection. Another issue is that the delay in inspection leads the monitoring cell to inspect only a sample of all capex undertaken by the DF, which obviously is going to have some error.

It was also observed that availability of electricity in rural (more appropriately periurban) pockets of the DF are usually lower than other rural areas which are operating directly under the discoms. A DF may have positive incentive to not supply 24X7 power in pockets where commercial and technical losses are higher, because this increases their loss levels rather than revenue. The differentiated supply in such periurban areas adversely affects the struggling but globally well-known silk/textile industry of Bhagalpur. A significant portion of the non-recovery of revenue in the Bhagalpur DF is due to the fact that power loom consumers located in periurban areas have not been paying their bills regular due conflict about the tariff that is applied to them. This hypothesis resonated in informal discussions with employees of the DF. On the contrary, however, the discoms have a positive incentive to provide the DF with required power on a priority basis because DFs for them are a big single-point consumer with guaranteed revenue. Another, notable point with regards to DFs areas in Bihar is that these areas are not getting the usual funds from the Centre and state; DFs are supposed to raise their own resources to undertake capex. Upon further probing it was found that DFs are not able to invest beyond mandated amount as per their agreements because of their limited human resource capacity and limed ability to raise funds from the market. Thus even though it makes economic sense for DFs to spend on capex much more than the mandated amount in their agreement, they face serious limitations in raising the required amount of capital from the market.

The experience of DFs in Bihar has not been encouraging till now. In terms of basic performance parameters, such as billing and collection efficiency, the discoms are doing better than the DFs, as can be seen from Table 3.

Table 3: Performance in meter reading, billing and collection efficiency of DFs compared with discoms

	Southern Discom	DF Gaya	DF Bhagalpur	Northern Discom	DF Muzzafarpur
No. of Consumers	25,23,950	1,20,672	1,62,540	33,61,480	2,11,321
Meter Reading %	63%	48%	55%	29%	51%
Billing %	60.96%	37%	49%	76%	68%
Revenue Collection %	90.97%	96%	80%	87%	69%

Source: BERC tariff orders for Southern and Northern Discoms issues on March 21, 2016

IV. Progress of Renewable Sources

On several occasions, officials in Bihar painted a bleak picture of renewable energy potential because of very high population density and expensive land. Currently Bihar has about 90 MW of biomass-based cogeneration, 55MW of small hydro, and 38 MW of solar PV of contracted capacity. Recently BSPHCL signed power purchase agreements for another 100 MW of solar PV. All these procurements are obviously geared towards meeting renewable purchase obligations (RPOs) enforced by BERC under the directives of the Central Electricity Regulatory Commission (CERC).[9]

[9] To harness unevenly distributed renewable energy potential across states of India, CERC introduced a mechanism of renewable energy certificates (REC) where renewable generators can sell their energy at general average cost/price of conventional power in that state while the additional cost of renewable generation can be recovered from trading the environmental attributes of that generation in the nationwide market. Discoms and other obligated entities with deficient renewable energy sources can buy those tradeable environmental attributes in the form of RECs to meet their RPO, which is enforced by the respective SERCs. One REC is equivalent to 1 MWh of electricity from renewable sources. These REC's are supposed to be traded between a predefined floor and ceiling (forbearance) price by CERC. In 2014, the prime minister announced a goal of 175 GW of renewable capacity by 2022, which includes 100 GW of solar and 60 GW of wind capacity. The current level RPOs set by SERCs are not anywhere close to reaching this target. Even these modest RPOs has not been met by most discoms. Very small quantities of RECs are being sold at the floor price all the time. The latest data for the month of October 2016 show that only about 19,000 solar RECs were traded compared to 2.3 million RECs on offer. In the case of non-solar RECs, a little more than 157,000 RECs were traded compared to about 8.3 million RECs on offer.

Enforcing RPOs has been challenging because penalty for non-compliance of any direction of the commission or provision of the law is only Rs 1 lakh. This amount of penalty for a discom with turnover of thousands of crores is hardly a deterrent. Discoms are willing to pay the Rs 1 lakh penalty instead of complying with the RPO. As an alternative, some state regulators, including Bihar, have provided for deposit of a penal amount linked to the amount of noncompliance of RPO and to the forbearance (ceiling) price of renewables (fixed by CERC) in a separate RPO fund. That fund, according to the directive of the BERC, can be used for purchase of renewable energy certificates (RECs) and providing an evacuation facility for new renewable power projects in the state. This is something that BERC has been doing since its last three tariff orders. For the period of 2014-15, BERC has directed the two discoms to deposit a total of close to Rs 88 crores in the RPO funds account. For the period of 2016-17, BERC has approved at total of 6.5 percent energy as an RPO consisting of 1.5 percent from solar and 5 percent from non-solar sources.

In addition to the RPO mechanism, there are proposals for grid interactive rooftop solar panels facilitated by net metering technology so that consumers are billed according to net energy consumption. Regulators have already directed the discoms to work towards implementation of this. This policy may well overcome the longstanding stumbling blocks for renewable energy in Bihar. However, it is yet to take off, and there is no way to speculate on how it this fare.

It appears that national policy is overly invested in using the electricity sector as a tool for increasing the proportion of renewables in the energy mix of India. This is probably because of the institutional capacity in the electricity sector, i.e., discoms, that can be used effortlessly through the regulatory mechanism. However, discoms across the country have largely failed in responding to regulatory requirements. It is not surprising, though, because these institutions have traditionally faced financial difficulties. It would be hard to motivate them to buy expensive renewable power until their respective state governments are willing to finance such purchases.

On the other hand, a major source that can be tapped for promotion of renewables in India's energy mix has been squarely ignored. A significant part of India's demand for modern energy, which is still largely latent, will be for cooking. A large majority of Indians still use traditional biomass in open-fire ovens to cook their food. Only about 16 percent of rural Indian households are able to use some form of gas or kerosene for their cooking. Bihar's situation is much worse, at just 6 percent of households. Obviously the widespread lack of access to modern cooking fuel has socioeconomic ramifications. Modern energy access for cooking, in addition to enhancing energy efficiency, will deliver massive socioeconomic dividends, such as improvement in health conditions of women and children who primarily become victims of indoor air pollution and increased availability time can be utilized by women for economic activities when they do not have to spend time searching for firewood. Thus, promoting renewables for cooking fuel can help India address gender disparity. Even at a global level, gains are significant because reduced demand for natural gas from a country of India's size will significantly help in stabilizing the price of energy. However, no developing nation, including India, has ever fixed a target for universalizing access to modern cooking fuel. Due to lack of policy attention on this front, there is a) little or no technological progress in gasification of biomass that is being burnt in open-fire ovens with only 8 percent to 16 percent of efficiency, 2) there is no bureaucratic institution that has direct responsibility of delivering modern fuel for cooking as in the case of electricity. However, marginal gains of policy efforts in this area could be huge.

Conclusion

Bihar is currently on the way to universalize access to electricity at a massive speed, which contrasts with the former dismal performance of the electricity sector before 2005, where villages were de-electrified owing to dysfunctional transformers and stolen distribution wires. Such stagnation was mainly due to Lalu Yadav's deliberate attempt to let the bureaucracy deteriorate because he saw it as captured by upper castes. However, even before Yadav's administration, access to electricity and its consumption remained at very low levels.

In the post-2005 period, Nitish Kumar's government—a coalition of lower and upper castes—saw the bureaucracy leap back into action. Bihar followed the traditional model of functional unbundling of the power sector, but has maintained the sharing of resources across the unbundled companies through a parent (holding) company. However, Yadav's legacy meant it was not possible any more for the upper-caste-dominated bureaucracy to ignore the need to share the state resources with now-empowered lower castes. Availability of money to strengthen and extend the transmission and distribution network, along with a huge subsidy to finance power purchases, has enabled the electricity sector to provide new connections with a reasonable level of supply in villages. Given the sums of money being allocated, obviously this sector has become a priority of the Bihar government, whose efforts in this regard were largely a response to widespread demonstrations on the streets of major district towns in 2012.

The focus of the policy is on extending the network and making access universal, not on recovery of costs. Bihar has a historically low rate of household electrification even in electrified villages, which suggests a problem from the demand side. Given massive poverty levels in the state, it is important to create more jobs so that the poorest have a share in growing prosperity. Access to electricity can be very instrumental in promoting employment. especially among women, as demonstrated in the South African experience (Dinkelman, 2011).

The Government of India and the states should look again at the policy of achieving renewable energy targets, because due to high costs most discoms have failed miserably to respond to regulatory requirements with regard to procurement from renewable sources. Instead, India should look to a potential large new source of electricity demand that could be met by renewables: as cooking fuel.

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